#	Taken by	Date
~~226~~, 231, 232, ~~236~~, 242, ~~245~~, 246, 247, ~~249~~, 253, 254,	FMC for AGN	13 Sept 56.

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Ivanov, P. I. Transl. 226; Growth Substances
Use of Growth Substances for the Control of Fruit Drop in Apples.
Sad i Ogorod 1948(5):24-27. May 1948. 80 Sa13
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Translated by Mrs. S. N. Monson

GROWTH SUBSTANCES

Fruit drop in apples may be divided into 4 periods: the first and second periods relate to the time of formation and development of ovaries of fruits. Under normal external conditions a natural thinning of trees of superfluous immature or diseased fruits takes place in those periods. This fact may be regarded as normal. The third period relates to pre-harvest fruit drop, when a tree loses fully mature fruits which nevertheless did not reach the stage of commercial ripening; and finally, the fourth stage, of ripe fruit drop during harvesting.

Numerous observations indicate that fruit drop of apples before harvesting and during that time amounts to 90% among separate varieties. Up to recently all measures to control fruit drop of apples proved unsuccessful where ordinary agro-technical methods had been applied. Only in the last years, in connection with the studies of phyto hormones (growth substances) of the academicians Kholodny, Maksimov and other Soviet scientists were new possibilities opened to control fruit drop of apples.

The fruit possesses from its earliest development the capacity for producing itself special substances which contribute to the flow of nutrients to the fruit, resulting in its growth and development. These substances are called auxins or growth substances. Auxins, essential for the primary growth of the fruit are introduced with the pollen during pollination and fertilization of the flower. Subsequently they form within cotyledons and seeds produced from them. In varieties tending to natural seedless fruits auxins form in unfertilized cotyledons. The larger the amount of seeds in a fruit, the larger its production of auxins, the greater the flow of nutrients to the fruit and the more rapid its development.

Experiments have shown that fruits less endowed with auxins are retarded in growth. Fruit growth takes place only so long as its seeds form auxins. When seeds have completed their growth they acquire a hard coat, and production of auxins is equally terminated. So are growth and development of fruits which usually drop.

Fruit drop is caused by the fact that a so-called abscission layer is formed at the base of the fruit stem, consisting of living cells which under certain conditions separate from each other. The fruit stem is sort of cut through and the fruit drops.

Tests have shown that the formation of the separating layer is caused by a drastic reduction in auxin content in the fruit and its access to the fruit stem. We thus observe that the discontinuance of the emission of auxins by seeds leads to the discontinuance of growth and fruit development, to the formation of a separating layer within the fruit stem and the drop of the fruit. If the emission of auxins by seeds is radically reduced before the fruit ripens a premature formation of the separating layer in the fruit stem follows and the immature fruit drops. This explains that one may control fruit drop in apples either by intensifying the production of auxins by seeds or by introducing auxins from outside.

At present our chemical laboratories are engaged in manufacturing synthetic growth substances that possess biological activity analogous to auxins.

Multiple experiments have shown that if growth substances are introduced externally into apples their drop is drastically curtailed; fruits continue to develop and attain normal maturity and size. At present we know of several synthetic growth substances which interfere with fruit drop in apples. These substances, in line with their biological activity, may be applied in different concentrations of solutions established by previous tests:

Preparations	Concentrations of Solutions
Alpha-naphthalene acetic acid	0.001%
Beta-naphthol acetic acid	0.003%
2-4 Dichlorphenoxacetic acid	0.0002%

Among the above-listed growth substances the one most tested and exerting a positive action in preventing fruit drop in apples is alpha-naphthalene acetic acid. It has, compared to the rest, many valuable characteristics: complete harmlessness in applied dosages for the human organism, absence of formative action on the treated plant and relative resistance to external influences in storage.

In the summer of 1947 the author of this article was engaged in tests on apple trees of the variety Candille Sinap at Krasnodar fruit-vineyard experiment station. Three trees were taken for the experiment, aged 31 years, equal in fruit bearing (according to data of preceding years) and to which in the immediately preceding three years similar agricultural methods had been applied. In the spring of 1947 all three trees had practically similar bloom and produced abundant fruit germination. In July because of severe infestation by the apple moth (Lasneyresia pomonella L.), mass fruit drop began amounting to 5-6 kg per tree daily.

On July 31 two trees were sprayed with alpha-naphthalene acetic acid. 20 liters of liquid solution of this chemical in a concentration of 0.002% were used for each tree. The test was conducted in three variants:

1. Tree No. 1, untreated for control.
2. Tree No. 2, treated with liquid solution of alpha naphthalene acetic acid in 0.002% concentration, to which was added 1g. of citric acid

for 20 liters of solution.

3. Tree No. 3 treated with the same solution in same concentration. Citric acid was added to increase the action of the chemical.

The solution was prepared in an ordinary manner. 200 mg. of the substance were dissolved in 10cc. of alcohol. The obtained solution was poured into 20 liters of cold water and thoroughly mixed. To prevent rapid evaporation of the liquid, the trees were sprayed in the evening, in calm weather, from an ordinary knapsack sprayer, and an attempt made to have the solution penetrate the indentation of the fruit from which the fruit stem appears.

On the third day after spraying (Aug. 2) fruit drop was drastically reduced. The action of the chemical continued until August 13, inclusive, after which fruit drop became the same as in the control.

From August 14 and until harvesting (Aug. 25) the trees under test were not treated again. During that period we observed a certain increase in fruit drop on treated trees.

During the period of active action of alpha naphthalene acetic acid (from Aug. 2 to 13) fruit drop compared to control was reduced an average of 27%. In the same space of time (Aug. 14 to 25), without alpha napthalene acetic acid fruit drop on treated trees increased an average of 7%.

On the whole, treatment of trees by this chemical reduced fruit drop 20%. It may be assumed that a repeated treatment (on Aug. 14) would have improved results. It is also interesting to note that the chemical interfered with fruit drop from fruits injured by the apple moth and thus preserved their commercial value.

In external appearance the fruits picked from treated trees (Aug. 25) were noted to be different in degree of ripening and color. Fruits picked from treated trees were of two stages of maturity. The minority of fruits had reached the degree of industrial ripening, bright yellow, of a color alien to the variety. The majority of the fruits was of commercial ripening value, of larger size and beautiful coloring. Fruits picked from the control tree were unripe and much smaller.

Judging from the general quantity of fruits dropped between August 2 and 25, and picked on August 25, all three fruit trees produced equal yields which corresponded to their performance of previous years. This permits us to determine the yield of trees under test with relation to the control.

RELATIVE DATA ON FRUITS PICKED FROM TREES UNDER TEST
August 25, 1947

No. of Trees	Fruits of industrial maturity (yellow) kg.	speci- mens	Av. wt. of fruit (g)	Fruits of commercial maturity (red-sided) kg.	speci- mens	Av. wt. of fruit (g)	Unripe fruits kg.	speci- mens	Av. wt. of fruit (g)	Total picked on 8-25-47 kg.	speci- mens	Av. wt. fruit (g)
No. 1-control							23	200	115	23	200	115
No. 2-treated	13	95	137	37	224	165	3	40	75	53	359	148
No. 3-treated	11	100	110	30	182	164	8	82	97	49	364	135

It appears from this table that the spraying of fruits on trees treated with alpha naphthalene acetic acid resulted not only in reduced fruit drop but accelerated ripening and increased weight. The yield from every treated tree was double that of the untreated control. It is possible that some injury caused by the apple moth to fruits of treated trees affected the difference in degree of ripening. But on the control all fruits were unripe and equally infested by the apple moth. No fruits of yellow color were observed on the control.

The taste of fruits from treated trees did not differ from that of ordinary untreated fruit at the time of harvesting and after 4 mos. of storage. Nor did a chemical analysis reveal any deviations from control fruits, except for higher acidity of the latter which is explained by the degree of ripeness.

It follows from the above that the aqueous solution of alpha naphthalene acetic acid in 0.002% concentration represents a biologically active preparation which interferes with pre-harvesting fruit drop of apple trees, a fact of great significance for yield increase. In addition, the chemical substance of this concentration stimulated growth and accelerated ripening of fruits which produced fruits of consumer ripeness in a shorter period and permitted regulating of periods of fruit ripening on large plantings, thus ensuring reguler and uninterrupted supply of a valuable raw material to the processing industry.

The capacity of this chemical substance to prevent fruit drop from trees infested by the apple moth preserves the commercial value of the fruits.

The above experiment should be considered tentative, will require repeated testing and more detailed study of indicated factors.

Krasnodar Orchard Viniculture Experiment Station

End of article.

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Translated by S. D. Monson

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Iakovlev, B. Transl. 228: Potatoes
Colorado potato beetle and measures to prevent its penetration into USSR territory. Sovet. Agron. 8(7): 15-23. July 1950. 20S084.

228

Translated in large part by S. N. Monson

Only 126 years ago (1824) a yellow beetle with ten black elongated stripes was discovered by Thomas Say on slopes of the Rocky Mountains in North America and described as a new type of insect; it was named Leptinotarsa decemlineata Say. At that time the beetle fed on a wild plant, the thorny Solanum, and was not injuring potatoes. In 1859 this most dangerous enemy of the valuable potato plant was first discovered in the State of Colorado; since that time it has been known as the Colorado Potato Beetle.

Some time passed until it was finally noticed by farmers; by 1865 it had propagated to dangerous proportions, moving in continuous masses and devouring in its path not only plants of solanum but also cultivated cabbage, oats, red gooseberry and others.

American farmers, caught unawares, proved unprepared to cope with the pest which also destroyed potato crops all over. There was a time when it was believed in North America that the situation in the country with regard to potato culture was hopeless.

The year 1875 struck Americans particularly hard when the Colorado potato beetle because of its colossal propagation rate, terrified not only farmers but even the urban population.

In October of that year a living mass of pests covered the beach at Coney Island, New York, for several kilometers; railroad tracks were so piled with insects that trains were unable to run.

The application of poisonous intestinal chemicals reduced in part the injury caused by the Colorado beetle.

In 1874 the Colorado potato beetle appeared in such quantities at seaside towns and naval ports of the East American seaboard that it was necessary to lock the hatches on ships. This presented already a threat to its potential importation abroad. Countries of Western Europe, concerned over the penetration of the pest into their territories issued already in 1875 laws prohibiting the importation into Europe of potatoes and various types of plant material which could act as hosts for the Colorado beetle.

During the period of the first Imperialist War, in 1917-18, the American Expeditionary Armies carried the Colorado beetle into France. No one in that country used any initiative to prevent the entry of the Colorado potato beetle. The population was not familiarized with its external appearance and the harm it would cause to their potato fields. This potato scourge was recognized in France only in 1922 when it began causing considerable damage to potato crops.

No measures were taken, nevertheless, for the immediate and complete destruction of foci of the pest; as a result it spread in 1935 throughout France, invading 77 departments out of a total of 88 and penetrated into Belgium.

The Second Imperialist War prevented countries of Western Europe from conducting planned control over agricultural pests and diseases, thereby creating favorable conditions for their development and distribution.

The absence of systematic regular control and agricultural pests in these countries reflected with particular severity on the development and destructive activity of the most harmful potato pest, the Colorado potato beetle. Governments of countries where it dwells were burdened with the financial responsibility of controlling the pests. In America 20 to 30 million rubles are spent annually on the control of the Colorado beetle; in 1930 the U.S.A. spent 120 million rubles for this purpose.

In addition to these expenditures, losses are suffered in yields. In 1930 the U.S.A./loss amounted to 150 million rubles from damage caused by the Colorado potato beetle.

According to the foreign press, France bears yield losses of 30%; the average yearly loss amounts to 5250 thousand tons; on some farms 90% of the potato crop is destroyed.

In order to preserve potato plantings from damage caused by the Colorado beetle it is essential to be well equipped for its control.

All working people of the Soviet Union should be well-acquainted with the external characteristics and living habits of the Colorado beetle in order to recognize the pest on potato fields in time.

Timely discovery of the Colorado beetle is the basis for its successful liquidation.

EXTERNAL CHARACTERISTICS OF THE COLORADO POTATO BEETLE AND ITS LIVING HABITS (P. 17-21)

EXTERNAL CHARACTERISTICS (p. 17-19)(not translated)

LIVING HABITS (p. 19-21)(not translated)

ORGANIZATION OF SURVEY (p. 21-23)

In order to free our country in time from damages caused by the Colorado beetle, the Ministry of Agriculture of USSR, based on decrees of the government, has established a system for conducting all over surveys of potato plantings on the territory formerly under temporary occupation and in the vicinity of naval and river ports and airports where steamships and airplanes arrive from abroad.

At collective, state and auxiliary farms, farms of scientific research, other institutions and organizations surveys are conducted at the expense and with the labor provided by these farms. Potato plantings on adjoining plots of collective farmers are surveyed by the farmers themselves under the supervision of a responsible person assigned by the management of the farm.

On farms of peasant-independent land holders, ("edinolichniki") of workers and employees (in the field and adjoining plots) surveys are performed by the owners of fields under the supervision of a responsible person selected by agricultural sections and in cities by municipal or regional councils.

School children are also drawn into the work under the supervision of their teachers or specially trained personnel. It is recommended to make surveys on warm and sunny days when beetles and their larvae crawl on the upper side of the foliage.

A daily norm has been set for every surveyor by the Ministry of Agriculture. For an adult ~~w~~ working in the field the norm is 0.75 hectares, on adjoining plots - 0.5 h.; for school children - in the field 0.3 h., on adjoining plots - 0.2 h.

After the potato blooms and the hills have expanded and become tangled the norm should be reduced in half.

School children, above ~~no younger than~~ 12 years of age, are called in for work; brigades of school children should consist of no more than 10, supervised by one adult and well-trained brigade leader.

Surveyors walk along rows and observe every potato hill in every row. Upon noticing beetles, larvae or egg laying that resemble the Colorado beetle, the brigade leader collects these in a labeled bottle; the hill is marked. Insects and marked plants are delivered to the inspector of plant quarantine.

In addition to making compulsory special surveys the duty of every working man or woman who grows potatoes and other crops of the Solanum family is to watch for the appearance of the Colorado beetle during weeding, hilling and harvesting.

FIRST ESSENTIAL MEASURES FOR DISCOVERING FOCI

When information is obtained about the location of a focus of the Colorado beetle there is a suspicion of infestation it is the responsibility of the agronomist to verify the accuracy of the information in person, on the same day. Once the presence of the pest is confirmed, the following measures must be undertaken under the supervision of the Inspector of Government Inspection of Quarantine of Agricultural Plants.

1. Boundaries of the focus of distribution of the Colorado beetle determined by organizing on the infested plot and around it the most careful survey of all hills; all beetles, larvae and egg laying of the pest must be collected. The soil under infested hills must be examined to a depth of 30 cm and sifted; since larvae, pupae and beetles may be found underneath. All beetles, larvae, pupae and egg laying piles must be collected into bottles or cans filled with a concentrated solution of sodium chloride. No living specimen of the insect can be carried outside the boundaries of the infested plot.

2. The discovery of a focus must be communicated by telegraph to the section on plant quarantine of the Ministry of Agriculture of USSR, or krai or oblast' inspection on plant quarantine.

3. The plot infested by the Colorado beetle and that adjoining it must be placed under quarantine, accession to them by outsiders prohibited and a 24-hour watch established on the plot.

The administrator of the farm or owner of the field where infestation occurred must be warned (under his signature) against access to the plot of all outsiders without exception, and of the prohibition to transport plants and soil from that portion of the plot elsewhere.

4. A brigade is selected from the population which under the supervision of a responsible person (inspector or other) makes regularly daily surveys of the quarantined plot and collect beetles, larvae and egg laying heaps.

5. Poles carrying signs must be set up around the boundary to indicate that access to the infested plot is prohibited.

6. A document is compiled based on data provided by the survey concerning the appearance of the Colorado Beetle. The Commission which establishes the presence of the Colorado beetle and compiles the document consists of the quarantine inspector, the supervisor of the survey and representatives of the regional section of agriculture and the particular farm.

Liquidation of the focus of the Colorado beetle is conducted by specially trained personnel of the Government Commission of Quarantine of Agricultural Plants.

End of article.

VT 10-5-51

Galakhov, P. N. Transl. 229: Insecticides
(candidate of biological sciences, All-Union Sc. Inst. of Oil Crops)
Effect of benzine hexachloride on change in dynamics of Aphis laburni
on peanut plantings. Sovet. Agron. 8(12):87-91. Dec. 1950. 20 So84

Translated by S. N. Monson

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The acacia aphid [Aphis laburni] is one of the most multi-poisonous and widely spread species of agricultural crops in the USSR. Among oil crops it particularly injures peanut plants Arachis. In attacking primarily the lower surface of the plant's foliage and sucking their sap, it visibly reduces the yield of seeds of this crop. Young cotton plants are also severely injured by [Aphis laburni], are delayed in their growth and frequently destroyed. Among grasses the pest causes severe injury to alfalfa, esparsette [Onobrychis], and among woody genera - the white acacia.

Many other cultivated plants are also injured by acacia aphids ~~which~~ large quantities of which populate various species of weeds and wild plants.

Anabasine and nicotine-soapy solutions or anabasine and nicotine dusts are used chiefly to protect agricultural crops from this pest. We have personally tested the action of the new preparations, DDT and hexachloride to control acacia aphids.

Among various ~~points~~ factors connected with DDT and hexachloride, the problem of changing the dynamics of the pest under the influence of the above preparations is of considerable practical interest.

Research to establish the reaction of toxic dosages of the above preparations preceded the solution of this problem, as one of its major parts: it concerned dependence ~~from~~ upon different percentage content, speed and duration of reaction upon the pest of the most toxic dosages of preparations.

The studies were conducted at the experimental base of the institute, at the city of Krasnodar. The former problem was studied under laboratory and field conditions. In laboratories DDT and hexachloride were applied in the form of dusts and suspensions to control acacia aphids. DDT contained 3 and 5% of the active ingredient, while hexachloride contained 3, 5, 7 and 12% of active principles. Dosages of dust per hectare were 15, 20, 30 and 40 kg. Dosages of suspensions - 0.5 - 1 - 2%; of water 1000 liters per hectare.

Plants were treated with dust and suspension on colonies of acacia aphids; every plant was then placed into a small garden, and when the effect of the preparation was clearly apparent quantities of living and dead specimens of aphids were counted. Each variant was treated three times with use of control. Data obtained from these laboratory tests is presented in Table 1.

TABLE 1

Name of preparation and content of active ingredient in %	Expenditure per hectare	% of dead aphids in comparison to control
3% dust hexachloride	15 kg.	29.2
3% " "	20 "	31.2
3% " "	30 "	40.0
3% " "	40"	46.2
0.5% suspension of above dust	1000 l.	37.2
1% " " "	1000 l.	53.2
2% " " "	1000 l.	51.3
12% dust hexachloride	15 kg.	88.7
12% " "	20 "	94.1
12% " "	30 "	94.6
12% " "	40 "	94.6
0.5% suspension of above dust	1000 l.	86.6
1% " " "	1000 l.	94.6
2% " " "	1000 l.	94.7

The preparation DDT applied in the form of dust and suspension proved of minor efficacy in the control of acacia aphids and tests with this preparation were therefore discontinued. Hexachloride, however, proved highly effective for the purpose. The application of 12% dust in quantities of 15 kg/h, destroyed 88.7% of aphids. When 20 kg/h were used the percentage was 94.1.

Dusting plants with 1% suspension destroyed 94.6% of aphids. In subsequent studies of the reaction of most effective dosages of hexachloride upon acacia aphids we transferred our experiments into fields of peanut plants. Plots were 50 m^2 (5 x 10). Repeated three times with control.

The reaction of the preparation was evaluated on the quantity of living specimens of aphids on plants under test before the experiments were started and after their completion, and compared with control plants.

Phytoncide reaction of the preparation and meteorological conditions, accompanying the experiment were taken into consideration. Results are presented in Table 2.

TABLE 2

Name of preparation and % of content of active ingredient	Expenditure per hectare	No. of tested plants on ea. plot	% of dead aphids compared to control	Remarks
12% dust hexachloride	15 kg.	10	86.9	T° of air - 19.1 - 21.1°. Relative humidity 64-72%. Precipitation not recorded. No burning of plants observed.
12% " "	20	10	98.0	
1% suspension of dust	1000 liters	10	96.7	

It may be seen from data in Table 2 that under field conditions 12% dust of hexachloride proved equally highly effective in the control of acacia aphids. The high toxicity of 12% dust hexachloride confirmed laboratory test data, i.e. expenditure of 20 kg/h; and 1% suspension of 1000 liters per h. Destruction of aphids amounted to 98% under field conditions at above dosage; 1% suspension produced destruction of 96.7%. Negative reaction was not observed on peanut plants from hexachloride. The reaction of 12% dust of hexachloride was further verified under industrial conditions.

Dust was used on one hectare of peanut plantings in amounts tested before. A similar area was used for control. On the plot intended for treatment the number of living specimens of aphids were counted before dusting and after the complete reaction had taken place. Control was dealt with in the same manner. Results appear in Table 3.

TABLE 3

Name of preparation and % of content of active ingredient	Expenditure of prep. per hectare	Size of treated area in hectares	No. of tested plants	% of dead aphids in comparison to control	Remarks
12% dust of hexachloride	20 kg.	1	10	95%	Temp. of air 18.8°-25°. Relative humidity 62-76%; precipitation not recorded; burning of plants not observed.

As seen from Table 3, the reaction of the preparation hexachloride upon acacia aphids proved equally effective under industrial conditions; no negative reaction of the preparation upon the peanut plant was observed.

The ~~speed~~ rapidity of action (of the preparation) upon the pest was studied in the following manner. Under field conditions peanut plants with colonies of aphids were dusted or sprayed with suspension of hexachloride and placed in isolators. Every 24 hrs. the number of living and dead aphids was counted. Dosages of 12% of dust and suspension of 1%, were taken in 20 kg/h, as those most effective. Results are shown in Table 4.

TABLE 4

Name of preparation and % of content of active ingredient	Expenditure per hectare	No. of repeatedly dusted or sprayed plants	% of dead aphids in comparison to control: in 24 hrs.	48 hrs.	after 72 hrs.
12% dust hexachloride	20 kg.	3	89.1	96.6	96.6
1% suspension of dust	1000 liters	3	87.6	94.0	96.1

It may be observed from this table that the reaction of hexachloride in the form of dust and suspension is apparent in full measure 48 hrs. following treatment.

The second problem was solved by analogous method, except for the fact that new colonies of aphids were placed upon isolated plants on dusted and sprayed plots after various hours.

The results of this experiment are presented in Table 5.

TABLE 5

Name of prep. and % content of active principle	Expenditure per hectare	No. of repeatedly dusted & sprayed plants	% of dead aphids in comparison to control: 48 hrs.	144 hrs.	216 hrs.	Remarks
12% dust hexachloride	20 kg.	3	96.3	69.2	6.6	Temp. of air - 18.1°-29°; relative humidity 62-76%.
1% suspension of dust	1000 liters	3	94.3	62.6	7.6	Total precipitation 8.7 mm.

As will be seen from this table, hexachloride in either dust or suspension form produces its highest effect under favorable meteorological conditions within 144 hrs.

The problem of changing the dynamics of the acacia aphid under the influence of hexachloride was solved on the basis of periodical estimates of their number on treated and non-treated plots of peanut plantings (Table 6). Treatment of plots with hexachloride was done during visible increases in number of aphids on peanut plants. The area of plots was 50 m^2.

As seen from results presented in Table 6, plots treated with hexachloride showed a drastic reduction in number of aphids compared to the control. Such low quantities of aphids on treated plots remain until their disappearance from peanut plants under the influence of external factors. Thus to reduce the quantities of aphids on peanut plants to degrees where they will no longer have economic significance, a single application of hexachloride dust of 12% and total expenditure of 20 kg/h, or a single spraying with 1% suspension of this dust at an expenditure of 1000 liters of the solution per hectare is adequate.

Hexachloride in the form of 12% dust and 1% suspension was widely used by the sector of pest control at Krasnodar krai administration of agriculture to control acacia aphids on cotton plants in many regions of this krai. According to reports received from collective farmers and specialists on plant protection the high efficacy of the preparation hexachloride in controlling this pest on cotton plants was fully confirmed.

CONCLUSIONS

1. The acacia aphid is a multi-poisonous and widely distributed pest of agricultural plants. Among oil crops it primarily and severely injures peanut crops.
2. Anabasine and nicotine preparations were chiefly used to control acacia aphids.
3. Hexachloride proved highly effective in the control of acacia aphids on peanuts. A single dusting or spraying with hexachloride of populated peanut plants resulted in various changes in the pest's dynamics and reduced their quantities to insignificant degrees.

TABLE 6

Name of Prep. & % content of active ingredient	Expenditure per hectare	No. of tested plants	No. of aphids on 10 plants during different periods of counting 6-14	6-16	6-18	6-21	6-23	6-25	6-28	7-2	7-6	Remarks
12% dust of hexachloride	20 kg.	10	111	282	11	15	12	16	21	15	4	On 6-16 plants were dusted with hexachloride
1% suspension 12% dust of hexachloride	1000 l.	10	156	363	19	21	23	27	22	20	7	on 6-16 plants were sprayed with suspension.
Control	—	10	139	311	1100	2243	2311	1913	1297	543	73	

4. To achieve the above effect 20 kg/h of 12% dust of hexachloride are expended or 1% suspension of this dust in the amount of 1000 liters.

Remarks At the 19th Plenum of the Sector of Plant Protection of the All-Union Academy of Agricultural Sciences, imeni Lenina, held at the city of Stalinabad, Tadzhik SSR on September 20-24, 1949, the chief of the department on pest control of the Ministry of Agriculture of Tadzhik SSR, V. F. Rekutin, in his report ~~under the title~~ "Summaries on industrial applications of DDT and hexachloride for the control of cotton, alfalfa and orchards pests of Tadzhik SSR" produced data on the industrial application of hexachloride to control acacia aphids. He stressed that the death rate of aphids in 1948 amounted to 100% after 48 hrs.; that in 1949 the death rate was 90%, at an expenditure of dust of 15 kg/h.

~~Altogether~~ in 1949 13.362 hectares were treated, of which 3222 h. were dusted and 10.142 h. sprayed. The decisions of the above Plenum (Bull. No. 5, p. 22, point 19) recommend wider application of the dust hexachloride and its aqueous suspension along with other poisons in the control of aphids and thrips.

End of article.

VT 10-5-51

Scientific Chronicle of VIZRa.
Leningrad. Inst. Zashch. Rast. Sbornik 1:65-101. 1932. 464.9 L542

Translated in part (excerpts and headings) by S. N. Monson

We shall in this section provide (furnish) brief information on the course of work of all institutions of Plant Protection based on reports and communications we receive from them.

In the first place we publish here news on the situation of work at sectors and laboratories of VIZRa for the first 6 months of 1932.

Considering this information to be of great significance, primarily for the staff working on plant protection, the editors of "Zbornik" (Collection) ask all institutions and individual scientific collaborators to send to the Planning Sector of VIZRa information on their respective course of the work, describing it in brief and condensed form and indicating: 1. the work they do; 2. where, under what conditions and according to which method; 3. who is personally engaged in the work; 4. the most characteristic facts and factors noted in the process of the work, and if possible, note tentative preliminary conclusions for the future development of the work, ways and forms leading to the realization of achievements.

One need not consider the data published below as an imperative sample of writing. It is an approximate ~~type~~ exposition from which there may be deviations called for by the substance of the work and the course it will take.

PLANNING SECTOR (p. 65-66)

Following the final confirmation of the plan for 1932, the principal attention of the collective (group) or scientific personnel of VIZRA was directed upon the compilation of a PLAN OF SCIENTIFIC-RESEARCH WORK ON PLANT PROTECTION DURING THE SECOND 5-YEAR PLAN.

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SECTOR OF GENERAL ENTOMOLOGY (p. 66-73)

Section of Ecology

Section of Anatomy-hystology

Section of Systematics

Section of Parasitic Insects

Section of Locusts

Section Of Sugar Beet Webworm (Loxostege sticticalis L.)

Section of European Corn Borer, (Pyrausta nubilalis) (Hbk)

Section of Cutworm Moth, (Agrotis segetum Schiff) and chewing moths.

Section of Immunity

SECTOR OF GENERAL PHYTOPATHOLOGY (p. 74-77)

1. Section of smut and rust
2. Section of certification of seeds
3. Section of wilt
4. Section of systematics
5. Section of fusarium of cereals
6. Section of Bacterium
7. Section of Immunity
8. Section of Injuriousness
9. Section of establishment of prognosis

SECTOR ON VERTEBRATES (p. 78-79)

SECTOR OF QUARANTINE (P. 80-81)

SECTOR OF CHEMIZATION (p. 81-85)

SECTOR ON WEED CONTROL (p. 86-90)

SECTOR OF FORESTRY (p. 90-92)

SECTOR OF LIVESTOCK PESTS (p. 93-94)

SECTOR OF INDUSTRIAL-TECHNICAL PROPAGANDA (p. 94-97)

PUBLICATIONS (that had appeared in 1932 on Plant Protection and are about to appear)(p. 94-97)

Bibliographic and Library Section (p. 97-98)

MECHANIZATION IN PLANT PROTECTION (p. 98-99)

Otdelenie mekhanizatsii vsesouznogo instituta Z. R. [OMVIZR] is the direct descendant of MAFUNIZRa (Machine apparatus of filiale of UNIZRa) which existed in Kiev in 1930.

MAFUNIZRa changed into OMVIZR, i.e. obtained an all-union significance, in March, 1932, when the Sector of mechanization of VIZRa at Leningrad was liquidated.

OMVIZRa in 1932 has the task of taking care of immediate problems of mechanizing the work of Plant Protection. OMVIZR, as of today, consists of 20 engineers, 1 physicist, 1 entomologist, 1 agronomist, other Branches (filiale) are ~~pending~~ about to be established at Tashkent, Rostov, Saratov.

The collection of apparatus available at present and at the disposal of OMVIZR, amounts to over 30 different machines of Soviet and foreign makes.

BRIZ (under OMVIZR)-Brigade Inst. of Plant Protection.

End of Article

Notes from following article:

Ozrasi-Reviews of work of section branch, dept. institutes. p. 101.

Otdely Z. R. Specializirovannykh institutov-depts. of pl. prot. of specialized institutes.

IZR-Institute of Plant Protection (others, aside from VIZR)-zonal, p. 102.

Chesalin, G. A.
"Khedolit" as a herbicide in the control of weeds. Sovet. Agron. 5(3):118-124. Mar. 1947. 20 S084.

Translation from the Russian by R. G. Dembo

In recent years considerable attention was given to chemical measures in controlling weeds. A great amount of chemical substances is consumed yearly for both treating agricultural and non-agricultural fields. According to the data of Prof. Robbins(4) (University of California), in the Western States of USA in order to control weeds, thousands of miles along railroads are sprayed yearly with arsenic sodium oxide, and along highways with diesel naphtha. Large agricultural fields in Northern America and in Europe are treated with various herbicides and with dry mineral fertilizers. In scientific-research institutions extensive work is carried out in discovering and applying new, more promising herbicides.

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The experiments which were carried out in recent time indicate that organic substances are more interesting than other herbicides of selective effect.

In order to clean our fields we must apply chemical methods in controlling weeds simultaneously with agrotechnical methods. Nevertheless, before we introduce chemical substances into production, we should study them thoroughly, especially those from abroad(1). Among the organic compounds used in controlling weeds, khedolit (compound dinitroorthocresol) deserves special attention. In 1946, as a herbicide of selective effect, we experimented with the compound khedolit. The compound is a powder of orange color which, when being placed into water, forms suspension. The compound consists of: 55.00

percent dinitroorthocresol, 10.27 percent of sodium hydroxide, 20.00 percent of anydrous sodium sulphate, 0.7 percent caustic sulphate, the rest,--water.

As a powder, khedolit catches fire easily. The compound does not cause metal corrosion and, in comparison with arsenic, it is not poisonous. It could be easily transported to various distances. It is applied as a solution controlling weeds of the Crucifer family.

In our experiments we worked on the following problems: 1)to determine the effect of khedolit upon weeds during various periods of vegetation and to determine the time during which the chemical compound affects the plant; 2)to determine the concentration and the doses of khedolit which are able to destroy weed sprouts.

Experiments were carried out in boxes of 0.25 square m. and upon meter lots of the field of the All-Union Institute of Fertilization, Agrotechnique and Agricultural Soil Production, and under field conditions-upon the field of the Selection Station of Timiriazev Agricultural Academy. In boxes and upon meter fields were sown weeds of winter and spring crops of non-black soil along with the plants.

The experiments were repeated twice in boxes and upon the Institute field, and three times-at the Selection Station. Hundred grains of the plant and thirty seeds of each weed species were sown in the boxes.

When spring wheat reached the development stage of 2-3 leaves, and the weed sprouts had 2-4 leaves, we sprayed the field with solution of khedolit of various concentration (0.5; 0.75; 1.0; 1.25; 1.5 percent with 5; 7.5; 10; 12.5; and 15 kg of the compound per hectar). The dose was

1000 litrs of the solution per hectar. During the experiments the spraying was carried out with a pulverisator, under field conditions- by a regular hand sprayer. During the spraying of the crops (20/VI) and afterwards was hot, sunny weather (26-30°). The height of the weeds reached then 3-7 cm. The results of the experiments are shown in table 1. (Table 1, page 4.)

As it is seen in table 1, khedolit has a different effect on various weeds. Its greatest effect is shown upon the following weeds: 1)smartweed, 2)wild radish, 3)pennycross, 4)blue cornflower, 5)hemp, 6)amaranth, 7)groundsel plain, 8)sow thistle, 9)swallowwort stock, and 10)field lycopsis. These weeds were completely destroyed.

The effect of khedolit upon goosefoot, field spurry, odorless camomile (between 30 to 100 percent destruction) was weaker, depending upon the concentration of the solution. For the destruction of crucifer weeds in the stage of 2-4 leaves 0.5-0.75 percent of khedolit solution was sufficient, or 5-7 kg of the compound per hectar.

The greatest effect of khedolit upon weeds takes place under the concentration of 0.75-1 percent or 7-10 kg of the compound per hectar. One percent solution of khedolit caused complete destruction of all weeds used in the experiment. Higher concentrations (1.25-1.5) caused slight burnings of spring wheat (5-10 percent of leaf blades).

Plants sprayed with khedolit acquire a yellow color. The toxic effect of herbicide is manifested slowly: after several hours the tissues lose their turgidness, the leaves gradually lose their green coloring, are covered with light yellow spots which increase, the leaf begins to roll. After 1-2 days the leaves yellow and dry out, the stem droops

Table 1

Weed Species	Phase in development of weeds	Concentration of the suspension of khedolit(o/o)									
		0.5		0.75		1.0		1.25		1.5	
		length of effect (in hours)	weed destruction (in o/o)	length of effect (in hours)	weed destruction (in o/o)	length of effect (in hours)	weed destruction (in o/o)	length of effect (in hours)	weed destruction (in o/o)	length of effect (in hours)	weed destruction (in percent)
Smartweed	4 leaves	48	100	48	100	28	100	28	100	20	100
Wild radish	2-4 leaves	52	100	52	100	36	100	36	100	24	100
Blue cornflower	2-4 leaves	48-56	100	48	100	36	100	36	100	24	100
Field thlaspi	4 leaves	52-58	90	52	100	36	100	28	100	24	100
Hemp nettle	4 leaves	52	100	--*	---	48	100	48	100	36	100
Goosefoot	2-4 leaves	72	40	72	70	48	90	48	90	48	100
Amaranth	2-4 leaves	52	100	52	100	--	---	48	100	46	100
Field spurry	4 leaves	72	80	72	75	60	100	60	85	48	100
Odorless camomile	2-4 leaves	72	30	72	70	60	100	60	100	48	100
Ragweed	4 leaves	--	--	--	---	44	100	44	100	--	---
Garden thistle	2 leaves	--	--	--	---	44	100	40	100	--	---
Stock swallowwort	4 leaves	--	---	--	---	48	100	40	100	--	---
Lycopsos	2-4 leaves	--	---	--	---	48	100	40	100	--	---
Field thistle	2-4 leaves	--	---	--	---	46	100**	46	100	--	---

*The weed was not experimented
**The external part perished

and wilts completely. Gradual weed transformations under the effect of khedolit are reflected in table 2. (See table 2, page 6.)

The experiment with khedolit was carried out upon millet on a small lot. The treatment with the compound was done during the later phases of weed development. The results of khedolit effect are given in table 3. (See table 3, Page 7.)

The results of this experiment indicated that with the increase of the stage some weeds increase their immunity to the spraying (white goosefoot, odorless comomile, goosefoot).

Goosefoot sprouts which have 6-8 leaves proved to be more resistant to spraying. This, apparently, is explained by the fact that at this time they are covered more tightly by filaments with surfaces which are spread spherically which protect them against herbicide. The upper part of the goosefoot stem is not covered with filaments as yet, and when the drops of suspension penetrate into that part, the plant perishes.

Of the sprouts of odorless camomile 70-100 percent perished in the first experiment (concentration 0.75-1 percent), in the second experiment (with the same concentration) 60-80 percent. Consequently, with the increase of the age it becomes more resistant to the spraying. Such weeds as smartweeds, wild radish, blue cornflower, pennycress, amaranth, perished completely from khedolit during a later phase of development. Chickweed was almost immune to khedolit. Its leaves had considerable burnings, but its entire destruction was rarely observed. By applying concentration, 1.25 percent, millet received slight burnings, but 5-6 days after spraying its crops recovered completely.

The fields treated by khedolit, after spraying and up to harvest were cleared from weeds. The millet crops developed well and had a strong,

Table 2

Weed Species	Six hours after spraying	24 hours after spraying	48 hours after spraying
Smartweed	Leaves lost the green color, became light yellow, drooped	Leaves yellowed, became dry, friable stems drooped.	
Hemp nestle	Leaves slightly darkened, their situation did not change.	Leaves dark yellow, drooped. The stem drooped slightly.	The leaves and the stem drooped, became dry, friable.
Goosefoot, pigweed	Leaves started to roll and to yellow.	Leaves yellowed, rolled, drooped.	Leaves and stem drooped, dried, yellowed.
Odorless camomile	Leaves began to yellow slightly.	All leaves became dark yellow, drooped	Leaves and stems blackened drooped, dried out.

Table 3

Weed species	The stage of weed development during spraying.	0.75		1.0		1.25	
		length of effect (in hours)	percent of weed destruction	length of effect (in hours)	percent of weed destruction	length of effect (in hours)	percent of weed destruction
Smartweed	4-6 leaves	38	100	38	100	24	100
Wild Radish	5-6 leaves	48	100	48	100	48	100
Blue cornflower	6 leaves	48	100	48	100	48	100
Field thlaspi	6 leaves	48	100	48	100	48	100
Field spurry	Beginning of stem	48	60	48	90	48	90
Amaranth	4-6 leaves	48	100	48	100	48	100
Odorless camomile	6-8 leaves	70	60	62	60	48	90
Polygonaceae buckwheat	4-6 leaves	40	75	48	100	48	100
Goosefoot, pigweed	4-6-8 leaves	70	50	48	70	48	100
Chickweed	6-8 leaves	48	leaf burning	--	considerable burning of leaves	--	considerable burning of leaves

developed panicle. Meanwhile the lots which were not treated by khedolit were covered with wild growing weeds. The data of millet yield indicate the effect of applying the compound khedolit (table 4, page9).

The spraying of millet crops with khedolit compound, by destroying weeds, increased millet yield by 4-5 times, in comparison with control crops.

Khedolit has the strongest effect upon weeds which have 2-4 leaves and which reach 3-6 cm in their height. At that very time the highest percentage of destruction of all weed species occurs. Simultaneously the plants being early freed from weeds develop better and yield the best harvest.

In order to compare the effect of khedolit with other herbicides, weed seeds were sown: smartweed and wild radish, 70 pieces each species, and oat seeds at the amount of 150 pieces (repeated twice.)

Before the treatment by chemical compounds there were 120 pieces of oats sprouts, field mustard-60, wild radish-48, During spraying the weeds had 2-4 leaves, oats-3 leaves. The norm of spraying 1000 liters/ha. (See table 5, page 9.)

As the data of table 5 indicate, sulphuric acid and cupric vitriol gave worse results than khedolit. The effect of sulphuric acid takes place quickly, after 2-3 hours, while the effect of khedolit developed during 1-1.5 days. In comparing the doses of khedolit in various concentrations, we discovered that the doses of 800 and 1000 liter, according to their effect upon weeds, are similar, the doses of 600 was inapplicable because its effect was weak.

The field experiment upon the selection station was carried out with barley in 1946. Barley was sown after spring wheat which has been preceded by clover.

Table 4

Experiment variations	WEIGHT OF THE RAW MASS FROM 1 m^2 (in kg)		Yield of millet from 1 m^2 (in g)	DIFFERENCE IN COMPARISON WITH CONTROL	
	millet	weeds		(in g)	(in o/o)
Control	0.50	2.40	65	---	---
Khedolit 0.75 percent	2.00	0.25	274	209	320
" 1. percent	2.00	0.10	290	225	346
" 1.25 percent	2.80	0.10	380	315	484

Table 5

Herbicides	Concentration of the solutions (in percent)	Decrease in the amount of weeds. (in percent)
Khedolit..............	1	100
Sulphuric Acid.........	5	89.5
Cupric Vitriol.........	3	85.0

Table 6

Variations	No. of fields	Amount of weeds upon $1m^2$									
		pigweed	wild radish	hemp nettle	field spurry	winding buckwheat	chickweed	odorless camomile	field thistle	field thlaspi	sum of weeds
Control................	1	60	6	3	5	8	9	8	2	20	121
Khedolit.1o/o..........	2	55	5	4	6	7	10	9	3	18	117
" 1.5o/o........	3	62	7	3	7	10	9	8	2	16	124
Calcium cyanamide......	4	56	6	4	8	9	8	7	3	15	116
"Agrokson"............	5	58	5	4	5	8	8	9	2	15	114

1.5 percent of khedolit concentration caused burns upon the barley crops, but five days after the experiment they recovered.

In the lots treated with calcium cynamide a slight wilting of the leaves of thlpsi and wild radish was noticed. The barley crops upon these lots also had peculiar burns, but after ten days the barley recovered. Upon lots treated with "agrokson" we did not notice any changes in the weeds, due to its effect. Only with individual specimens of goosefoot the leaf blades began to deform slightly.

During the entire period, from the moment of spraying until barley harvest, we observed the effect of herbicides upon weeds. Khedolit manifested the quickest toxic effect upon weeds, cyanimide calcium--considerably slower, and "agrokson" effect was the slowest. Barley crops treated with calcium cyanamide became conspicuous by their green color and high stalkiness. This is, apparently, explained by the fertilizing effect of calcium cyanamide (feeding).

Before barley harvest, we registered the amount and the species of weeds. (Table 7, page 12)

The treatment with various chemical substances reflected favorably upon barley harvest. (Table 8, page 12)

As we see from table 8, upon al lots treated with chemicals, barley yield increased by 17-29 percent in comparison with control.

Conclusions

1. Khedolit (compound dinitrorthocresol), being an organic compound, possesses all the positive qualities of other herbicides (mineral salts) of selective effect, without possessing any negative effects which makes it most perspective.

2. The most appropriate time for the application of herbicides is

Tables 7 and 8

Table 7

Variations	No. of fields	Amount of weeds upon 1 m^2										
		Pigweed	wild radish	hemp nettle	field spurry	winding buckwheat	chickweed	odorless camomile	field thistle	field thlaspi	sum of weeds	decrease in weeds (in o/o)
Control...........	1	58	16	6	4	6	8	9	8	2	117	---
Khedolit 1o/o.....	2	12	0	0	0	2	2	6	2	0	24	80
" 1.5 o/o..	3	8	0	0	0	2	3	4	0	0	17	86
Calcium cyanamid..	4	16	3	0	1	3	6	7	3	1	40	66
"Agrokson".......	5	9	2	0	0	3	7	6	3	1	31	73

Table 8

Variations of experiment	Barley yield		Increase (in 0/0)
	(in c/ha)	(in o/o)	
Control................	10.5	100	--
Khedolit 1o/o..........	13.0	124	24
Khedolit 1.5o/o........	12.5	119	19
Calcium cyanamide......	13.6	129	29
"Agrokson"-powder......	12.28	117	17

when the weed sprouts have 2-4 leaves, because it causes the highest percentage of weed destruction.

3. Crops which are early freed from weeds develop better, producing better yields.

4. With the norm of 7-10 kg of the compound per hectar, khedolit destroys completely the following weeds: 1) smart weed [Polygonum hydropiper], 2) wild radish, 3) blue cornflower, 4) field thlaspi [fanweed, Thlaspi arvense], 5) hemp nettle [Galeopsis], 6) amaranth, 7) groundsel [Senecio], 8) garden thistle [Sonchus], 9) swallowwort [Chelidonium majus], 10) field lycopsis, 11) shepherd's purse [Capsella bursa pastoris].

5. The amount of suspension per hectar depends upon the species and the amount of the weeds, the degree of weediness. In our experiments the optimal doses of khedolit were fluctuating within the limits of 800-1000 liters of solution per hectar, with the concentration of 0.7-1 percent.

6. The spraying of the crops with khedolit represents a radical measure for controlling weeds. Its application yields the increase of crops by 19-24 percent in comparison with the control.

It is necessary to organize the production of dinicorthocresol for controlling weeds and agricultural pests.

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Metlitskii, Z. Retarding the spring growth and blossoming of fruit trees by spraying them with growth substances. Sad i Ogorod. 1946(11/12): 89-90. Nov/Dec. 1946. 80 Sa13

Translated by R. Dembo

Spring frosts often destroy completely the orchards' crops upon large fields. In connection with the possibility of frosts and with the necessity of carrying out the work for protecting fruit trees, great sums and much labor are spent yearly. The early blooming cuts down fruit production in some raions. Thus, for instance, apricots are risky in Tashkent Oasis, in the steppe section of Crimea, in Kuban', due to its early blooming, although this plant is cultivated in many more Northern and cool raions with great success.

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For many years attempts were made to check the spring blooming of fruit trees (covering the root circle with snow or spraying with lime), but these attempts were not successful. More successful was P. G. Shitt with his experiments of special graftings (cutting).

In recent time the experiments of applying growing substances yielded promising results.

Hitchcock and Zimmerman at the Bois-Tomson Plant Research Institute (USA) made experiments with summer and fall spraying of fruit trees with (KNA) d-naphtalenocetate of potassium by means of a hand sprayer. Three timings were under survey (July 21, August 20 and September 17) and four concentrations (200, 400, 800 and 1000 mg of the chemical for one liter of water with the addition of 0.1 percent "aerozol"). The experiment was carried out with an apple tree (five varieties), cherry (3), peaches (3), pear (2), and plum (2). Various variations of the experiments were carried out upon the trees (1-2 branches for one variation).

Observations for the following spring indicated that the spraying checked the development of the growing buds. The degree of retarding fluctuated with various variations from several days to two weeks for the fruit buds and 19 days for the growing buds. July spraying gave best results for all species. The concentration of 200 mg. in July yielded with the cherries the same results as 400 mg. in August and 800 mg. in September. During the September spraying only high concentrations were effective.

The blooming of fruit buds upon circular sproutings was retarded stronger than upon prolongated sproutings. The development of growing buds retarded most; as a result of that, the leaves upon the sprayed brances were considerably smaller than upon the control ones. The ripening of the fruit retarded as well, but the ripe fruits were not worse upon the sprayed ones than upon the control ones.

The results during all the three years of experimenting were similar. The authors assume that other substances of the growing groups should yield analogous results. And, really, in their experiments with spraying pot plants of lilac with naphthalin acidic acid the blooming retarded by 10-14 days. They sprayed methyl and ethyl ethers of d-naphthalin acidic acid upon Icex opaca and obtained analogous results.

Summarizing their experiments, Hitchcock and Zimmerman express an assumption that the retarding of blooming by means of growth substances should be of great interest not only for fruit growers, but for florists as well, because this method enables them to prolong the blooming of decorative flowers in the ground.

Interesting perspectives of utilizing the retarding of the growth by spraying growth substances were opened also in nursery practice.

Marth at Marilende, treating one year roses (15 varieties), apples, pears, peaches, "khurma", cherries, jasmine, maple and winter apple graftings with growth substances studied the influence of this operation upon winter storage.

The plants were dug out in fall and were kept in basement-like places. The treatment with growth substances was carried out on March 27. A-naphthylmethylacetate was applied in gaseous form (0.5 g for 1000 cub. feet of the storage room). The temperature of the storage room was 21° C., the length of the effect--16 hours. The growth substance was transformed into a gas by being placed upon incandescent metallic tablet. A strong ventilator with the diameter of 50 cm drove a stream of air from the evaporator to the plants which were located at a distance of 120, 240, 360, and 480 cm from the evaporator.

In another variation the plants were sprayed by the emulsion of light machine oil (oil concentration 0.25 percent), which contained 0.1 percent of the growth substance. The plant revision was done on May first. The control plants grew at that time considerably: the seed plants had 2.1-8.7 average sprouts per one plant, and the stone plants had 29-32.1 sprouts. The length of separate sprouts reached 25 cm.

In the experiment varieties by treating with growth substances the buds did not open at all, with the exception of cherry and maple. Nevertheless, even with these species the number of the opened buds decreased by 4-5 times in comparison with the control. The most effective for the plant was the influence of the gaseous growth substance.

The spraying caused considerable burning upon cherries and peaches. The plants were placed into the soil on the second of May. The plants which were treated with growth substances retarded with their bud growth by one week, approximately.

With winter graftings the delay of the bud opening was followed by the improvement in the plant's adaptation (the percentage of plant adaptability-74 in control, 80 for those who were sprayed, and 100 which were treated with gaseous substances.)

We also should test the retarding influence of the growing substances. We are able to obtain a new effective method in controlling early frosts, to increase sprouts during winter grafting, improve the acclimatization of trees during transplanting, especially those which are big and in dry raions (the delay in bud opening and, consequently, transpiration improves the conditions of restoring the root system).

Timiriazev Agricultural Academy Department of Fruit Production proceeded already with the preparation for the appropriate experiments.

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End of Article

Matveenko, V. N. Rice culture in Kursk Region. Sovet, Agron. 8(2):95-96. Feb. 1950. 20 So84 The author is an agronomist

Translate from the Russian by R. G. Dembo

On February 1, 1949, the Ministers' Council of USSR made a decision "Concerning the development of rice plant varieties which require little irrigation and the shifting it into new raions". This decision has been spread in Kursk oblast'.

The practice determined that rice is able to yield good crops under the conditions of Kursk oblast'.

In 1941 already eight collective farms planted rice upon 12 hectars, whereby the sowing material was grown in Kursk oblast'.

The work of the experimental institutions and the practice of collective farms which produce rice indicate, that it is possible to shift to the mechanized method of rice sowing; the sowing is done by a sowing machine into dry land, and the irrigation should follow after the sproutings. The All-Union Experimental Rice Station came to the conclusion that a periodical irrigation which is carried out as follows: seven days with water, and seven days without water, or nine days with water and nine days without water, increases the rice yield in comparison with permanent irrigation.

As far as temperature is concerned, the raions of Kursk oblast' are favorable for rice production.

The first three months with high temperature which is so characteristic for Kursk oblast' create best conditions for good sprouting, further development and accelerate the maturing of grain.

Rice harvest has been, according to years, in Kursk oblast' as follows:

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in 1938, Kirov collective farm, Streletsk raion, harvested 34 c/ha, in 1939, the collective farm "New World", of Old-Oskol'sk raion harvested 31.6 c/ha, and the collective farm "New Road", of New-Oskol'sk raion-32.9 c/ha. At the Kirov collective farm, Streletsk raion, the rice yield fluctuated from 12/ to 17 c/ha, depending upon the variety.

In 1940 the collective farm "Pravda", of Urazovsk raion, planted rice upon a field of 2.55 hectars. The preceding plant was sugar beets. The plowing was done at the depth up to 30 cm. The tilling before sowing consisted of early spring double harrowing and of introducing fertilizers with a deep tilling. The field has been divided into parts by a tractor train. Around the field and within it, small banks of ground were constructed. For the elucidation of the influence of fertilization kinds and doses upon the crops of rice, the collective farm carried out an experiment whose results are given in table 1. (Page 3)

As the table indicates, the rice crops depend in considerable measure upon the amount and the type of fertilizer, as well as upon the sowing term.

Rice responds well to organic fertilizers; with the decrease of their dose (especially of manure) the crops decrease considerably.

Hence, for rice cultivation in Kursk oblast' it is necessary to carry out the sowing early, introduce manure under the basic plowing, to feed by mineral fertilizers and to supply water during the entire vegetating period.

Northern border of rice sowing in Kursk oblast' could be established along the line from Krupets to Ryl'sk, B-Soldatskoe, Rzhava and Old Oskol. In these raions and in raions located Southward, we may recommend sowing

Field in hectars	Sowing time	Norm of sowing up on one hectar in kg	Basic fertilizers in c/ha					Feeding in c/ha			Crops in cent.	
			manure in t.	furnace ashes	bird dung	superphosphate	potassium chloride	Before sprouting: superphosphate	Before sprouting: potassium chloride	after sprtg.: superphosphate	from wedge	on hectar
0.47	10/V	150	15	4	2	2.5	1.5	1.5	1.0	1.5	14.80	31.50
0.50	10/V	150	20	4	2	2.5	1.5	1.5	1.0	1.5	17.10	34.20
0.46	16/V	150	30	6	4	3.0	1.5	1.5	1.0	1.5	17.25	38.70
0.20	20/V	150	40	5	4	4.0	1.5	1.5	1.0	1.5	10.90	54.50
0.30	22/V	150	20	3	---	2.0	1.5	1.5	1.0	1.5	9.45	31.50
0.30	26/V	150	20	3	---	2.0	1.5	1.5	1.0	1.5	9.42	31.60
0.20	22/V	150	---	---	---	2.0	----	1.5	1.0	1.5	2.20	11.0
0.12	5/VI	150	---	---	---	---	----	1.5	1.0	1.5	1.80	15.0

of rice variety "Kendzo"; this variety ripens early, it requires for its normal development and maturing 110-115 days with the average daily temperature not lower than 16.5-17^{0} C.

For rice sowing it is necessary to select land which is located near an irrigated field or near some well.

At the collective farms of South-Eastern, Southern and South-Western oblast's it is necessary to utilize meadows of low productivity which are located near irrigated fields.

Experimental work should be carried out in order to promote the shifting of this most important food product towards the North.

ADV-10-10-51

Ivanova-Aleksandrova, Z. V. and Nikiforov, A. N.
Hexochlorane: a survey of experiments for controlling agricultural pests.
[redacted]. Sovet. Agron. 5(7):76-80. July 1947. 20S084

Translated from the Russian by R. G. Dembo

In recent years in the USSR and abroad the experiments in discovering new synthetic organic compounds for controlling agricultural pests are widely extended.

Among the new compounds Hexochlorocyclohexane-$C_6H_6C_6$ is of great interest.

This compound, named hexochlorane, has been prepared by the Institute of fertilization and insecticides of the Ministerium of Chemical Industry in the form of a 7 percent talcum-dust.

In 1945 the Moscow Division of the All-Union Institute of Plant Protection (Mosstarza) carried out an extended experiment with the compound in various zones of the Soviet Union, testing its effect upon various agricultural pests (soil, locust, storage pests, pests of vegetables, fruit-berries, technical plants etc.). During the experiments with hexochlorane in controlling soil pests, we dedicated considerable attention to the wire-worms which are multi-poisonous pests and cause great harm to agricultural crops.

The experiments which were carried out in 1945 by Z. V. Ivanova and E. A. Kopkov indicated that hexochlorane is a very effective compound against wire worms. In 1946 hexochlorane was tested at four points of Moscow oblast' : upon the fields of oats and rye at the Dolgoprud Experimental Field of the Institute of Fertilization and Insectofungicides (Z. V. Ivanova, E. A. Kopkov and S. V. Shcherba); at the experimental field of the Oblast' House of the agronomist-with oats (A. L. Ozol); upon the fields of kok-sagyz at the experimental base Gorki-Lenin All-Union

Academy of Agricultural Science (L. T. Iapina); with hops-The Republic Scientific-Research Hops Station (Vasil'kov)

Hexochlorane was introduced upon the lots of Dolgoprudny Experimental Field by two measures-by regular introduction of 7 percent talcum dust mixed with seeds at the proportion of one part of the compound to five and ten parts of the seeds, i.e. 40 and 20 kg dust per hectar. In counting pure compound it would mean 2.8 and 1.4 kg/ha. The norm of oats sowing would be 2 c/ha.

Table 1

Experiment varieties	Amount of wire worms upon 1 m^2	
	Before introduction of compound 27-28/V	After oats harvest 13/IX
Control........................	27	21
Introduction of 7 percent Hexochlorane dust with seeds 1:5..	17	1.3
The same 1:10.................	19	5.2
" 5o/o dust DDT 1:5....	28	12.6
Introduction into the soil: 40 kg Hexachlorane plus superphosphate 3 c........	22	0
Hexochlorane 80 kg plus 3 centner superphosphate....	22	0
30 kg Hexochlorane plus 3 centners of air-dry soil..	16	0.6
80 kg Hexachlorane plus 3 c air-dry soil.............	19	0.6

According to the second method, hexochlorane was mixed with superphosphate and air-dry soil counting for one hectar 40 and 80 kg of hexochlorane and 3 centners of superphosphate or soil. One day before sowing oats, the mixture was thrown along the field and was harrowed by the harrow "Zigzag".

The best effect was obtained during complete introduction into the soil of 40 kg/ha. It is necessary to observe that hexochlorane yielded good results, when introduced as 7 percent dust along with the seeds at the proportion 1:5 i.e. 2.8 k.g., With the introduction of DDT minor results were noticed (table 1).

The soil, treated by hexochlorane, proved to be toxic for wire worm after four months. Into such soil under laboratory conditions wire worms were placed. Already on the third day 25 percent of them died, and the rest was in a condition of depression; fifty percent perished on the twentieth day, and the rest showed hardly any sign of life.

Table 2

Experiment varieties	Field taken for analysis	The amount of hexachlorane and registration upon 1 m^2. 66
Control..............................	100	0
Hexochlorane 8 kg plus 3 c superphosphate	100	5 r
The same.............................	100	6.7 r

Chemical analyses of such soil indicated that hexochlorane could be preserved during the entire vegetating period in a soil with mineral ashes and with a slight acid reaction.

These data and theoretical bases indicate that hexochlorane affects the wire worm for several yeafs and thus assists in preserving the crops against wire worms and other soil pests.

The registration of oats yield indicated that, by introducing into the soil maximal doses of hexochlorane (80 kg) per 1 hectar, by mixing it with the seeds, did not produce any yield decrease, in comparison with control. The dynamics of the feeding regime did not change either.

During the experiments of 1946 with winter rye (Z. V. Ivanova, E. A. Kopkov and S. V. Shcherba) the methods were the same as with spring crops, but hexochlorane was introduced into fallow field during plowing twelve days before sowing which has been carried out on August 24. In table 3 we give the results of the experiments. (See page 4a)

The table indicates that the greatest amount of perished crops in the control field was 44 percent due to the harm caused by wire worms, while upon the fields, where hexochlorane was introduced at the doses of 60 kg/ha, only o.8 percent of the crops perished.

When seven percent dust was mixed with the seeds (the dose of hexochlorane-2.8 kg/ha), 5.2 percent of the plants were damaged.

At the experimental field of the Moscow Oblast' Agronomist House hexochlorane was introduced before the oats sowing with a harrowing with the amount of 60 kg/ha as seven percent of talcum dust which means 4.2 kg of the technical compound of hexochlorane. Upon control fields the amount of wire worms reached 48 pieces, and the plants were conspicuously cut; upon the experimental fields the amount of wire worms decreased considerably, and at the end of the vegetating period was not noticed at all. The density of plants was normal. The data of Dr. Thomason and G. Jameson (England) indicated that by introducing technical mixture of isomers of hexochlorocyclohexane in the amount of 9.6 kg/ha the amount of the wire worms decreases b6 66 percent; by introducing 3.2 kg of the compound with seeds-50 percent.

In 1946, upon the experimental base of VASKHNIL (   ) THE All-

Table 3

Variations of experiments	Amount of wire worms upon 1 m^2 8-9/VIII	Date when hexochlorane was introduced	Percentage of dead wire worms upon 1 m^2 21-22/VIII	Percentage of perished plants due to wire worm upon one running meter.
Control..............................	19	12/VIII	0	44
Introduction into the soil of 40 kg HChCH* 1/2 plus 3 centner superphosphate upon 1 ha................	19	12/VIII	48	4.7
The same, 80 kg HChCH* plus 3 c superphosphate......................	19	12/VIII	64	0.8
Mixing 7 percent dust of HChCH* with seeds.................................	22	24/VIII	--	5.2
Mixing 5 percent dust of DDT with seeds 1:5................................	19	24/VIII	--	11.7

Union Lenin Agricultural-Scientific Institute, at Gorky-Leninsk experiments were carried out (L. T. Iatsin) with kok-sagyz which is heavily damaged by wire worms.

Upon a field where hexochlorane was introduced in proportion to seeds 1:1, no living wire worms were discovered. Kok-sagyz was not damaged in comparison with control.

A preliminary introduction of hexochlorane into the soil yields high effect and could be utilized as a method of controlling wire-worms upon kok-sagyz.

Another variant was the pollination of kok-sagyz grafts. The experiment started May 23. It became clear after seven days that the pollinated graftings are not damaged and the wire worms perish almost entirely if they happen to fall into the poisoned zone, while in the control the wire worms remain alive (density-28 pieces for one m^2) and damage the graftings. We would not recommend the pollination of graftings as a method for controlling wire worms, because hexochlorane affects negatively the growth and the density of the plants.

At the Hops Producing Station (Vasil'kov) laboratory experiments with hops were carried out. A nest introduction of 7 percent of hexochlorane dust is sufficient for the destruction of wire-worm at the calculation of 100 kg of dust for 1 hectar; i.e. 7 kg of isomer mixture.

In connection with high effectiveness of hexochlorane upon soil pests-wire worms, the influence of the compound upon soil microflora has been clarified. The work has been carried out by the Moscow division of the Institute of microbiology of VASKHNIL( ) The All-Union Lenin Agricultural Scientific Institute (Dr. P. I. Rudakov). The experiments proved that even by introducing high doses-1 g. of 7 percent dust of hexochlorane for 100 g. of soil--there was no depressing effect upon Azotbacter and upon Microflora.

Now we are able already to question the necessity of mixing superphosphate with hexochlorane so that, by introducing a mineral fertilizer, we would simultaneously introduce into the soil the desinfestating compound. It is not necessary to introduce hexochlorane into the soil yearly, because its toxicity is preserved for a long time, and the accumulation of wire worms in the soil takes place during a comparatively long period.

During the treatment of seed grains, five percent dust of hexochlorane was tested in controlling storage weevil, legume pest and mites.

The experiments indicated that the mixing of wheat seeds with five percent hexochlorane dust with the dose of 1 g. per one kg. of seeds causes already 100 percent mortality of the weevil on the fifth day. In calculating as the pure compound-the technical mixture of isomers, this would mean one part of hexochlorane to 20,000 parts of grain, i.e. 50 g. per grain tonne.

The subsequent experiments indicated that the ~~pollination~~ dusting of wheat seeds by one percent dust in minimal dose--0.5 g. per one kg. grain-one part of technical mixture of isomers for 200,000 parts of seeds, five g. for one tonne, causes hundred percent mortality of storage weevil on the thirtieth day.

The toxic effect of hexochlorane upon the insects is noticeable from the very first days. They become inactive and are unable to harm the insects.

Positive results were obtained also in controlling pea weevil (Bruchus pisorum]. With the dose of 0.5 g. of five percent hexochlorane dust for 1 kg. of peas we noticed 100 percent pea weevil mortality on the twentieth day. Only 15 percent of the bugs succeeded to leave the peas (they died immediately), and the rest of 85o/o died withing the peas. This indicates the fumigating quality of hexochlorane. Grain mites [Tyroglyphus farinae] were more resistant.

Hexochlorane does not have any harmful effect upon the sprouting and yield of cereals. The positive quality of hexochlorane is the duration of its effect. Seven months after the wheat seeds were ~~pollinated~~ dusted by hexochlorane at the indicated doses, weevils were introduced into the seeds. The registration of the insect mortality indicated that even after such a long time the effect of the compound was the same as if the seeds would be treated immediately after ~~pollination~~ dusting.

In distinction from the previously applied compounds, hexochlorane could be utilized upon grain with increased moisture without any harm to the sprouting energy.

Of considerable interest are the results of the experiment of seven percent dust of hexochlorane upon pests of fruit-berries. At the Sochinsk station of subtropical plants, during ~~pollination~~ dusting of seven percent dust of hexochlorane of tangerine trees in controlling scale [Coccodea], tea trees-incontrolling "pulvinaria", and lemon trees-controlling brown scale, the infestation decreased twice or three times, according to the data of Bogdanova. These results are far from ideal, but they enable us to carry out further experiments not only by ~~pollination~~ dusting but by spraying as well, which method could be more effective.

The Institute of Conserve Industry and the Moscow Fruit-Berry Station carried out experiments by ~~pollinating~~ dusting gooseberry with seven percent dust in controlling gooseberry moth [Etiella zinckenella] for the control of which no effective chemical measures were worked out as yet.

According to the data of Ushatinsk (the Institute of Conserve Industry), after ~~pollination~~ dusting with hexochlorane at the dose of 30 kg. per one hectar, 28 percent infestation decrease has been achieved. The most appropriate time for gooseberry ~~pollination~~ dusting in controlling this pest is the period when the plant begins to bloom which coincides with moth flight and with the laying of eggs. According to the data of M. P. Popova (Moscow Fruit-Berry Station) a triple treatment with 7 percent hexochlorane dust with the dose of 60 kg. per 1 hectar caused 35 percent decrease of berry infestation in comparison with control. Gooseberry yield capacity increased by 7t/ha (in control-8t, and upon ~~pollinated~~ dusted field-15 t).

As a negative factor, we should mention the unpleasant odor which stayed in the berries until their full ripening. The chemical analysis of such berries carried out by the candidate of chemical science, A. A. Potashnik, did not indicate the presence of hexochlorane toxicity, and the odor was caused by other substances connected with this compound.

By ~~pollinating~~ dusting wild strawberry in controlling raspberry-wild strawberry weevil and wild strawberry leaf consumer, 57-69 percent infestation decrease has been achieved. In this case hexochlorane was more effective than calcium arsenate. The same results were obtained by the Institute of Conserve Industry in controlling raspberry beetle where the infestation decrease was 71-72 percent at the average with the consumption of 7 percent hexochlorane dust, 20-25 kg/ha.

Positive results were obtained during the experiments with 7 percent hexochlorane dust in controlling gooseberry saw fly, apple aphid and others.

Interesting work has been carried out by the chief scientific worker of the Institute of Sugar Beet Field Production, S. I. Bocharova, in controlling sugar-beet and gray weevil and sugar-beet aphids. Hexochlorane has been tested upon the indicated pests in the form of 5- and 7 percent dust and oil emulsions of hexochlorane.

The highest results were obtained by the compounds in the form of oil emulsions. Thus, for instance, during the experiments with oil emulsion IUIF iwht 0.5 percent of hexochlorane the average of 96.5 percent mortality of sugar-beet weevil has been achieved.

Hexochlorane, in the form of oil emulsions, could be utilized only for the poisoning of beetles in a well, because, by spraying the plants, it burns considerably the sugar beet leaves.

As to the sugar-beet and gray weevil, hexochlorane compounds are of a strong intestine effect. When the ~~pollinated~~ dusted hexochlorane destroys sugar-beet leaves, the mortality of the indicated weevil reached 71-75 percent. The same results were obtained by Mironovsk Selection Station.

In controlling sugar-beet aphids, hexochlorane compound is similar to anabasin-sulphate as far as its effect is concerned, but it affects somewhat slower.

In Krasnodarsk krai (Station for Plant Protection) were carried out experiments in controlling the new pest of sugar-beets-miniring moth. The pollination of infested plants by 7 percent hexochlorane yielded good resullts. It is necessary to mention that chemical methods in controlling the miniring moth were not worked out as yet.

Good results were obtained in Krasnodarsk krai by the candidate of biological sciences, P. N. Galakhov (NIIMK), in controlling ants by means of dusting peanut seeds before sowing with 7 percent hexochlorane dust at the dose of 1 percent to the seed weight. The ~~pollinated~~ dusted seeds were not damaged at all, and the ants, by penetrating into the zone of hexochlorane activity, died soon.

In controlling pests of vegetables, hexochlorane was tested at six various experimental points of the Soviet Union in the form of 7 percent talcum dust and obtained everywhere positive results. An especially high effect was obtained in controlling flea-beetles by ~~pollinating~~ dusting crucifer plants-cabbage and radish. After the treatment of the plants, the flea-beetles disappeared completely, the damage of the plants was checked. For 12 days they did not appear at all upon the plants treated with hexochlorane, and during the treatment with other compounds they reappeared on the third day in great amount and damaged the plants. Control, untreated plants were considerably damaged by the fleas and died.

In controlling owlet-gamma, hexochlorane dust was tested by the candidate of agricultural science, B. A. Gerasimov, under field conditions, on lettuce, on the third day after ~~pollination~~ dusting the mortality of caterpillars reached 100 percent.

Positive results were obtained by ~~pollinating~~ dusting vegetable with hexochlorane in controlling leaf gnawing caterpillars, cabbage and turnip worm [Pieris rapae], cabbage moth, cabbage owlet of second and third stage and others. All the results were positive.

In controlling cabbage and onion fly, hexochlorane also proved to be effective. In the experiments of B. A. Gerasimov (Institute of Vegetable Farming) by ~~pollinating~~ dusting around the basis of cabbage by the dust at the radius of 2-3 cm. positive results were obtained. Upon control untreated fields all plants were damaged by cabbage fly, 56 percent of them- at high degree. Upon the fields treated with hexochlorane, 33 percent of the plants were damaged to a low degree.

When hexochlorane was placed under the plant in controlling cabbage destructor, a small amount of it fell also upon the leaves. This was sufficient to protect the plants against lef gnawing caterpillars.

In controlling onion destructor (D. A. Gerasimov) the onion, prepared for planting, was covered with 7 percent hexochlorane dust. The plant infestation in control was 40 percent, after the treatment with hexochlorane it was 12 percent, and the onion yield increased by 27 percent.

Of considerable interest are the experiments with the preliminary introduction of hexochlorane into the soil before planting of onion and of cabbage.

This summary of work indicates which place should be taken by hexochlorane in the assortment of insecticides. Therefore, the question arose concerning the necessity of studying the effect of this compound upon warm blooded animals, including man.

During the study of the effect of technical solutions of isomers of hexachlorcyclogen upon warm blooded animals, it has been determined that it possesses low toxicity. According to the data of A. I. Tareeva (Scientific-Research Chemical Pharmaceutical Institute), the mortal dose for rats, when introduced in to the stomach through the mouth is 4 g. per kg. of the living weight. The doses 1 and 0.5 g. do not stimulate toxic phenomena. A daily feeding of 100 mg. of isomers of hexochlorocyclohexane during two months did not show any harmful effect upon the rats.

During the study of the effect of hexochlorane upon the skin done by Dr. Vashkov (Disinfestation Institute) it has been determined that hexochlorane during a prolonged usage of bandages which were permeated by 10 percent of solution of hexochlorcyclohexane in turpentine or in dichlorethan did not cause any change of the skin of the rabbits, nor any change in the animals's behavior, even if the bandages were on for 160 days (with some interruption). Five coworkers of the same Institute were wearing underwear permeated with 0.5 percent of hexochlorane solution for a week, but they did not have any harmful effects either.

Conclusions

Hexochlorane is highly toxic for many harmful insects and is of low toxicity for warm blooded animals. This fact is conducive for its wide application in agriculture in protecting crops against pests.

We don't have as yet any right to confirm boldly, as some English firms dow, which are trading hexochlorane for grain ~~pollinating~~ dusting against granary pests that such grain could be used for man's food and for forage, nevertheless we may state that hexochlorane is less toxic for warm blooded animals than the majority of chemicals used lately.

All this requires from the chemical industry a speedy organization of the preparation of this compound of high toxicity and of low cost for agricultural purposes.

Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sakharnoi Promyshlennosti.
Sveklovodstvo (Sugar Beet Industry) Transl. 235 : Sugar Beets
V. 3. 392 p. Kiev, 1938 66V963 Translated in part by S.N. Monson
SB-208

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Part Two

Diseases of Sugar Beets and Methods for Controlling Them

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VT Oct. 11, 1951

Razumovskii, V.V.
Growing Substances. Chemistry. Priroda. 6:46-48, June 1948.

Translated by R. Dembo

It has been noticed for a long time that the illuminating gas which appears in the air in some concentrations influences plant growth.

Research indicated that carbon monoxide is the active agent of the illuminating gas in influencing plant growth. Later on the stimulating influence of ethelene, acetelene, and of propelene upon plant growth has been determined.

F. Koegl first isolated the plant growth substance as a clean chemical compound and determined its construction. It became evident that beta-indolelacetic acid is the growth substance of a plent (Chem.Rev., 39,199,1946): (structural formulae).

Khitchkok, after having studied the organic compounds in connection with their effective action upon the plent growth, discovered the influence of beta-indolelpropionic, phenylpionic and phenylbutyric, besides beta-indolylacetic, acids upon root formation: (structural formulae).

Soon new organic compounds which affect plant growth were discover This group of compounds which is found in the molecule of naphthalin, anthracene and indole (alpha-naphthaleneacetic acid, beta-naphthalinacetic acid, beta-indolyl oil acid, anthraceneactic acid) are effectively influencing the growth of plant roots. 236

The adding of one of these substances into the soil is sufficient for root transformation of the plant. Further it has been discovered that the complex ethers of alpha-naphthalene, phenylacetic, beta-indolylacetic, beta-indolylpropionic and beta-indolyloil acids belong to growth substances.

Sodium sales of alpha-naphthaleneacetic and beta-naphthalene acetic acids appear to be active substances for initiating the growth of plant roots.

It is a quite interesting factor that the growth substances which stimulate the development of the stem, of the petiole and the formation of the roots, under the same concentration, as the above-mentioned acids, also check the growth of the plant roots.

There exists also a series of other growth substances - herbicides which check or accelerate plant growth. The possibility of their wide application in the future is stipulated for various reasons, by the following:

First, these growth substances may be applied for the removal of superfluous flowers and fruits.

Second, herbicides could be utilized as an instrument in controlling weeds.

Third, they could be successfully utilized for retarding development of buds, flowers and leaves of trees and bushes which bloom early.

The application of herbicides helps in preventing the harm caused to plants by early frosts, and on the other hand to extend the period of blooming and fruit maturing (ripening).

Herbicides also permit extending the time for spring planting of bushes. Growth substances are utilized for preventing early development of buds in the potato tubers.

Of special interest is the differential herbicide. This herbicide stimulates a speedy propagation of wide leaf plants, up to their complete destruction. Along with that the effect of the given herbicide does not spread upon grasses.

The application of growth substances is widely used in orchards for irrigation of fruit trees.

Such growth substances, as beta-indolylacetic acid and methyl ether of alpha-naphthalinacetic acid, retard the development of buds upon fruit trees.

In order to prevent the harmful effect of late frosts and the prolongation of the period of fruit ripening upon trees, the latter are treated by the vapors of alpha-naphthalinacetic acid. (structural formula)

Alpha-naphthalinacetic acid prevents the dropping of apples before its ripening and retards the blooming of trees.

Beta-naphthalinacetic acid and its potash and sodium chlorides are strongly effective growth substances.

During a short period of time insignificant concentrations of beta-naphthalin acetic acid have a harmful effect upon the plants.

A still more effective growth substance is the 2,4 dichlorphenoxyacetic acid - 2,4 D. This organic compound destroys all plants which grow upon meadows without destroying grasses.

Simultaneously, 2,4-dichlorphenoxyacetic acid accelerates the ripening of apples, pears and bananas. Simultaneously tomatoes and pepper are entirely indifferent to the effect of 2,4 dichlorphenoxyacetic acid.

Betaindolyl oil acid, (structural formula) stimulates plant propagation. In particular, it causes the formation of tomato fruits.

Naphthoxy compounds (betanaphtoxy acetic acid) transforms the plant organs. The most effective growth substances are the derivatives of phenoxy acetic acid: 2,4 dichlrophenoxy acetic acid and 2,4,5 - trichlorephenoxy acetic acid. They retard the development of plant buds, assist in producing fruits without seeds and prevent the falling of fruits before ripening.

Benzoic acid is physiologically inactive. Benzoic acid replaced by 2,3,5 triiodobenzoic acid (1) and 2-bromide-3-nitrobenzoic acid (2): (structural formulas) are physiologically active.

Acid (1) is the regulator of plant growth. Acid (2) influences the lengthening of the plant cells and, especially, upon the modification of their organs.

The methods of treating plants with growth substances vary.

In order to prevent the falling of apples before ripening, a water solution which contains 10 to 50 mg. of alpha-naphthalene acetic acid upon 1 liter is sprayed along the entire tree.

For retarding the development of buds upon tubers, bulbs, trees, and bushes, the plants, or its parts, are treated by vapor, either are placed into the solution, or are sprayed by the powder of alpha-naphthalene acetic compound.

The most effective retarding of the plant growth could be achieved by treatment with vapors of methyl and ethyl ethers of beta-naphthalene acetic acids.

Seedless tomatoes are obtained by various methods.

The regular method consists in spraying the dying blossoms by water solutions or emulsions of beta-indolel oil, beta-naphthoxy acetic, -beta-naphtoxipropionic or 2,4-dichlorphenoxypropionic or 2,4-dichlorphenoxy acetic acids.

The method of treating meadows by 2,4-dichlorophenoxy acetic acid in controlling weeds is right now (pulverization.) ? spraying - dusting yes

VT Oct. 29, 1951

Dzulai, A. P.
On growing rice with irrigation at certain periods. Sovet Agron. 7(6): 68-79. June 1949. (The author is a Cand. of Agricultural Science, All-Union Rice Experimental Station.)

Translated by R. Dembo

Among the tasks which were placed by the Five-Year Plan and by the February Plenum of the Central Committee of the All-Union Communist Party(b), according to the development of agriculture during the post-war period, rice should occupy an important place among cereals; it is a plant of high and resistant fruitfulness, of good production and which possesses great possibilities in extending plant fields.

The plan intends to increase the irrigated fields by 656 thousand hectares during the Five-Year Plan. Considerable fields will be used for rice in Krasnodarsk krai, the valleys of Syr-Dar'ia, in the Ukraine and in Rostov oblast', and also in Stalingrad and Astrakhan' oblast's by irrigating the Volga-Akhtubinsk flood-lands. Besides, in a series of raions which lack sufficient and resistant irrigation, special irrigation fields are created upon which it is most advisable to distribute rice in crop rotation with vegetables. At the present time, in the Southern parts of Kursk and Voronezh oblasts irrigated fields are constructed which are provided with good pump stations; in many collective farms there are constructions for rain supply. According to the Michurin methods of plant cultivation, rice will soon grow not only in Southern, but in the Northern raions of these oblasts as well.

The spreading of planting fields of rice in new, as well as in old raions of USSR, is connected with the distribution of this plant in various raions, so far as their natural conditions are concerned, upon a wide surface between 37 and 51° of Northern latitude. This requires a great diversity in rice varieties and an introduction of a new agrotechnic.

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The method of producing rice by permanent flooding of the rice field which was established for centuries is not adaptable for all raions of rice production which differ by their soil, hydraulic and climatic conditions. This method of rice growing does not satisfy the contemporary requirements of socialist production.

In Krasnodarsk krai upon Petrovsk-Anastasiev and Labin-Urup massives, in Saratov oblast', in the valley of the river Irgiz, in many raions of Southern Ukrainian SSR and in Rostov oblast', as well as in Southern raions of central Black Soil belt, the production of rice with a permanent flooding, is too complicated, and in many cases absolutely impossible, due to great filtration of the soil and the inability of the under-soil horizons for keeping water supplies. Under these conditions a complete flooding requires a great consumption of irrigating water and the flooding of the nearby territories.

The shift to the new method of periodical irrigation of rice fields is caused not only by the indicated reason, but is of great interest from point of view of acquiring a large amount of soil differences for rice growing, the decrease of consumption of capital for irrigation construction. The introduction of rice production with periodical irrigation eases the crop rotation, destroys the nests of malaria mosquito and creates conditions for the application of high agrotechnic based upon mechanization.

The crop rotations which were worked out at the present time in the USSR did not acquire the necessary development in connection with the fact that the irrigation network does not permit the regulating of the surface and ground waters, which flood all crop rotation plants and fallow lands, and which do not till them correctly. The practice indicates that it is impossible to remove the permanent flooding upon large fields without large capital investment for drainage and pump stations for evacuation of the waters.

By producing rice with periodical irrigation the introduction of crop rotation upon rice fields will not encounter any obstacles. Thereby many various plants could be included into crop rotation which would increase its productivity.

During the rice production with periodical irrigation, checks upon the rice field will not be necessary any more. They will be replaced by strips cut by a ridger simultaneously with the sowing of rice by means of a sowing machine.

By shifting to this method of irrigation, there is no need for preparing equipment for agricultural machines. All machines produced by industry for grain economy could be utilized without any important equipment for rice economy with full production. The process which requires a great amount of labor - the harvest of rice - will be successfully solved, since the application of harvesting machines is facilitated by the construction of the irrigation network, but all the rice varieties cultivated by means of periodical irrigation are not lodging at the yield of 50 or more centners per hectare.

According to the research of the candidate of biological sciences, P. S. Erygin, various rice varieties during various phases of vegetation react to soil water in various ways, while this characteristic is expressed in rice more conspicuously than in other crops. According to his data, rice possesses a double quality:

a) The root systems of the young and mature rice plant are differently adapted to the irrigated soil: when the plant is young, the roots of rice react painfully to irrigation, but the mature plants are not only able to endure irrigation, but even produce additional roots during the appearance of stem which phenomenon was not observed with unirrigated plants;

b) Rice utilizes (for consumption and transpiration) the same amount of water as barley and wheat but rice's requirement for water is different.

For a better development of rice, the soil moisture during the sprouting period until the appearance of stem should be not less than 50 per cent, from the appearance of stem until the wax maturity should be 75 per cent, and from wax maturity up to full maturity not less than 50 per cent of the full soil moisture.

The production of rice with periodical irrigation is not an innovation in agronomy. It has been applied many hundreds of years in the countries of the South-East, and is widely spread in the countries of East Asia. But during primitive technic and manual labor, the yield did not increase above 12-14 c/ha. But with our modern technic a yield of 35-40 c/ha is no problem when periodical irrigation is applied.

In our country the problems of periodical irrigation in rice production were discussed by the All-Union rice experimental station, Azerbaidzan, Uzbek, Far-East, Ukrainian, North-Caucasian experimental-meliorating stations and Southern Institute of Hydrotechnic and melioration.

The majority of the scientists had as their aim the improvement of the micro-biological processes in the soil by means of changing the water regime of the soil and to direct the chemical and micro-biological processes in such a manner that could guarantee a more intensive process of mobilizing the natural soil fertility.

In the regions where the problem of economizing irrigation water was acute, the possibility of reducing irrigation norms was examined. Research work with rice was carried out basically with an interrupted irrigation.

For a few days the field was irrigated and then for a certain period remained not only without any water, but the drying of the soil was even permitted. Such raions are: the Zaravshan valley of Uzbek SSR, the downstreams of Southern Bug, of the Dniepr, etc. Here the filtration of the soil reaches great dimensions - 1-1.5 litres per second upon hectare.

At the Northern Caucasus of the All-Union Rice Experimental Station and at the Northern-Caucasus Experimental-Meliorating Station (SKOMS), were carried out experiments with periodical irrigation of rice, the results of which are given in Table 1. (See table 1 on page 7)

All these experiments are carried out with great errors: the control of constant irrigation and the registration of the yield has been carried out upon 5-10 one meter fields, according to each experiment variation. As exception were experiments which were carried out at the All-Union Rice Experimental Station, where the registered field was 100 m^2.

Almost in all experiments, the rice yield was quite high, but indicate the full possibility of producing rice with periodical irrigation.

In 1937, at the Mosdok Experimental-Meliorating field the experiments with periodical irrigation of rice were carried out by the scientific worker of the All-Union rice experimental station, comrade Yarkin, S.A., according to a wide program. The field soil was the Forcaucasian chestnut light loam. The soil water during the vegetating period was at the depth of 40 m. The variations of the experiment: moistening by means of flooding the fields after 1, 7, 15 days, the control with constant flood.

The number of the watering according to variations, the average watering and irrigation norms are indicated upon Table 2. (See table 2 on Page 8)

In the given experiment were studied 14 varieties of productive and selection rice. During vegetation an essential difference was observed in the behavior of the varieties.

Upon fields, where the watering has been carried out after a day, the rice plants had a fresh, light green appearance. Upon fields which were watered after seven days, the rice leaves had a slightly different coloring than in the first case, and during the watering after 15 days - dark green. Towards fall this difference intensified: upon the fields with watering of 15 days rice would improve immediately after the watering, and at the end of the watering period, the leaves would turn and become dry. It has been conspicuously expressed with the variety Kendzo. The following varieties: Lysogolovyi, Belyi, Golden sprouts and LKVP, which are demanding less water, reacted to the decrease of soil moisture in less degree.

This table (See page 8, table 3) indicates that the yields according to variations are in direct relation to the degree of soil moistening, i.e. the oftener the watering was, the higher was the yield, although in a series of cases during the watering, by skipping one day, the yield was higher than on the control during permanent flooding. During the watering after 15 days, it has been 2-3 times lower than during permanent flooding. As far as the quality of the varieties is concerned, it is somewhat lower with the majority of varieties in comparison with control.

It is necessary to observe that with the varieties: Belyi, LKVR, Golden Sprouts, etc., which require less water - the strength of the panicle under various conditions of the irrigation remains without any change and even increases during periodical irrigation. The number of steriled spikes varies in some degrees with various methods of irrigation, if the drying of the soil is not too great. Naturally, during the watering after 15 days, under the conditions of a hot climate in the raion of Mozdok, the drying

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Table 1

Raions where and by whom the experiments were carried out.	The years of the experiments	No. of the watering	Watering Norm (m^3/ha)	Irrigation Norm (in m^3/ha)	Yield of grain (in c/ha)	Varieties which were used in experiments
Persianovka prof. Vitte P. A.	1929-1931	5	--	--	23.5	White SKONS
		8	--	--	34.2	
		11	--	--	42.3	
		14	--	--	50.2	
		17	--	--	51.2	
		without watering	--	--	9.2	
Mozdok, SKONS	1929-1931	8	790	6320	24.7	White SKONS
		9	--	--	30.1	
		10	680	6800	41.0	
		15	715	10725	32.0	
		18	--	--	24.7	
Behind the Kuban flux SKONS	1931	12	430	5160	42.9	White SKONS
The experimental field of the All-Union Rice Station S. Ia. Iarkin	1937	12	1258	15100	46.8	White SKONS
					44.0	LKVR
Kuban experimental-meliorating station, P. Ia. Krechko and A. P. Dzhulai	1946	3	1164	5820	18.1	White SKONS
					14.1	LKVR
	1947	6	1743	10458	34.9	White SKONS
Novocherkask K. P. Shumakova	1946		410	25250	31.0	
			434	14760	26.9	
Tashkent M. I. Uklonskaia	1933	13	--	--	18.3	Kazakhi-shaly
Carl Marx Collective Farm of Slavianak raion P.IA.Krechko	1947 1948	6	1866	11200	25.1	White SKONS

Table 2

No. of watering	Experiment variations	Number of watering during the season	Watering norm (in m^3/ha)	Irrigation norm (m^3/ha)
1	watering after 1 day	45	968	43560
2	" " 7 days	18	1080	19440
3	" " 15 days	11	1192	13112

The data which characterize the rice yield and the absolute weight of the grain under various conditions of the water regime are given in table 3.

Table 3

Rice varieties	During watering after one day		During watering after 7 days		During watering after 15 days		During permanent flooding	
	yield (in c/ha)	absolute weight of the grain	yield (in c/ha)	absolute weight of the grain	yield (in c/ha)	absolute weight of the grain	yield (in c/ha)	absolute weight of the grain
Kendzo..........	30.8	29.4	19.1	27.2	6.7	24.4	37.3	29.6
Iukto...........	51.1	25.7	38.2	23.7	24.0	22.1	----	26.0
Elita.012.......	58.1	30.6	38.7	27.2	14.7	24.6	58.4	32.2
" 039.......	61.8	30.9	48.9	28.3	25.1	26.0	60.9	32.4
Belyi...........	53.3	27.2	50.2	24.6	39.8	22.9	52.7	27.6
Lysogolovyi.....	53.8	28.7	50.7	27.4	44.0	26.2	----	----
Golden sprouts..	50.4	31.5	48.4	29.8	38.2	27.7	66.9	32.3
LKVR............	44.0	29.1	44.9	27.4	34.0	26.3	46.7	29.8
Buryi...........	49.1	26.0	45.5	24.3	35.5	22.6	----	26.1
Elita 055.......	54.2	30.8	47.1	28.0	22.0	25.1	57.8	31.8
" 048.......	49.8	29.6	42.2	27.8	20.0	25.0	49.3	30.8
" 060.......	60.0	30.4	48.4	28.0	21.8	25.6	58.7	31.6
" 061.......	61.3	32.8	47.1	30.1	32.0	27.8	----	32.8
Kazakhi-shaly...	66.7	30.4	49.8	27.4	26.7	25.1	65.3	31.4

the soil occured quite intensively. This reflected upon the formation of the grain and caused high sterility of the spikes (Table 4).

Table 4

Rice varieties	General amount of spikes in the basic panicle during watering				Percentage of sterile spikes in the panicle during watering			
	Permanent flooding	after 1 day	after 7 days	after 15 days	Permanent flooding	after 1 day	after 7 days	after 15 days
Kenmo................	42.8	38.7	37.3	36.2	14.0	11.4	23.0	80.1
Inkto................	33.3	38.0	39.7	36.4	12.9	9.3	19.9	37.9
Elita 012............	35.6	31.4	32.0	29.3	11.2	6.1	14.7	46.4
" 039............	51.5	51.3	46.7	40.7	10.1	6.8	9.6	33.7
Belyi................	42.2	44.2	49.0	48.1	10.9	11.1	12.2	29.5
Lysogolovyi..........	42.8	41.2	43.5	49.1	7.2	6.1	9.9	25.7
Golden sproutings....	38.6	37.8	35.1	41.1	9.1	8.2	12.6	30.6
LKVR.................	43.4	43.3	50.7	57.0	5.1	4.1	9.5	26.9
Buryi................	32.8	35.8	35.4	37.0	9.7	6.7	9.6	25.1
Elita 055............	52.9	53.6	56.2	47.1	9.6	4.9	8.7	34.8
" 048............	51.5	56.1	54.7	44.4	10.9	5.2	7.9	41.7
" 060............	56.7	65.7	54.0	49.8	8.1	6.1	11.3	46.2
" 061............	38.3	47.4	48.8	40.2	11.5	6.7	8.8	27.6
Kazakhi-shaly........	59.3	61.6	50.8	47.7	7.6	6.5	7.3	42.8

By studying the data about the amount of spikes in basic panicles we may conclude that with the majority of varieties (Lysogolovyi, Golden Sprouts, LKVR, Elita 061, Iuko, Belyi, Buryi, etc.) during periodical irrigation the panicle is stronger than during permanent flooding. The amount of sterile spikes during the watering every second day, after seven days and during permanent flooding vary slightly. With all varieties, with the watering after 15 days the percentage of sterile spikes is very high.

In field and in vegetative experiments during several years the varieties which demand less water yielded a greater amount of spikes upon the main panicle during periodical irrigation than during permanent flooding. The amount of sterile spikes in vegetative experiments with all varieties is higher upon moistened soil than upon flooded soil.

Our observations in 1948 indicated that the percentage of sterile spikes depends to a considerable extent upon the conditions of agrotechnic and first of all upon the conditions of soil moisture and upon sowing term.

In our experiments during an early sowing, the percentage of sterile spikes with the variety Belyi SKOMS was less than in the experiments of A. S. Iarkin and in the vegetative experiments of P. S. Erygin with the same variety during flooding.

Upon Mozdoksk experimental-meliorating field experiments were carried out with rice during various methods of irrigation: along the furrows by means of infiltration and along the strips by means of flood. The All-Union Rice Experimental Station carried out experiments upon small one and a half meter fields in lysimeters, where rain waters were applied, with keeping soil moisture at 100-95 per cent of full moisture capacity. Rice yields during these experiments were quite high. During the experiments with irrigation along the strips and furrows, no basic difference in rice yield has been observed.

The results of the experiments are presented in table 5

TABLE 5

The place where the experiment has been carried out	Years of carrying out the experiment	Method of irrigation	No. of watering	Irrigation norm (in m^3/ha)	Rice yield (in c/ha) according to varieties				Control with permanent flooding
					White SKOMS	LKUN	Kukto	Buryi	
Mozdok SKOMS	1929-1930	Watering along furrows	15	17300	36.0	--	47.0	53.4	46.4
		Watering along strips	10	12200	35.2	--	30.1	55.4	37.6
All-Union Rice Experimental Station, city Krasnodar	1939-1940	Periodical moistening	--	--	51.8	66.5	--	--	60.7

Table 6

Repetition	The height of plants (in cm.)	Bushiness		Length of the panicle	Amount of grains on the panicle				Yield (in c/ha)	Absolute weight of the grain	Filmness (in o/o)
		general	productive		normal	poor	empty	total			
1	105	2.5	2.5	17.2	57.4	--	10	68	33.1	28.4	19.3
2	93	2.5	2.5	17.0	52.4	--	13.2	65.6	32.8	28.3	19.3
3	104	2	2	16.8	51.2	2.0	11.0	62.2	32.5	28.1	19.2
4	105	3	3	17.6	50.8	4	14.8	65.6	32.0	28.2	19.5
5	97	2.5	2	16.9	32.5	3	4.5	40.0	31.9	28.1	20.0
average	101.6	2.5	2.4	17.1	48.0	1.8	10.8	60.3	32.5	28.2	19.5

During the experiments carried out in Mosdok upon the control with permanent flooding the variety Buryi was sown, and at the All-Union Rice Experimental Station - the variety Belyi SKOMS. The data of the table indicate that, during all the methods of periodical irrigation the yields of this variety were higher than during permanent flooding.

Field and vegetative experiments which were carried out in Northern Caucasus indicated that rice yield during the periodic irrigation depends not only upon the amount of waterings and of the general amount of water, but depends mainly upon the time when the waterings were carried out and which soil moisture has been kept during each phase of plant development.

During the experiments which we carried out in 1947 during the inundation of the river Kuban', upon the irrigated field of the school farm of Pashkov Agricultural Technicum, during the vegetative period were given seven waterings at 680 m^3/ha. The waterings were carried out when the upper soil layer dried out somewhat and the crust cracked. This corresponded to approximately 55 per cent of moisture capacity of the soil within the zone of the spreading the basic mass of rice roots.

The level of ground waters upon the field fluctuated during the vegetating period from 1.90 m to 1.10 m and during the entire period it depended directly upon the water level in Kubán'.

The sowing has been carried out on 30-31 of May by sprouting seeds into a soil which has been divided unsatisfactorily and has been plowm in spring. In spite of that, the yield of the variety LKVR was two centners higher than the yield harvested from the other crops of the school farm with permanent flooding. The data which characterise the rice yield according to repeated experiment are given in Table 6. (See table 6 on page 11)

In the table we notice especially the absolute weight of the grain and its filmy-form. The variety LKVR during the best years as far as climatic conditions is concerned, under permanent flooding yielded grains with absolute weight not higher than 28g., and under the given conditions it yielded 28.2g., which is explained by the normal density of grassland (approximately 300 plants per 1 m^2) and by the absence of "podgon" due to which the absolute grain weight decreases and the percentage of filmness increases.

The filmness of the grain is not great. If with the variety Kendzo, which has larger grain than LKVR produced during permanent flooding, the filmness amounted to 18 per cent, then for LKVR the filmness of 19 per cent is a good indicator of grain quality.

The results of this experiment confirm that during periodical irrigation it is possible to obtain not only high rice yields, but grain of high quality as well. The opinion of some specialists that the production of rice with periodical irrigation yields grain of inferior quality has no foundation whatsoever. This point of view has been rejected by degustation, whereby rice produced by a periodical irrigation often obtained the highest evaluation.

The rice plant with periodical irrigation without a water layer, as has been indicated above, besides other qualities, is important for the decrease of expenses for irrigating water, especially upon light grounds with high filtration.

Data which characterize water consumption for rice irrigation under permanent flooding and periodical irrigation without any water layer of some experiments indicated above are given in Table 7. (See page 14)

Hence, the irrigation norm for rice during periodical irrigation without water layer is approximately 50 per cent lower than during permanent flooding.

Based upon the work which has been carried out, we may come to the conclusion that the potential possibilities for obtaining high yields of rice are higher under periodical irrigation than under constant flooding. There is no difficulty in obtaining the density of 350-400 rice plants for square meter under periodical irrigation while under permanent flooding, 200 plants for square meter is considered a good indicator. Naturally, it is not easy to obtain a high yield with such density. Besides, under periodical irrigation many varieties form a panicle with a larger amount of grains than under permanent flooding.

TABLE 7

Regions where the experiments were carried out	A short description of the soil	Number of watering	Water expense		Rice yield in c/ha		Water economy (in percentage) under periodical irrigation
			under periodical irrigation (in m^3)	under permanent flooding (in m^3)	under permanent flooding	under periodical irrigation	
Mosdok experimental-irrigation field	Pre-caucasus, chestnut light loam.....	13	14750	32800	37.6	40.0	55.2
Kuban experimental-meliorative station	Cracked soil Medium loam, of meadow-alluvium origin.............	6	12216	50200	---	43.8	75.6
Carl Marx Collective Farm of the Slaviansk region	Soil alluvium-meadow loam, of diverse mechanical content.	6	11200	17600	26.8	25.1	36.2
Novocherkask collective farm "Labor of the grain worker"	Light upper terrace black soil.........	43	20700	36400	---	31.0	43.2

Many scientists are of the opinion that the application of this method on wide productive scales involves at the present time great difficulties, due to the growth of a great amount of weeds after each watering. In the water layer upon rice field they see the basic means in controlling weeds and thus they explain the necessity of permanent flooding.

Weeds do appear upon a rice field under periodical irrigation, but this occurs with any irrigated plant and, nevertheless, nobody rejects the method of irrigation even of less valuable plants than rice, such as millet, barley, oats, wheat, etc. The measures of controlling the weeds of these crops are well worked out and could be applied also with rice production.

By producing rice under the periodical irrigation regular crop rotations are basic against whose background should be applied various agrotechnical measures, according to the requirements of the crops and the field conditions.

The components of rice crop rotation under the periodical irrigation should be mainly intensive crops which require irrigation which are determined by the organization-economic conditions and plan task. The following possible schemes of rice crop rotations under the production with periodical irrigation without any water layer could be recommended: (See p. 16.)

The scheme of rice crop rotations

No.P.P.	Schemes of crop-rotation	Fields and the rotation of crops							Percentage of rice in crop rotation
		I	II	III	IV	V	VI	VII	
1	Five-fields	Perennial grasses	Perennial grasses	Rice	Vegetable plown	Rice	—	—	40
2	Seven "	Perennial grasses	Perennial grasses	Rice	Vegetable plown	Rice	Vegetable plown	Rice	43
3	Six-fields	Perennial grasses	Perennial grasses	Rice	Rice	Plown land	Rice	—	50
4	Four "	One year grasses (Bersim)	Rice	Plown land	Rice	—	—	—	50

According to the data of research along rice agrotechnic and according to the modern knowledge about its biology and biological peculiarities of the weeds growing among it, we may recommend the following agrotechnic by producing rice with periodical irrigation.

The field should be selected among fertile soil with a good structure and free from weeds. The field should be well leveled out, should permit a good distribution of water during watering along the stripe and which would check the formation of pools during rains. Therefore, regardless of the watering methods, the field should be well planned with a grader.

The plowing of the field should be plown at the depth of 20-25 cm., depending upon the strength of the plowing field. Spring harrowing should be carried out with "gvozdevka," as the soil moisture would permit.

Rice is a plant which prefers heat and is sown after the temperature reaches 10-12°C., i.e. considerably later than the seeds of weeds grow. Therefore, after the field has been plown, further field cultivation is carried out according to the method of spring tilling of black fallow land. The last spring plowing should be carried out not deeper than 10-12 cm. with immediate trailing. Pre-sowing tilling should assist in destroying weeds.

In Kursk, Voronezh, Rostov, Saratov and Stalingrad oblast's one or two pre-sowing tilling should be carried out, and in Krasnodarsk, Stavropol' krais, in Astrakhan and Grosnen oblast's 2-3 tillings.

In order to obtain good sprouts of rice in all raions, sowing with sprouting seeds should be carried out under average day temperature of 12°C. For this reason, two to four days before the sowing, depending upon the air temperature, the seeds should be moistened (placed into water for 12 hrs.) and then sown upon the floor or upon bresent with a thin layer for drying. After that, the seeds acquire their former friability and do not stick in the sowing machine. As soon as sprouts are shown, the sowing with a regular sowing machine should be carried out immediately. The seeds should_be placed at the depth of 4-5 cm. If the sowing is done in a moisted soil, the field should be smoothed slightly. If the soil is dry, then it has to be watered after the sowing, but no smoothing is applied. In Kursk, Voronezh, Saratov, Kuibyshev, Stalingrad oblast's and in the Northern raions of Rostov, the rice sowing is more dense counting 4.5-5 million seeds per hectare, which means 130-140 kg. of sprouting seeds per hectare for the varieties: Belyi SKOMS, LKVR and Golden Sprouts. In these raions it is impossible to permit a strong sprouting, because it ripens not simultaneously and retards the harvest.

In Southern raions the sowing norm decreases up to 3.8-4 million grains which is equal to 110-115 kg. of economically fitted seeds per hectare. Upon soil which are not sufficiently cleaned of the weed seeds, a double lined sowing should be carried out in the Southern oblast's, in order to facilitate the weeding. The distance between the strips is 45 cm.

During the watering along the strips, after presowing tilling, the lot is divided into strips of 100-200 m in length and 4.5 m in width, if the sowing is done with a horse sowing machine, and 3.8 m when a tractor is applied, i.e. in the first case the strip width equals three passages of the horse sowing machine, and in the second place - one passage of tractor sowing machine.

In case, when the field is not even, the width of the strip should not exceed 3m. The soil ridges between the strips are made by a light ridger of a tractor or horse draught. The height of freshly filled soil ridges "valik" is 18 cm., and the width - 35 cm.

For a full utilization of the lot, the ridges should be covered with rice. Thereby during a full sowing, the plowed land which reaches the ridge has to be lifted at 10-12 cm. higher than the others, so that the rice seeds would be sown not deeper than 5 cm. During the wide strip sowing, the ridges are sown separately after the rice sowing upon the strips. For this purpose, 3-4 shares which are to be sown upon the ridges are elevated at 10-12 cm. higher than the rest where the sowing equipment is covered by slide bars. After sowing, the ridges should be straightened out in places where they were destroyed.

Waterings should be done as soon as the upper 2-cm. soil layer dries out and begins to crack. Such condition of the field's surface indicates that the availability of moisture in the soil at the depth of 7-10 cm. is about 55 per cent of full moisture capacity.

Such soil moisture is sufficient during the period from sprouting until the appearance of stems and from waxen up to full ripening of rice. After the first watering up to the appearance of sproutings a crust might be formed which retards the sprouting. In such cases a special watering should be given. The irrigation should be at smaller norms, but more often. During the season seven to eight waterings should be carried out in Northern regions, and nine to ten waterings in Southern regions. If there is enough rain, the number of waterings should be decreased.

During the period of the beginning of appearance of stems and up to the waxen ripening, the soil moisture should not be less than 65-70 per cent of the entire moisture capacity. For this purpose it is necessary to carry out frequent watering, i.e. after 5-6 days; the period between waterings from the day of sowing up to the appearance of stems and from waxen to full ripeness is 7-10 days. Upon poorly structured soil during the watering along the strips a crust is formed; in controlling it, the interval between waterings should be reduced up to 4-5 days. Practically, between the sowing and the sprouting, one or two waterings should be given, depending upon the region, because during the sowing at optimal periods after the average day temperature is 12-15° the sprouting of sprouting seeds occurs after 7-10 days. With wide strips of sowings, after watering it is necessary to carry out a loosening of the soil between the rows with a horse cultivator. Practically, in Southern regions during the period from full sprouting up to the appearance of rice - two to three between rows tilling are carried out.

A well-rotted manure is introduced into the plowm land with the calculation of 25-30 t/ha. During the period of stem appearance, feeding with mineral fertilizers is carried out counting 30-45 kg. of nitrogen per hectare, 30-45 kg. of phosphorus and 25-30 t/ha. During the period of stem appearance, feeding with mineral fertilizers is carried out counting 30-45 kg. of nitrogen per hectare, 30-45 kg. of phosphorus and 25-30 kg. potassium. After the introduction of fertilizers, a watering by a small stream is carried out immediately, with the aim that the fertilizers would not be washed out, but would penetrate into the soil along with the water.

The weeding should be done at least 2-3 times, approximately, every 12-15 days, i.e. after two alternate waterings. It is impossible to delay with the weeding, because weeds grow fast and depress the rice plant considerably.

Rice should be weeded after watering, as soon as the soil would not stick to the feet of the labor men; the weeding should be carried out often - every two-three days, so that the soil would not dry out completely. If the soil is dry, then the weeds could not be torn out with the roots, but tear off at the stem and soon grow again. The last weeding is carried out when the rice enters the pipe stage. After rice has been cleared, separate weeds which remain unnoticeable should be removed before rice ripening.

Under correct agrotechnic the average rice yield of 35-40 c/ha could be obtained.

For a further introduction of rice into production with periodical irrigation, it is necessary to carry out research on the problems of agrotechnic, hydrotechnic, watering technic and the selection of the corresponding rice varieties.

The problems of first order are the following:

1. The construction of irrigation card for the periodical irrigation of rice, thereby the length and the width of the watered strips should be determined in relation to the natural contour of the field and to the natural physical qualities of the soil.

2. To determine the hydromodus of rice irrigation with periodical waterings and the irrigation norms calculating the prevention of salting the soil.

3. To study a series of problems of rice agrotechnic under periodical irrigation:

a) measures of sowings, time of sowings and the norms of sowing in order to shorten the vegetative period of various rice varieties under production;

b) soil tilling by the crop rotation system;

c) the predecessors of rice in crop rotation.

In order to produce rice with periodical irrigation, it is necessary to select all varieties in respect to their morphological and other characteristics of susceptibility to dryness, and to carry out further selection in this direction on wide scale.

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CONCLUSION

In order to eliminate the weeds of fields, it is necessary to introduce plowing by plows with coulters during plow and fallow lands tilling.

It is possible to carry out weed control on fallow land, as well as on plown land, based upon the knowledge of biological peculiarities. The basic problem should be considered not the removal of roots from the soil, but the creation of conditions which would check their viability.

The method of combing out and of burning out which is based upon the mechanical removal of roots from the soil and which is connected with slight plowing should be eliminated from agricultural practice as absolutely unfit.

The method of controlling quack-grass on fallow land which has been worked out under the supervision of T. D. Lysenko, based upon the biology of the weeds and verified under productive conditions of collective farms and state farms of Omsk oblast', could be recommended for wide application in Siberia. By clarifying the application of this method according to the soil-climatic and other conditions of the zone and of the specific collective or state farm, it could be applied on the farms of European part of the Union of SSR.

By controlling weeds based upon the achievements of Soviet agrobiological science, it would be possible to free the fields of weeds in a short time.

The progressive study of Michurin-Williams which has been developed by the academic T. D. Lysenko, provides us, the workers of agricultural

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production, with the knowledge of nature's regularity and assists us in fulfilling historical problems which are placed before us by the party and by the government during the post-war period.

MJA 11-6-51

Voevedin, A. V.
Powdered preparations of benzene hexachloride in locust control. (In Russian.) Sovet. Agron. 8(3): 89-92. Mar. 1950. 20 So84

Transl. 239: Insecticides

Translated by R. Dembo

Grain dusting on collective farms in Stavropol Region

The author is the candidate of agricultural science of All-Union Institute of Plant Protection

The author of this article studied the problems which are connected with the application of benzene hexachloride in powdered compounds for the control of Asiatic locust through the aviomethod. The nature of the compound, the concentration and the method of distribution of the active agent in the compound, the mechanical shifting, the cultivation of the compound by the solution HChCH and the heating of the mechanical mixture at 125° C - all this has been studied.

The author analyzed the toxicity, adherence and the aerodynamic qualities of the compound. The work consisted of a series of laboratory experiments, of field experiments and of productivity research.

In field experiments with the application of a manual pollinator which have been carried out in spring of 1947, in Alakul'sk raion, of Kazakh SSR, we determined that the technical effectiveness of concentrated dusts is higher than the low percent, provided we applied the same amount of the active agent per one field unit (Table 1).

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Table 1

The dose for HChCH in kg/ha	0.25		0.50		1.0		2.0
Concentration of HChCH in dusts percentage	5	10	10	20	20	40	40
	Dust upon talcum						
Mortality of larvas of the second and third stage in percentage during the fifth day	47.7	64.0	80.8	91.3	95.0	96.3	99.0
	Dust upon Kembrii loam						
	49.7	69.7	81.0	92.0	93.0	95.7	100

By special (planting) experiments upon fields with rare vegetation it has been determined that the basic role in technical effect of dust HChCH is played by the contact effect of the compound. Thus, the mortality of the larvas of Asiatic locust of the 4th and 5th stage from the dust doses of 5 kg/ha upon Kembrii loam, provided the intestine effect has been excluded, is expressed by the following figures:

Percentage of HChCH in dust	Mortality of the larvas in percentage	
	First day	Third day
20	67.3	91.0
10	46.0	80.0

The high contact effect of HChCH enables the destruction of the locust, irrelevant to its nourishment, and thus permits the application of the chemical method in controlling this pest under varied conditions.

In order to verify the obtained data, we carried out extensive productive experiments in Stavropol' krai, during 1948 with the dust of varied concentrations of HChCH (7-13 and 21 o/o) according to the method of avio-dusting. The work has been carried out in the inundations of the river Manych against older stages of the Asiatic locust and upon winter and spring crops in controlling the larvas of the younger stages. The results of the experiments with the dust HChCH are given in table 2.

The given figures indicate that the dusts of HChCH are a highly effective measure in controlling the locust larvas of the older stage. In this respect, they excell calcium arsenite which is applied in our experiments as a standard compound. Thus, from calcium arsenite at the dose of 4.5-5.0 kg/ha, at the height of the reed 0.5-0.7 m, the mortality of the larvas after 72 hours was 65-70 percent, while from HChCH at the dose of 1.0-1.5 kg/ha at this time practically 100 percent of the insects perished.

The table indicates that the technical effect of the dust HChCH depends upon the height of the grasses. This signifies that if the fusing agent is in a high reed, than the dose of HChCH should be increased from 1.0 kg/ha up to 1.2-1.5 kg/ha. As to the reasons of the influence of the height of the vegetation, they depend upon the variety of the height of the reed and, consequently, upon the density of the compound upon the powdered fields.

Table 2

The height of the reed in m	Concentration of HChCH in o/o	Dose		Mortality of the larvas in o/o					
				24 h.		48 h.		72 h.	
		Dust in kg/ha	HChCH in kg/ha	P.	M.	P.	M.	P.	M.
2.5 - 3.0	21.0	7.2	1.5	50.0	12.0	21.0	75.3	0.3	99.7
0.5 - 0.7	21.0	4.8	1.0	0.3	99.7	—	—	—	—
2.5 - 3.0	21.0	4.8	1.0	27.0	7.3	36.0	16.0	22.3	52.7
0.5 - 0.7	21.0	3.2	0.65	3.0	27.0	7.0	32.3	1.0	39.0
0.5 - 0.7	13.0	7.7	1.0	4.3	88.7	—	100.0	—	—
2.5 - 3.0	13.0	7.7	1.0	8.7	5.0	10.0	24.0	4.3	39.7
0.5 - 0.7	7.0	14.3	1.0	4.0	5.3	17.0	21.3	26.0	58.0

Footnote: in graph P are given the paralysed larvas, in graph M - the dead larvas.

The data of the table fully confirm the conclusion made before, that the HChCH dust concentration influences the technical effectiveness. Thus, for instance, the mortality of locust (during twenty-four hours) from the dose of 1.0 kg/ha (as a 20 o/o dust) at the height of the reed of 0.5-0.7 m amounts to 99.7 percent. In case of treatment with 7 percent dust in similar conditions, there appeared 5.32 dead and 4.0 percent paralized larvas at the same period. According to our laboratory experiments in respect to aerodynamic qualities of the dust, the low mortality in the latter case could be explained by less adhesiveness, and mainly by the loss of the low percent compounds from the powdered areas. The latter circumstance has been confirmed also during the field experiments of aviopollination. During the treatment we caught some particles of the compound into Koch cups. The data of the chemical analyses which were carried out according to the method of NIUIF-1 indicated that with a wind speed of 1 m/sec, the loss of compounds of various concentrations in percentage is expressed as follows:

seven percentage	80.0
thirteen percentage	55.0
twenty percentage	34.5

Besides increasing the technical effectiveness, the application of concentrated dusts (20 o/o and more) leads to the decrease of consumption by applying the aviation method. Thus, with the increase of concentration HChCH from 7 to 21 o/o the dose of dust during the treatment decreases from 14.3 up to 4.7 kg/ha, and the field treated with one load (the average of 180 kg) of the airplane increases from 15 to 37.5 ha. Along with that the beneficial time for the work cycle - direct pollination - increases from 22.5 percent in the first case to 40 percent - in the second one.

Besides experimenting, we carried out in the fusing agents, a treatment with the locust upon the fields of winter and spring crops in collective farms of Mineralovodsk, Apollo and other raions of Stavropol' krai. Those treatments secured the yield of cereal upon a lot of approximately 10000 ha and eliminated the locust threat. It became clear that, besides other confirmative qualities, the dusts of HChCH have a stimulating effect upon the plants. Thus, according to T. I. Shirko, the leader of Georgian squad on controlling locust who supervised these treatments, the yield of winter and spring wheat on the lots which were treated with the dust HChCH amounted to 18 c/ha, while the yield of the fields which were not treated with HChCH and which were not infested by locust holothurians amounted to 15 c/ha. The problem of the possibility of combining the insecticide and stimulating effect of the compound is under study (P. V. Sazonov and A. A. Bogdarin).

The results of our work on pollinating the crops with the dusts of HChCH in order to destroy the locust larvae are given in table 3.

As the data of the table indicates, in these experiments the high technical effectiveness of the dusts HChCH in comparison with calcium arsenite is higher than under the conditions of fusing agent. Thus, from calcium arsenite at the dose of 4.2 kg/ha during twenty-four hours perished only 21.3 percent of the larvas, while from the minimal dose of HChCH -0.7 kg/ha during the same period perished 52 percent of locust and 30 percent were paralyzed.

It is necessary to notice that calcium arsenite, due to the danger of burning the plants, was not applied upon the crops, but has been used only for the treatment of fallow lands, etc.

The advantage of HChCH during its application upon crops is its frightening effect upon the locust larvas. The larvas which are powdered with the dust HChCH are leaving the treated lots and cease to feed themselves. In one of the experiments we observed how the larvas moving from fallow lands to wheat crops, when they reached the belt covered with dust HChCH, moved along that strip and then turned back to the fallow land.

We should underline the fact that the mortality of locust larvae varies in respect to large (1.0-1.2 kg/ha) and small (0.7 kg/ha) quantities of HChCH. In the case of great amounts of HChCH, we observed a speedy mortality of locusts, which is most important during treatment of infested crops. Two hours later more than a half of the larvas are already dead and a part is paralyzed. In case with small quantities of HChCH we observe a different picture. The number of the paralyzed larvas increases constantly; the number of the dead larvas increases gradually.

Table 3

HChCH concentration in percentage	Mortality of larvas of First and Second stage							
	Dosing		4 hours		12 hours		24 hours	
	Dust in Kg/ha	HChCH in kg/ha	P	N	P	N	P	N
21.0	6.0	1.2	41.0	58.0	9.6	90.3	0.7	99.3
21.0	4.8	1.0	63.7	31.3	11.8	88.3	9.0	91.0
13.0	6.5	0.85	—	—	18.0	72.0	15.0	75.0
7.0	10.0	1.7	19.7	15.0	25.7	45.7	30.0	52.0
Calcium Arsenite	4.2	—	—	—	—	—	—	21.3

Besides the beneficial influence of large concentrations of HChCH upon the technical effect and upon the economy by utilizing airplane, they also help in the decrease of government's expenses for measures in locust control.

A comparison of the expenses by using 10 tons of HChCH in the form of dusts of varied concentrations for treatment of 10,000 ha* (dose of HChCH is 1 kg/ha) is given in table 4. (See page 8)

Table 4

Name of the expense	Actual measure unit	Expenses depending upon the concentrations of HChCH in o/o					
		7		13		21	
		In natural	In rubles	In natural	In rubles	In natural	In rubles
Requirement for the feeder......	ton	132.8	66400	66.9	33200	37.6	18750
Transport expenses..	wagon	9.0	9863	5.0	5486	3.0	3291
Airplane loading....	loading	715.0	1430	385.0	962	240.0	600
Flying hours for throwing out the compound............	flying hour	155.0	31000	122.0	24400	104.0	20800
Total expenses for 10,000 ha	—	—	107693	—	64047	—	43441
Total expenses for 1 ha	—	—	1077	—	6.40	—	4.34

* The cost of HChCH is excluded since it is constant at all concentrations.

The data given in the table indicate the great significance in concentration of dusts for the decrease of expenses during avio-pollination. By shifting from 7 percent to 21 percent dust, the cost of labor decreases more than double and with the substitute of 13 percent compounds with 21 percent we obtain more than 30 percent of economy on measures.

Taking into consideration the general volume of work, we must admit that the economy might indicate quite a considerable sum.

In connection with other elements of the compound construction, besides the concentration of the active agent, let us sum up that the nature of the feeder influences considerably the technical effect of low percent dusts. Thus, for instance, the mortality of larvas of the second and third stage on the fifth day after the application of 5 kg/ha of 5 percent talcum dust is 47.7 percent, and in the case of diatomite dust - 35 percent. But talcum is not the only feeder for this purpose, because the dusts upon other feeders (loam, apatite, dolomite, granulated slag) yield not only less effect, but at times even higher effect. With the increase of concentration of HChCH approximately up to 20 percent the difference in the effect for the majority of the examined feeders (except those whose specific gravity is small) disappears, which indicates also one of the advantages of concentrated dusts as it extends the possibility of selecting the feeder.

The compounds which are distributed on the surface and which were obtained by the HChCH solution as well as by heating the mechanical mixture (thermic) proved to be more effective at a low (5-10 percent) concentration of HChCH than plain mechanical mixtures of the active agent and of the feeder. For instance, if from 5 percent mechanical solution of HChCH with

Kembrii loam at the dose of the compound - 5 kg/ha, 49.7 percent of larvas of the second and of the third stage perished, then from 5 percent transplanted compound - 82 percent perished, and from thermic - 88 percent.

The increase of the concentration of HChCH in compounds, as it has been observed by the substitution of one kind of poison with the other, leads to the leveling out of the technical effect by various preparations of the dusts.

It is necessary to observe the possibility of poisoning bees with the dust of HChCH, if on the pollinated fields are available blooming honey carriers and beehive is nearby.

Therefore, in order to protect the bees, in case of the necessity of HChCH treatment near beehives, the latter should be removed at 5-7 km from the place of work, approximately for 10-15 days.

In summarising the above, we should mention that the dust of HChCH surpasses calcium arsenite as far as technical effect is concerned. Due to the harmlessness for the plants and due to the complexity of their effect, they could be applied in controlling locust under such conditions under which calcium arsenite is difficult to apply, particularly upon crops and in desert reions. The stimulating effect of HChCH upon the plant is an additional argument in favor of applying HChCH dusts upon crops.

Concentrated dusts in comparison with low percent dusts are of higher technical effect, promote the increase of airplane productivity and the decrease of government's expenses for locust control measures.

Based upon the exposed material we may determine that in controlling Asian locust of younger stages upon crops and upon virgin soil with a low grass it is sufficient to consume 0.75-1.0 kg/ha of technical HChCH. On flux with vegetation of 2.5-3.0 m height for the control of larvas of older stages, the dose of HChCH should be increased up to 1.2-1.5 kg/ha.

MJA 11-7-51

Chesalin, G. A.
Experiments in weed control on the fields of collective farms in Dmitrovskii District in Moscow Region. (In Russian) Sovet. Agron 8(2):78-84. Feb. 1950 20 So84

Transl. 240 Weed control

Translated in part by R. Dembo

Table 1

Crops	Amount of weed seeds upon a field of 1 m^2 in a layer		Amount of seeds per 1 m^2 in a layer of 0-20 cm
	0-10 cm	10-20 cm	
Perennial grasses of the second year of utilization	6640	6720	13360
Spring wheat	7360	6760	14120
Fallow land	—	—	—
Winter rye	9220	7720	16940
Potatoes	9880	8320	18200
Oats and other spring crops	10920	14560	25480
Black fallow land	—	—	—
Winter wheat	7620	6800	14420
Perennial grasses of the first year	—	—	—
Total	51640	50880	102520

Table 2

Crops	Amount of weeds upon 1 m^2		
	One year	Perennial	Total weeds
Perennial grasses of the second year of utilization	10	1	11
Spring wheat	14	2	16
Fallow land	—	—	—
Winter rye	5	1	6
Potatoes	37	2	39
Oats	40	6	46
Black fallow land	—	—	—
Winter wheat	5	0	5
Perennial grasses of the first year of utilization	—	—	—

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Table 3

Crops	Amount of seeds upon a field of 1 m in a layer		Amount of seeds per 1 m in a layer of 0-20 cm
	0-10 cm	10-20 cm	
Rye...............	28600	33020	61620
Viko-oats........	29380	26000	55380
Potatoes..........	39260	15860	55120

Table 4

Name of the weeds	Number of sprouts of weeds upon a field of shallow plowing under winter crops per 1 m^2	Number of sprouts of weeds upon a field of shallow plowing under spring wheat per 1 m^2
White mar'.........	14	23
Bird yarrow........	9	24
Pennycross fanweed (Thlaspi arvense)...	11	25
Buckwheat...........	6	8
Spurry.............	4	3
Pansies.............	21	40
Odorless camomile..	14	21
Undefined..........	32	49
Total of weeds.....	111	193

Table 5

Crops	No. of seeds upon 1 m^2 in a layer 0-10 cm	No. of seeds upon 1 m^2 in a layer 10-20 cm	No. of seeds upon 1 m^2 in a layer 0-20 cm	No. of seeds upon 1 m^2 in a layer 0-10 cm	No. of seeds upon 1 m^2 in a layer 10-20 cm	No. of seeds upon 1 m^2 in a layer 0-20 cm
	Collective farm "Kolos"			Collective farm "Poddubki"		
Rye and winter wheat with grass sowing..........	11960	8320	20280	42120	31460	73580
Spring wheat..............	9360	10140	19500	—	—	—
Grasses of the 2nd year...	11180	7540	18720	—	—	—
Potatoes..................	13780	13000	26780	—	—	—
Oats......................	13260	11960	25220	45760	35360	81120
Fallow land...............	11960	9880	21840	30680	33800	64480
Grasses of the First year of utilization............	10660	9100	19760	—	—	—
Total	82160	69940	152100	—	—	—

Table 6

Crops	Average yield from the entire field of crops in collective farm "Kolos" in c/ha	Average yield from the entire field of crops in collective farm "Poddubki" in c/ha	Difference in yields in c/ha
Winter wheat..	25.0	10.0	15.0
Winter rye....	22.8	16.0	6.8
Spring wheat..	18.0	9.0	9.0
Potatoes......	220.0	170.0	50.0
Oats..........	33.5	—	—

MJA 11-6-51

Utekhin, A. G.
Acroptilon picris and measures
for its control. (In Russian.)
Sovet. Agron. 8(4):69-77. Apr.
1950. 20 So84

Transl. no. 241 Weed Control

241

Translated in part by R. Dembo

C o n c l u s i o n

Smartweed is one of the most harmful quarantine weeds of the Southern dry regions of Ukrainian SSR. Its successful control could be accomplished only by applying the complex of agrotechnic measures upon the field of crop rotation (including special measures in tilling the soil which is covered with acroptilon picris) and upon other soil fields in compliance with organizational quarantine measures.

In collective and state farms whose fields are covered by acroptilon picris, the introduction and a full application of grass crop rotations is of primary significance. The crop rotations which are introduced in the regions where acroptilon was widely spread should have at least two fields of black fallow land upon which basic agrotechnical measures in controlling acroptilon, and at least three fields of winter crops (wheat, rye) which depress acroptilon the most.

The following agrotechnical measures which are directed to the destruction of acroptilon are important::an early shelling of stubble at the depth of 5-6 cm.; plowing of plown land and the whirling of fallow land at the depth of 23-25 cm., depending upon the power of the plown layer, by plows with coulters. The soil with insufficiently powerful plown layer, the tilling should be carried out by gradual deepening.

One of the decisive measures in controlling acroptilon is a deep and opportune (during its growth) cut down of smartweed in the fallow field. The best equipment for this purpose is the chisel-cultivator SKL with goose paws. During chiseling, the cutting of smart weed is carried out at the depth of 18-20 cm without turning the layer, whereby the soil would not dry out.

With the absence of chisels the fallow tilling could be carried out with many plough-shares without terraces, at the depth of 12-14 cm. The depth of tilling should be decreased in the second half of the summer to 7-10 cm.

During the cutting of the smartweed roots by chisel-cultivator or by multiple-plough-shares, it is necessary to complete the work by clearing the fields of root fragments by manual method or by a root receptacle which is especially added to the draft. The collected smartweed roots should be dried out and then burnt.

A deep tilling of fallow lands should be carried out during the appearance of the first sprouts of smartweed upon the soil surface, without permitting its growth higher than 8-10 cm.

Separate spots of smartweed upon fallow land should be destroyed by soil cultivation which is carried out according to the appearance of smartweed.

In summer, during vegetation, it is necessary to weed out the crops of cereals in all fields of crop rotation at least three times. The between row tilling of furrow plown crops should be done by tractor and horse plowing according to the appearance of smartweed and of other weeds (6-8 times), with a manual weeding in the rows ("prosapka").

In places where smartweed appeared at first in separate units, it should be destroyed by manual digging out at the depth of at least 40 cm., with the subsequent burning of the roots.

Upon waste land, road curbs and upon other inconvenient, unutilized land, smartweed should be destroyed by applying chemical measures.

It is necessary to observe quarantine measures: sow seeds only after inspection of the seed qualities at laboratories, not to allow seed transport, or transport of waste, hay and of other forage into regions where smartweed is absent, to observe strictly all the rules in cleaning and preserving seeds.

MJA 11/6/51

Rabotnow, T. V.
Lugovye sorniaki i mery bor'by s nimi
[Meadow weeds and measures for their control]. Moskva, Gos. Izd-vo Selkhoz. Lit-ry, 1949. 95 p. 79 R112 p. 56-57

Transl. No. 242 Weed Control

Trans. in part by R. Dembo

242

Chemical measures

Among the means of chemical control of weeds, chlorates are the most applicable (mainly, chloride), sulphuric acid and ~~its~~ sodium (cupric vitriol, ferrous vitriol, zinc sulphate) sodium of arsenuous and arsenic acids, a few organic compounds.

Herbicides are distributed either along the entire surface of the meadow or they are introduced in small quantities directly into the plants which are to be eliminated, usually, after they were cut down. Herbicides could be introduced either as solutions or in a dry form.

The introduction of herbicides in controlling major weeds is mostly applied upon meadows. In this case, the weeds are first cut down or trimmed, and then the herbicide would be introduced upon a cut surface. The application of herbicides would produce a good effect, but it requires a great consumption of labor and means, hence from economical point of view it is not expedient.

Some fertilizers, mainly calcium cyanide and kainite are also applied as herbicides. These fertilizers have a burning effect upon the leaves which are lacking the wax film or the fibers, upon various grasses, but does not have a harmful effect upon the leaves of cereals which are provided by a wax film. In order to obtain a satisfactory result, only well grounded fertilizers should be used. It is most rational to introduce them early in the morning, along the dew or after the rain (but not during the rain). Since these fertilizers cause damage to legumes, it is advisable to apply it upon meadows where there are few legumes. Calcium cyanide is applied in the amount of 2-5 centners, and kainite in the amount of 4-10 centners per hectar. These fertilisers should be introduced early in the spring when the grasses develope the leaf blades.

Biological methods

It has been observed that many weed species are infested by fungi and bacterial parasites, as well as by some insects. The propagation of these pests, thus, could cause the decrease of the amount or the complete destruction of the weeds. The biological methods of controlling weeds in USSR are worked out just slightly, although the facts about damaging weeds by pests are known. As an example, we might mention the frequent damage of sorrel, including horse sorrel, by sorrel leaf eater.

MJA 11-8-51

Kott, S. A.
·Ochishchenie pochvy ot
sorniakov. Sovet. Agron.
6(1): 78-82. Jan. 1948 20 So84

Transl. 243 Weed Control
Translated by R. Dembo

243

Controlling Weeds

The storage of weed seeds in the soil depends upon the cultivated crop, upon the care and the time of harvest and upon the system of field cultivation. For the majority of old arable land the basic source for weeds is the storage of weed seeds in the soil itself. Depending upon economic utilization, there accumulates in the soil from hundred millions to ten billions of weed seeds per hectar. With such contamination of the soil and with a constant natural planting of weeds, the introduction of their seeds with the sown crops, with manure, compost, by the fresh animal dung and anemonin (thistles, dandelion, small-petals, etc.) is of secondary significance. But even secondary factors of soil contamination should be controlled, especially upon soil, clean from weeds and newly cultivated. We must eliminate all the indicated measures of introducing weeds upon the clean fields by means of sowing the seeds of plants free from weeds, by introduction of the dung well rotted, etc.

Parallel with the elimination of causes which promote a new mass introduction of weed seeds into the soil, measures should be undertaken to clear the soil of weed seeds and of weed organs of vegetative propagation. Weed seeds, when penetrated into the soil, do not lose sprouting capacity. This capacity of weed seeds has been worked out and strengthened in the process of natural selection. This is proven by the fact that the seeds of the majority of plants and of special weeds preserve their viability in the soil during one year only. With typical field weeds a good preservation of seeds in the soil is due to the peculiarities of the film construction.

Under the conditions of the podzolic zone of USSR, the seeds of all 69 species under experiment (including 8 plants and 61 weeds) could be divided into the following groups:

1. Seeds which die entirely during eight months of fall-winter-spring. To this group belong the seeds of winter rye, soya and narrowly specialized weeds: flax dodder, sand wild oat, amarant "metel'chatyi" and soft campfire.

2. Seeds which die for twenty months. To these belong Mexican tomato seeds, and of specialized weeds the seeds of field camp fire, plain kukol', darnel, wingless rattle, and roofing crepis.

3. Seeds which perish during 32 months. To them belong the seeds of garden dill, small tubers of forage sugar geets, rye camp fire and plain dandelion.

4. Seeds which perish during 44 months, - malodorous thorn apple, double-house nettle, one year meadow grass, [Poa], deadly nightshade [Solanum Nigrum], "el'sholciia grebenchataia" and garden parsley.

5. Seeds which die completely during 56 months - plain xanthium, field broom, quack grass [Agropyron repens], field violet [Viola odorata] green bristly fox tail grass [Setaria] dove colored bristly fox tail grass.

6. Seeds which die completely during 68 months - amarant "kolosistyi", blue corn flower, chickweed [Stellaria media], shepherd's purse [Capsela bursa pastoris], European dodder, simple spurry and large spurry.

7. Seeds which die during 80 months - Canada thistle [Circium arvense], morning glory buckwheat, white goosefoot [Chenopodium], plain chicory [Cichorium], sorrel and curly sorrel.

8. Seeds which preserve their viability over 80 months - "aistnik cikutnyi", snakeweed, hairy peas, wild radish, white sweet clover, red clover,

plown clover, field clover, chicken millet, field lycopsis, web burdock, hemp nettle beautiful ("siabra"), hop formed dodder, large plaintain, gripping bedstraw, and pennycress fanweed (Thlapsi arvense).

Besides, the high sprouting of the seeds after eight months has been observed with "lakfiolevyi" swallowwort (Chelidonium majus), green "ikotnik", burning nettle, "korostavnik", Canadian small petal plant, dye "pupavka", odorless camomile, "shmindy"amaranth, sown flax, altogether 9 species. Further experiment with these seeds has been discontinued. At the end of the seventh year natural dying has been observed with 43 seed species of 69 species under experiment, or with 62 percent. In this number are included 6 crops and 37 weeds. Of the 26 other species the viability after seven years has been determined for 12 obligated weeds and one crop, or for 19 percent of the species under experiment.

We were unable to observe the dying of these 12 species of seeds of the highest viability under the conditions of our experiment. For orientation we took an unrotated black fallow land of the field station of Timiriazev Agricultural Academy upon which after 24 years of fallowing a complete clearing from seeds of all weeds has been found. Consequently, a complete natural dying of the most viable seeds occurs during the period from 6 to 24 years.

The introduction of regular crop rotations with the application of grass growing and of black fallow land, when each field will pass through black fallow land and through perennial grasses, and under the condition of discontinuation of new penetration of weed seeds into the soil will clear the soil of them. Each new rotation will decrease the potential storage of weeds in the soil.

The data concerning the viability of seeds in the soil are slightly exaggerated, since the plowing of experimental fields was not carried out. The species was considered dead when not a single seed in the experiment yielded sprouting. Practically, each species lost its viability because the absence of soil tilling conserved living seeds, prolonging its life, at least up to one year. Under those conditions the clearing of the soil occurs only by means of natural death of the seeds. The tilling of the soil replaces the seeds accelerating the end of the rest period and decreases the biological resistance of the seeds. Besides, the tilling of fallow land creates the best conditions for mass growth of weed seeds. All this put together accelerates double the clearing of the soil. Thus the clearing takes place under the conditions of black fallow land and in plown wedge when the between rows were well tilled.

The viability of the seeds depends upon soil diversities. The seeds die the fastest in slightly podzolic, sandy loam soil; slower - in medium podzolic soil, highly tilled and rich with humus and in degraded black soil (with sufficient moisture); still slower - in a soil which is highly podzolic and slightly cultivated clayey soil.

The preservation of the seed viability in the soil increases with the increase of the depth of their lying in the boundaries of tilled horizon. The latter disproves the findings of a series of explorers (Kiselev, Zhuravlev) concerning accelerated death of weed seeds in deeper layers of the plowing horizon. The least conservation of viability is noticed with seeds which are upon the surface of the ground.

Taking into consideration the biological peculiarities of plants and of their seeds, we worked out instructions in controlling dodder and ragweeds. The indicated measures justified themselves in production.

Flax dodder is the only species of the entire dodder family, which has 190 varieties, which became almost a crop due to man's productive activity. It has a well expressed one year cycle of development and a fast death after fertilization. We suggested to carry out the control of this quarantine object by means of clearing the flax seeds. The seed lots should be provided only upon fields which are free of dodders. The individual nests of the dodders should be destroyed in the field and the flax seeds from such crops should be utilized for technical treatment or exchanged for clear ones at the government preparatory points. The transport of the seeds from the oblast' and the raion into other oblast's and raions should be carried out only with the knowledge and the permission of the quarantine department.

All other dodder species are able to contaminate seeds and the soil. In controlling them, it is necessary to remove their fertility and their contamination of the soil and of seed material of grasses. During mass contamination of grasses, it is necessary to carry out a low mowing up to the fertilization of the dodder. Some nests are to be destroyed by means of mowing and burning. Thus, the control of dodder which contaminate the fields of forage grasses and of vegetables sums up to the destruction of dodder nests in the field before the formation of seeds and the contamination of the soil. The prohibition of transport of contaminated seeds (without the permission of quarantine department) and the sowing remains in power in this instance as well.

The basic mass of checkweed seeds dies in the soil after two years. The worker of the polar station, Turmas, suggested a two year treatment of the fields contaminated by checkweed. During this time the peat soil of the polar zone was cleared from checkweed seeds. Nevertheless, the two year clearing of the land under the condition of Far North from the soil contaminated by checkweed is economically unprofitable due to the lack of plowable land. It is obligatory to forbid the import of seeds, forage and hay which are contaminated by checkweed, to all the farms of the North which are newly organized upon peat soil.

The same measures should be applied in controlling field spurry at farms of the North which are organized upon light loam and sandy loam soil. The field spurry as well as checkweed become most dangerous weeds in agriculture of the Far North due to the short vegetative period (about 40 days). Profilactic measures are advisable: they will be cheaper than the subsequent destruction of potential storage of seeds of these weeds in the soil by agrotechnical measures.

Analogically it is necessary to carry out the control of sandy oat (ovsiug). Sandy oat, as a special spring weed, contaminates only oats, barley and spring wheat. Among the stems of the crops it occupies the upper stratum being elevated over crops which faciliates the weeding of seed lots. The clearing of oat seeds is complicated, and that of barley and wheat seeds is possible only by means of seed separators.

The seeds of flax rye grass die in the soil during one winter, and those of darnel - during one winter and entirely during 20 months. Hence the affirmation that flax rye grass and darnel propagate by self-seeding and with the seeds of cereals and of flax becomes unclear. Both darnel species, as specialized weeds, do not fall during ripening, but, when accidentally penetrated into the soil, sprout quickly or die. Their spreading by self-seeding is not advisable because the sowing of the same crops for successive two years, at the place where the mentioned weeds grow, is not practiced. The existence of both darnels among the crops is possible only by man's activity who unconsciously collects and sows them together with crops.

Due to his knowledge of biological peculiarities of weeds, academic V. R. Williams was able to solve the problem of controlling quack grass roots by the method of suffocating: they were placed at the depth of 20 cm. The method of suffocation with preliminary crushing of quack grass roots is carried out during winter plowing and during the tilling of black and clean fallow land.

Based upon concrete conditions and possibilities, the agronomical personnel would be able to clarify the measures of controlling basic weeds, taking into consideration the biological peculiarities of the weeds.

The ability of weed seeds of losing the condition of biological rest and of growing or perishing under certain conditions has to be taken into consideration when drawing up the system of soil cultivation, crop care and plant rotation.

The control of potential weeding of soil upon the fields, free from crops and not cultivated (waste land, crops of perennial forage grasses), should be based, mainly, upon the natural death of the seeds and absence of possibilities of new falling. In order to prevent a new contamination of the fields upon waste land, weeds should be cut during the first one or two years up to seed maturity. In using waste land for forage, the uneaten weeds are cut periodically up to the time of fruit-bearing. The weeded crops of forage grasses are mown for hay during their blooming. The clean and well weeded crops are to be left for seeds. Upon the fields occupied by the crops of unplown plants, the control of falling seeds should begin immediately after the harvest by the maximal checking of their growth.

The time limit in tilling such lots in fall only and especially in spring should require a special selection of schemes of soil cultivation and of the time of their execution.

The shelling of stubble is most effective in controlling newly fallen seeds of perennial, two-year, winter, wintering and narrow specialized weeds. In controlling seeds of typical spring weeds, especially with the group of stubble weeds, the shelling consists of the destruction of growing weeds.

During stubble shelling, the seeds of perennial weeds grow at the average up to 48 percent, the seeds of two-years, winter and wintering weeds - at the average up to 38 percent and spring one-year weeds, only up to 21.1 percent, and for all others together - up to 38.5 percent. During the years with a wet fall which follow a hot and dry weather, the seeds of recorded biological weed groups grow more energetic and in greater quantity than during tho years with both a wet summer and a wet fall.

If under shelling we understand the provoking of growth of newly fallen weed seeds, then the depth of shelling does not have to surpass 3-5 cm. which is the limiting depth in which the majority of small weed seeds sprout. With the absence of weed seed mass sprouting in the fall, the shelling depth could be increased which permits the sprouting of a large amount of seeds of old soil storage (wild reddish, hemp nettle, spurry, and others).

Shelling is especially expedient upon fields which are covered with wild oat, wild hemp and hemp nettle. The seeds of these weeds, when placed not deep into the soil, will fully sprout early in the spring and would easily be destroyed by presowing tilling of spring fields and of fallow lands. A fall small shelling is required upon lots which are intended for the sowing of late spring crops (millet, buckwheat, viko-oat for hay) as well as of the lots intended for fallow land. On the fields which are shelled, up to 33.5 percent of weed seeds are able to sprout. In the spring, due to a better accumulation of moisture and due to the friability of the soil, most favorable conditions are created for the sprouting of one-year wintering, two-year and perennial weed seeds which were placed in the ground in the fall.

In the fall the sprouting of seeds of weeds and of plants (windfall) is often limited by lack of moisture in the soil. Under the conditions of the dry zone, although the shelling does not cause a mass sprouting of seeds in the fall, but promotes their swelling and dying in the fall and winter, and promotes their better sprouting in early spring. During the eight fall-winter-spring months approximately 65 percent of newly falling seeds of I and II biological weed groups which we determined perish. With a non-deep placing of the seeds in the soil occurs a more intensive preparation of the sprouting of the rest of living seeds.

The increase of the depth of fall seed placing does not promote their sprouting early fall, especially upon heavy clayey ground. Therefore a deep early spring plowing, by plows with coulters, of the fields which are heavily covered with weeds and which were previously shelled is obligatory:

a) in controlling weed seeds whose viability in the soil does not exceed one year;

b) if in spring the plown land would not be replown at a full depth (upon heavy clayey land) or if the pre-sowing plowing is replaced by "chizelovanie".

c) if, after spring crops, the field is left as fallow land. The weed seeds, when in the soil, are able to sprout after periods fixed for each species and which become longer with the increase of the depth of placing the seeds. Early spring the sprouting of the seeds comes to an end, usually, for 3-5, more seldom - ten days. Academic V. R. Williams indicated that when the layer is turned over, the weeds grow on 5th-6th day.

These biological characteristics of weed seeds should be utilized during a short, pre-sowing early spring period.

During spring plowing, weeds sprout from contaminated soil layers which are turned over on the surface. This explains the often observed contamination of early spring crops along spring plowing. Spring plowing with an immediate sowing is the most backward and incorrect measure of agrotechnic. Attempts of aggregating spring plowing, harrowing and sowing usually caused great contamination of crops and a drastic decrease of yield.

The system of pre-sowing tilling of plown land, besides fulfilling general agrotechnical tasks, should create an upper soil layer free from weed seeds.

For this purpose the plowing of plown land should be replaced by chiseling. According to the data of Galichskaia, Gdovskaia and Mozyrskaia of the collective farm experimental stations, the plowing of plown land increases the yield of spring crops. As far as the contamination of the crops is concerned, in some cases it was higher, and in other cases - lower. The spring re-plowing of plown land of old plown contaminated turf of Minsk swamp station increased the crop contamination in all cases. According to the data of Orudzhev, the amount of weeds in the stem-stand of spring wheat which followed potatoes increased, according to the depth of the spring re-plowing of the soil. Chiseling, according to the data of the experimental station "Red Lighthouse", of Moscow oblast', according to the yield is equal to re-plowing and prevents contamination of crops. Consequently, the re-plowing of plown land could very successfully be replaced by chiseling. A deep re-plowing of plown land, in case of necessity, is possible only under plants of late sowing which permit the intervals between replowing and sowing, when the sprouted weed seeds are destroyed by additional surface friability.

An interruption between re-plowing of the land and sowing is especially obligatory during a belated shelling and during a land plowing without shelling. In such case the weed seeds have no chance of sprouting in the fall. Being turned into upper layers, during spring re-plowing of plown land, they will inevitably yield a strong contamination of the sowing which was carried out immediately after the sowing.

Usually the spring sowing is done with great tension, during short terms which are dictated by the necessity of storing moisture. Undoubtedly, the spring moisture decides the yield destiny in many cases, but the sowing upon spring plown land without any interval between plowing and sowing causes the contamination of the crops. Thus a contradiction arises between the time of sowing and the struggle for cleaning the sown land from weeds. Thus repeats and will be repeated from year to year up to the time when the sowing will be carried out in spring sowing. This contradiction is solved during plowing of plown land and during fall shelling which cause the sprouting of weed seeds in fall and early spring.

A new deep raising of plown land is permissible only after one year. During this time a considerable part of viable seeds die in the soil. The rest of the seeds, being replaced closer to the surface will grow in the fall and early spring.

Such a tilling of the soil corresponds to V. R. Williams' system of soil tilling.

When the soil is heavily contaminated by the seeds of wild oat, wild hemp and by other weeds, the tilling of fallow land should begin in the fall. The weeds which sprouted in fall and early spring will be destroyed during the lifting of early fallow land. The weed seeds sprout the best from a depth of 3-4 cm. Therefore, the tilling of the soil into fallow land should be carried out in layers with terracing plows with gradual deepening, and during the years with unsufficient moisture quantity and in the zone of insufficient moistening with gradual decrease of depth - by gang plows with removed moldboards or still better with the assistance of chisel-cultivators.

The layer tilling of fallow land is justified also by the biological peculiarities of weed seed sprouting. The seeds of obligated weeds which are physiologically prepared in the soil for sprouting early spring do not lose their ability of sprouting during the entire summer. Therefore, the layer tilling of non-black soil belt with terracing instruments (plows) cleans the entire plown soil layer at the cost of an intensified sprouting of weeds. Simultaneously the layer tilling intensifies and accelerates the process of natural seed death. The layer fallow land tilling should be carried out up to the depth of plowing of plown land.

In connection with the introduction of correct crop rotations and grass sowing, let us consider the role of the grass layer in controlling soil contamination. The data of inspection of a series of collective farms of Moscow and Tula oblast's indicate that the cleanness of clover grass - stand during the first year of utilization fluctuated from 52 to 79 percent (including timofeevka from 0 to 28.1 percent), and at the second year of utilization - from 28.2 to 29.3 percent (including timofeevka up to 39.1 percent). All the rest of the grass mass occupied weeds which constitute from 31 to 72 percent from which perennial weeds of first year clover amounted to 74 percent and of the second year - 81 percent. The prevalence of perennial weeds causes a great contamination of the soil by roots whose general length reaches 37 m. (some places up to 67) upon a lot of 1 m^2. The amount of roots from quack grass increases considerably at the second year of utilization. The sowing of clover should be carried out upon grounds which are previously cleared from quack grass and from other weeds.

The growth of clover and timofeevka creates a layer which compresses the soil and thus does not permit the sprouting of weed seeds and this causes natural death. If the sprouting weed seeds in the soil under clover of the first year of utilization amounted to 7 - 26 percent, then under clover of second year utilization from 6 to 18 percent, and under clover of third year of utilization still less. The percentage of the composite of one year weeds is the following: in the soil layer of 0.5 cm. - 59 percent, 6-10 cm - 11 percent and in a layer of 10-15 cm. - 18 percent. In a series of collective farms the contents of seed sprouts in soil under clover of the second and third years of utilization decreased up to 25-30 million pieces per hectar. Thus, the storage of weed seeds, especially those of one year, in soil under clover decreases considerably.

The system of soil tilling could not exist without agreement with the type of tools for soil tilling, with time, succession and plowing depth.

The basic instrument for soil tilling is a plow with crashing moldboard and with coulter. The coulter takes off the upper contaminated soil layer and throws it upon the bottom of the furrow due to which the lower layers of the soil which were turned over upon the surface mix less with the upper layers and remain cleaner. Depending upon the work of the plow, the weed seeds are able to penetrate from the surface into various soil layers. The distribution of weed seeds in soil layers influences directly the contamination of the crops. At the present time the plow is in production the only tool with the aid of which it is possible, at least partly, to regulate the stopping of the contaminated soil layers at a desired depth.

"The introduction of plowing by a plow with coulters is the most important problem of Soviet revolutionary agronomy" (academic V. R. Williams). According to the five-year-plan of the after-war progress in agriculture, at least half of the tractor plowing of MTS will be carried out by plows with coulters in 1948, and in 1949 - all the plowings will be carried out by plows with coulters.

In contemporary nomenclature of agricultural instruments for soil tilling we still do not have any which would be able to carry out upon the surface the lower infested layers of the soil without mixing the layers. The existing constructions of the sheller do not provide a soil tilling in layers.

For in-layers clearing heavy loamy soil from weed seeds which accumulated in them we need instruments of special construction, possibly, the type of a plow constructed by A. A. Vasilenko. For presowing, tilling and partly tilling fallow lands, quite promising is the chisel-cultivator. Chisel-cultivators loosen the soil well without turning the layer which is very important for dry regions; the tilling of the soil with the chisel could start considerably earlier than with plowshares. The chisel-cultivator is more efficient than many other tools and proved its efficiency in controlling pink "gorchak", one of the most harmful weeds.

Chisel-cultivators (according to Nekrasov's data) do not mix weed seeds with the soil of the lower layers into the upper layers. On the lots which were tilled by chisel-cultivators, the infestation of oat and spring wheat was two times less in comparison with crops which were re-plowed by plows.

Underlining the great significance of each method in clearing the soil from weed seeds, we avoided consciensciously prescribing suggestions.

It is the matter of each specialist to combine more thoroughly the soil tilling methods with biological peculiarities of weed seeds.

The socialistic system of agriculture has all the possibilities of freeing the soil of our collective and state farms from weeds and to lift its fertility to a higher level. Only by this method will be achieved a permanent progressive increase of yielding capacity of collective and state farm fields.

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Vaniev, A. D.
Experiment in controlling agricultural pests with an insecticide which penetrates into the tissues of plants. (In Russian.) Vsesoiuzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 16(3): 43-48. 1951. 20 Akl

Transl. 244 Insecticides

Translated by R. Dembo

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The chemical industry of USSR became familiar at the present time with insecticides of the group of ethers of phosphorous and thiophosphorous acid, whose peculiarities consists partly of the capacity of penetrating through the roots or exterior tissues into the vascular system of the plants, whereby it becomes temporarily an insecticide.

The research which we carried out in 1950 at the Moscow Station of Plant Protection enabled us to characterize most completely the compound NIUIF-100 (diethyl-n-nitrophenolthiophosphate), which proved to be useful under both laboratory and field conditions.

Next experimental task was to determine the possibility of controlling wheat pests - aphids, grain flies and other insects.

<u>The toxic effect of the solution NIUIF-100 upon grain aphids</u> (*Toxoptera graminum Rend.*). The first experiments in testing the toxic effect of the compound which were carried out upon water plants, during the first experiments indicated the effect of the poison upon the insects. Even small changes in the concentration of the solution (0.01 percent) brought considerable results. But along with that a serious shortcoming in the effect of the solution upon the plant has been disclosed: new roots did not develop, when the solution was applied, and perished.

Quite indicative were also the experiments in studying the influence of temperature upon the toxicity of the compound. While under the temperature of 9-12^{o} for two days the effect of the poison upon insects almost went unnoticed, under the temperature of 25-32°, during the first twenty-four hours, the plants were freed from aphids completely.

Then experiments were carried out with the soil in pots. The soil is that of a nursery, of compost, two kg. per pot. Before the introduction of the compound NIUIF-100 into the soil, the plants were in the phase of a tube, close to spiking. The soil was so dried out that the leaves wilted noticeably during the day. The solution was prepared at the concentrations of: 0.025, 0.05, 0.1 and 0.2 percent. The greatest concentration in these experiments (0.2 percent) surpassed ten times the same in the experiments with water plants (0.02 percent). The experiment was carried out upon a branchy wheat. 200 cubic cm. of the solution was introduced into the pot.

As we see from table 1, in the variation four, the plants remained free from aphids. Further, upon all treated plants some individual specimens were disclosed, but there was no mass propagation until the plants matured, while in control the aphids were in huge colonies. The continuing effect, although weakened, of the solution is seemingly connected with toxic qualities, but depends upon the decrease of attracting qualities of the plants.

Table 1

Concentration of the solution NIUIF-100, o/o	Number of living aphids					
	Before the experiment	after 1 day	after 2 days	after 3 days	after 4 days	after 5 days
Control	More than 100 specimens	many	many	many	many	many
0.025	"	6	3	2	4	5
0.05	"	5	1	0	0	2
0.1	"	0	0	0	0	0
0.2	"	0	0	0	0	1

Footnote: The temperature was kept in the limits of 20-33°

Further observations indicated that the plants treated with the solution NIUIF-100 continued their normal development, not lagging behind the control ones in their growth. In their appearance they even differed more advantageously from the control ones: they remained green for a longer time. The root system, according to its strength did not lag behind the control specimens. According to the weight, the grain yield with the plants under experiment was 20 percent higher than that of the control.

Thus, the negative effect of the compound upon the plant under the conditions of soil environment which has been observed in experiments with the water plant of wheat has been eliminated. But the toxic effect upon the insects was preserved, which is especially valuable and promising from the point of view of becoming familiar with the new method of controlling agricultural pests.

During the process of growth, the plant reacts differently to the presence of the insecticide in the soil. Individual observations indicated that with more mature plants, ready for spiking, the effect of the insecticide upon the pests is lesser. For the verification of such a condition, pots, in which the plants started to show spikes, were selected. Aphids upon these plants accumulated upon the spike and the top of the stem. Under the similar temperature conditions, as in the preceding experiments, 200 cubic cm. of the solution of 0.3 percent concentration was introduced into one vessel, and of 0.6 percent into another vessel.

Despite the increased concentration, in the first pot no significant effect has been obtained, but in the second pot, on the third day there were less aphids (individual specimens). Later, the toxicity of the compound was weaker and remained low up to the very maturing of the plants.

But, based upon these and previous experiments, it is impossible to determine the regularity which indicates the gradual decrease in the plant's ability of assimilating the solution from the soil. Such a generalization should not be applied to other compounds, especially HChCH. For instance, Piatnitskii (1), analyzing data, obtained during the feeding of wheat sprouts of various maturity which has been produced by daily watering with a water solution of HChCH, determined an inverse relationship. According to his data, during the plant's growth, the solution HChCH accumulates in its tissues. As a matter of fact, the curve of toxic effect of the poison in the plant will have one or two tops. In literature we find some indications about the maximum of observed breathing which occur at the stages of appearance of stems and of blooming (2). The plant's activity which is connected with this is able to provoke a more intensive penetration of the insecticide into the plant.

Apparently, it would be advisable to strive for a condition under which the compound would demonstrate its destructive effect upon the pests and afterwards it would lose its toxic power similar to the one which occurs when grain is disinfested by a fumigant against grainery pests (3).

By the experiments with the compound NIUIF-100 has been discovered that the poison loses its toxic power in the plant, but afterwards the plant is still unattractive for the insects.

The toxic effect of the solution NIUIF-100 upon the larvas of the Swedish fly and of the Grass Fly "Green eye" ,Chloropidae pumilionis, in an open ground. The experiments were carried out under various weather conditions, hence the results of the experiments differ.

In the first experiments a hot weather (23-26°) was favorable to a successful control of pests, there were no rains, the soil at the surface had moisture approximately 30 percent of the entire moisture capacity. In order to find the exact effect of the solution NIUIF-100 upon the larvas of the Swedish fly, we took the solution in the concentration of 0.005, 0.01 and 0.02. The solution entered the soil counting 0.5 litr in one row, for one running meter or counting per one hectar 0.6-2.5 kg. of the active agent. The watering has been carried out directly under the plants of the branchy wheat.

Despite the comparatively low concentration of the compound, the effect became quite high (table 2). In the latter variation, by analyzing the plants from 18 disclosed larvas, 14 were dead.

Table 2

The concentration of the solution NIUIF-100 percent	After 3 days: No. of plants	After 3 days: No. of larvas alive	After 3 days: No. of larvas dead	After 4 days: No. of plants	After 4 days: No. of larvas alive	After 4 days: No. of larvas dead	After 5 days: No. of plants	After 5 days: No. of larvas alive	After 5 days: No. of larvas dead	After 6 days: No. of plants	After 6 days: No. of larvas alive	After 6 days: No. of larvas dead
Control..........	11	4	0	—	—	—	—	—	—	13	5	0
0.005(0.6 kg/ha of the active agent).	—	-	-	—	—	—	11	6	0	8	2	0
0.01(1.2 kg/ha of the active agent).	—	-	-	12	3	0	—	—	—	16	9	5
0.02(2.4 kg/ha of the active agent).	9	1	5	—	-	-	—	—	—	16	3	9

In the following series of experiments the number of variations was increased on account of the increase of concentration up to 0.03-0.06 percent.

These experiments were carried out later, when the plants were in the phase of a pipe - the beginning of spike formation; the moisture of the soil - approximately 50 percent of full moisture capacity; the daily temperature increased up to 20-22 percent; the experiments were carried out upon the wheat Moskovka.

The analysis of the plants as to the infestation by pests which was carried out at the 5th and 20th day after the soil tilling by insecticide indicated that the effect from the compound decreased, if we take into consideration the same concentrations of poison as in the previous experiments (0.005, 0.01 and 0.02 percent); under higher concentrations (0.03-0.06 percent) it was quite high, reaching in the latter case the full death of the larvas (table 3).

Table 3

The concentration of the solution	After 5 days			After 20 days				
	No. of plants	No. of larvas of Swedish fly		No. of plants	Amount of larvas of Swedish fly		Amount of larvas of Green-eye	
		alive	dead		alive	dead	alive	dead
Control..............	12	4	0	14	7	0	5	0
	18	5	0	13	6	0	2	0
0.01 (1.2 kg/ha of the active agent)........	17	-	-	18	8	2	3	0
0.02 (2.5 kg/ha of the active agent)........	14	4	1	12	6	0	1	0
0.03 (3.7 kg/ha of the active agent).........	16	-	-	16	1	3	1	2
0.04 (5.0 kg/ha of the active agent)........	16	-	-	15	1	2	3	1
0.05 (6.2 kg/ha of the active agent)........	19	3	9	14	0	6	1	4
0.06 (7.5 kg/ha of the active agent)........	17	3	8	12	0	6	0	3

The toxic effect of the compound, NIUIF-100 upon harmful insects by introducing it as a dust. The research which has been carried out with one-percent dust NIUIF-100, the vegetative experiments with sand branchy wheat deserves our special attention. The dust in these experiments was introduced before the sowing. The results were as follows:

In the vessels where the dust was added, the plants developed considerably better than in control, i. e. in vessels with the mixture of Knop, without dust, and there were much less aphids (table 4)

Table 4

Amount of dust NIUIF-100 upon the vessel, g.	No. of plants in the vessel	Number of living aphids On 6th day	On 7th day	on 12th day	On 18th day	on 34th day	On 38th day
2 (2.5 kg/ha of the active agt..	10	0	0	0	On 18th day all aphids were removed	3	0
2 (2.5 kg/ha of the active agt).	9	0	0	2	"	0	0
4 (5.0 kg/ha of the active agt).	10	1	3	0	"	0	2
4 (5.0 kg/ha of the active agt).	12	3	0	0	"	5	0
6 (7.5 kg/ha of the active agt).	10	0	0	1	"	0	1
6 (7.5 kg/ha of the active agt).	8	4	2	0	"	0	0
Control	8	29	37	24	"	18	24
	8	50	50	45	"	11	7
	8	43	47	51	"	29	25
	10	32	40	28	"	34	12
	10	27	33	62	"	10	20
	9	55	84	57	"	38	41

Footnote 1. The sprouts are taken from "rastilen" and replanted into vessels

2. On the 34th day after registration 20 specimens of living aphids were placed upon the plants.

From the beginning of the plants' growth, aphids settled rapidly upon the plants which were placed in control vessels, but they were not able to remain upon the plants which were grown in the vessels with dust. By counting the dead aphids eight days after the replanting of plants into vessels, 53 specimens were disclosed in the plants, while in the control vessels only 2 were disclosed. Observations indicated that aphids upon the plants which contain insecticide, do not remain at that place over 1-2 days. The attempt to carry out an artificial settling of aphids upon the plants was unsuccessful. In general, for approximately two months aphids were not able to live upon such plants. But in control vessels, even after the living aphids were taken off the plants, after a few days they settled upon the plants in masses. It is necessary to note that plants in vessels which contain dust, grew faster than in control (for 20 days they surpassed by 1.5 times the control plants).

Based upon these experiments it is possible to come to the conclusion that poison is able to demonstrate simultaneously a favorable effect upon the plant and harmful effect upon the insects.

Consequently, it is possible to assume the practical application of the given method in controlling pests. Based upon the fact that in the mentioned experiments the toxicity of poison in the plant decreased up to the limits harmless for the insects, we may assume that the grain should be harmless in using it in forage or in food. But the latter condition should be tested.

The penetration of the insecticide NIUIF-100 through the external covers into the plant's tissues. A comparative fast penetration of the solution NIUIF-100 through the root system into the plant's tissues prompted us to verify whether this capacity could still be preserved by introducing the solution into the surface parts of the plants - leaves and stems. The experiment confirmed this assumption. It became evident that a water solution of the compound penetrates into the plant both through the leaf blade of the plant (wheat) and through the stem.

Each time, when the solution NIUIF-100 treated the basic half of the leaves with the aphids upon them, next day there were no aphids upon the rest of the leaves. When, however, not the leaf was treated but the stem at its base, within one or two days not a single aphid was left upon the plant. The treatment of the plants in reverse order, the introduction of the solution upon the top of the leaf (the upper and lower surface) did not demonstrate during the same intervals almost any effect upon the aphids which were settled in colonies upon the main part of the leaf. The boundary of toxic effect upon the aphids cut drastically by the line of leaf treatment. This fact indicates that the poison is able unnoticeably to spread along the vascular system of the plant by a lifting stream, and its motion to be in the direction of decreasing stream.

Conclusions

1. Compound NIUIF-100 is an insecticide which penetrates into the inner tissues of a plant (wheat) through the root system along with the nourishing substences and through the leaves and stems during the superficial introduction of its solution.

2. In plant's tissues the insecticide NIUIF-100 preserves its toxicity in controlling harmful insects (aphids) for several days.

3. After the compound lost its toxic effect upon the insects, the plants, treated by it, for quite a long period (up to 2 months) does not attract the insects (aphids).

4. The smallest dusting doses of the compound NIUIF-100 are from 2.4 to 7.5 kg/ha of the active agent.

5. The most effective method of introducing the compound NIUIF-100 is the soil watering under the plant. Therefore a natural watering and the utilization of rain-assemblings are useful.

6. The compound NIUIF-100 is effective in controlling all insects under testing-cereal aphids, larvas of Swedish fly and larvas of grass flies.

7. The most successful is the application of the compound NIUIF-100 under the condition of high temperature and low soil moisture.

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Sulakadze, T. S.
Peculiarities of water admission into tissues of plants affected with chlorosis and effect of growth substances on this process. (In Russian.) Akad. Nauk SSSR. Dok. 76: 941-944. Feb. 21, 1951. 511 P444A

Transl. 245: Growth Substances

Translated by R. Dembo

(presented by academic N. A. Maximov on XII, 27, 1950)

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One of the most drastic physilogical disturbances during chlorosis of grapes and of other plants is the change in the water regime of the diseased plants. It has been proven that, despite the fact that the tissues of plants affected with chlorosis are richer with water, the diseased tissues absorb more water from the outside. (2,3). The plants affected with chlorosis absorb a high amount not only of water but of mineral substances as well. With slight osmotic qualities of the cellular juice, the high absorbing characteristic of the cells of plants affected with chlorosis is possibly, the result of the transformation of the colloloid-physical qualities of the protoplasm. According to our research, the infestation by chlorosis is usually associated with the increased of the permeability of the plasma.

The studies of a series of authors indicated a relationship between the process of water penetration into the cells and the composition of the growth stimulators (1,4-7). E. A. Makarevskaia indicated that grapes affected by chlorosis contain in their tissues more bios than sound plants (2,3). We obtained data by studying lemons affected by chlorosis.

Based upon the fact of the effect of active substances upon the penetration of water into the cell and taking into consideration the indication of a great amount of bios in the plants affected by chlorosis, we carried out experiments in explaining the influence of the growth activators of group A and B upon the water pumping through the leaf tissues and upon the degree of permeability of their cells. As objects for research, we took the leaves of grapes (Aligote variety) and of lemons. The water absorption was determined by weighing suspending discs of leaves which were previously kept in water and in solutions of heteroauxin at the concentration of 10^{-4} and in two percent water extract of beer yeast (the latter served as the source for bios.). The results of the experiments are given in tables one and two.

Table 1

Water content in leaves and the dynamic of water entry into the leaf discs of a normal lemon and of one affected by chlorosis

The plant condition	10 II	25 II	17 III	9 VI	18 VII	19 VIII	16 IX	25 X	Average
The content of water in the leaves (in g. per 100 g. of dry substance)									
Normal.....	127	205	146	331	201	--	305	206	--
Diseased...	253	218	197	358	274	--	362	268	--
Increase in g. per 100 g. of the dry substance during 20 hours									
Normal....	22	--	39	35	43	43	25	30	32
Diseased..	30	--	39	41	57	75	29	36	44
Diseased in percentage from normal.	136	--	100	117	132	174	116	120	137

Table 2

Dynamics of water entry into the leaf discs of grapes (increase in g. per 100 g. of dry substance during 20 hours)

Date	Normal Control	Normal heteroauxin	Affected with chlorosis Control	Affected with chlorosis heteroauxin
30 V	32	33	33	41
16 VI	21	22	47	52
21 VII	18	18	33	42
17 IX	26	30	27	32
Average	24	26	35	44

As we see from the data on table 1, the leaves of lemons affected by chlorosis are 1 1/2-2 times richer with water and, in spite of that, when they were placed into water, they absorbed a larger amount of water than the sound lemons. The maximum of water absorption is observed in July and August, whereby with the plants affected with chlorosis it amounts to 57-75 g. per 100 g. of dry substance, with sound ones 43 g. The same increased ability of water absorption by leaves affected with chlorosis in comparison with sound leaves has been disclosed with grapes (see table 2) only with the difference that the general amount of absorbed water in this last case was lower: the maximum of water absorption leaves affected with chlorosis is 47 g., and by sound leaves -33 g.

Under the effect of weak solutions of heteroauxin (10^{-4}) the penetration of water into the tissues increases, disregarding the condition of the plant, i. e. in both affected by chlorosis and sound ones. According to the data in table 3, under the influence of heteroauxin, the absolute amount of water absorbed by leaves affected by chlorosis is higher than with sound leaves, but a relative increase in weight, after the water penetrated, is higher with the sound ones. The higher effect which we obtained in our experiments by treating sound leaves with heteroauxin indicates a smaller percentage of this stimulator in the tissues of sound plants than in plants affected by chlorosis, whereby the relative responsiveness to the entering of these substances from the outside is higher. With grapes both the absolute and the relative increase in weight is, as a rule, higher with plants affected with chlorosis [3], under the influence of a light solution of heteroauxin.

Table 3

Influence of heteroauxin upon water entry into the leaf discs of lemons

Date	Normal		Affected with chlorosis	
	in g. per 100 g. of dry substance	in percentage from control	in g. per 100 g. of dry substance	in percentage from control
10 II	26	122	38	122
17 III	53	147	70	179
9 VI	37	105	46	112
18 VII	44	100	57	100
19 VIII	60	139	78	104
16 IX	32	110	29	116
25 X	38	126	37	103

In order to clarify the influence of the stimulator of the group B (bios) we, due to the absence of a clean compound, applied 2 percent of water extract of beer yeast. In literature cases are known of a satisfactory application of yeast extract as the source of bios (8,9).

Table 4 indicates that under the effect of the extract of beer yeast a considerable increase is noticeable in the water entry into the tissues of the leaves placed into the solution, disregard the condition of the plant, but with plants affected with chlorosis the water pumping, according to all cases indicated above, is higher than with sound ones.

Table 4

Influence of 2 percent extract of beer yeast upon the water entry into the leaves

Plant	Date	Normal		Affected by chlorosis	
		IN g. per 100 g. of dry substance	in percentage from control	in g. per 100 g. of dry substance	in percentage from control
Lemon...	25 II	27	168	26	174
	17 III	60	151	65	166
	9 VI	38	111	45	109
Grape...	12 VI	26	108	58	156
	21 VII	24	126	46	129

Since we carried out the experiments with mature (with the lemon they were one year old) leaves, we may arrive at the conclusion that the influence of the growth stimulators reflects not only upon growing and young organs and that this influence is not located in the cell film, as a few authors assumed. S. V. Tageev and V. L. Brovtayn obtained analogical results in experiments with horse beans (6). Growth stimulators affect the protoplasm changing its colloid qualities in general and permeability, in particular. N. A. Maximov indicates that under the influence of stimulated substances an active pumping of water by the protoplasm accurs (4).

By comparing data on the stimulating influence of the active substances upon the permeability of cells with the increased absorption of water by grape, lemon or other plant , leaves affected by chlorosis, we arrive at the conclusion that the chlorosis disease is followed by the increase of the degree of permeability of the protoplasm of diseased plants. Systematic measures of the discharge of electrolits by electrometric method indicate that the organs of plants affected by chlorosis are specified by a relatively high permeability of tissues. Data given in tables 5 and 6 provide some idea of the characteristic of the permeability of diseased tissues and of the influence of the growth stimulator upon this quality.

Table 5

The resistance of water extract from lemon leaves (in ohms)

The condition of plant	18 VII	3 X
Normal	77	21
Affected with schlorosis	32	9

Table 6

Resistance of water extract and heteroauxin solution after lemon leaf disks were placed in them (ohms)

The condition of plant	Water		Heteroauxin	
	1 III	25 IV	1 III	25 IV
Normal...........	91	125	92	72
Affected by chlorosis.	78	79	63	66

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The data in tables 5 and 6 indicate that the resistance of water extract of lemon leaves affected with chlorosis is lower than the corresponding index for normal leaves, i. e. in the first case a more energetic discharge of electrolits takes place. The keeping of leaves in a slight solution of heteroauxin promotes a further energetic washing of electrolits from the tissues, possibly, by the increase of the degree of permeability of the plasma, whereby with the plants, affected with clerosis, it is higher in both cases.

In their experiments with onions and with cabbage, N.A. Maksimov and L. V. Mozhaev observed the relationship between the increase of permeability of the protoplasm and the treatment with stimulating substances (5).

Based upon the obtained data, we may express an assumption that, under low osmotic qualities of the cell juice, the intensified water absorption by plants affected with chlorosis should be the result of the increase of protoplasm's permeability which is conditioned, along with other factors, also by the accumulation of growth stimulating substances in the tissues of diseased plants.

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Tsitovich, I. K. and Shitko, IU. S.
Dynamics of weed quantity in (wheat) plantings treated with herbicides. (In Russian.) Akad. Nauk SSSR. Dok. 77: 449-452. Mar. 21, 1951. 511 P444A

Transl. 246: Weed Control

Translated by R. Dembo

(Presented by the academic N. A. Maksimov on January 25, 1951)

A series of authors (1-4) indicated that chlorphenoacetates depress the growth and the development of many dicotyledonous weeds and cause their death which follows 15-30 days after the effect of the poisons (depending upon the meteorological conditions). Nevertheless, the single registration of the weed death which is applied in the study of herbicides does not always provide a real picture of the sensitivity of weed varieties to the effect of the poison, the dynamics of their amount and, consequently, the effect of the compounds. 246

The task of this research consisted of the study of the dynamics of the amount (and death) of weeds among the cereal crops treated with synthetic herbicides of our own production: 2,4-DU (which contains 75 percent of clear 2,4-dichlorphenoxy acetic acid) 2M-4X (containing 76 percent of clear 2-methyl, 4-chlorphenoxyacetic acid and DiNOK (dinitro-O-cresol sodium salt).

As the experimental lot, we used the crops of wheat New-Ukrainka 083 at the experimental base of the Krasnodarsk Experimental Station of Plant Protection which was covered heavily with weed varieties. 2,4-DU and 2M-4X were tested in the norms of 0.75, 1.0 and 1.5 kg/ha, and DiNOK - 7.5 and 10 kg/ha with various norms of water: 1000, 500 and 300 l/ha. The spraying was carried out on May 12th, 1950. The lot of the experimental field was in each variant 100 m^2, repetition - three times. Upon each experimental lot were 4 permanent registered fields of 0,5 m^2. The preliminary registration of the amount and of the conditions of the weeds was carried out on the eve of the spraying, the succeeding four registrations - during the period before wheat harvest. At the moment of treatment with herbicides, the wheat was at the stage of the appearance of stems (before their formation into pipe-form) and the weeds (except the wintering form of Iarutka which began its blooming) - were in the stage of sprouting and rosettes. A single weeding of the control lots was carried out on May 30, 1950.

Experiments indicated that we will succeed in destroying completely the one-year weeds which are most sensitive to the effect of 2,4-DU, 2M-4X and DINOK: Ambrosia artemisiaefolia L., Xanthium strumarium L., Capsella bursa pastoris Moench, Thlapsi arvense L., and also plants which often contaminate crops: (Abutilon Avicennae Gaertna) and sunflower (fallen sprouts).

The effect of 2,4-DU and 2M-4X (with the consumption of 0.75-1.5 kg/ha in 500-1000 liters of water) caused complete death of these weeds 25-30 days after spraying. The dynamics of their amount is not of great interest, since it changes quite slightly depending upon the norm of herbicide consumption or upon the amount of solution with the same herbicide norm. A single registration of the amount of these plants 35 days after spraying indicates a clear picture of their death and the effect of the herbicides.

Drawing 1. Dynamics of weed quantity. a- in crops treated with 2,4-DU, b- control with weeding, c- control without weeding. 1 - simple amaranth, (Amaranthus retroflexus L.) 2 - White mar', (Chenopodium album L) Lines - the amount of old plants, Dots - amount of new sprouts

This, however, could not refer to such one year weeds like Chenopodium album L. and Amaranthus retroflexus L. despite the indications that new sprouts of a series of weeds do not appear in the field for two months after the spraying of the crops with herbicides, we determined that the checking of the new sprouts of <u>Chenonodium album</u> and <u>Amaranthus</u> is short, even with the absence of rain. The study of the dynamics of the quantity of mar' and of amaranth in the crops treated with 2.4-Du(1.5 kg/ha in 1000 l of water) enables us to see (see drawing 1), that a single registration of the amount of these weeds 35-50 days after spraying is able to give us a distorted picture of the effectiveness of 2.4-DU (as well as of 2M-4X). In connection with the increase of the amount of new sprouts, the real effectiveness of herbicides in controlling these weeds decreases, and their complete elimination from the crops has not been achieved.

On the contrary, a single and early registration of the amount of <u>Polygonum convolvulus L.</u> and <u>Polygonum aviculare L.</u> which are more resistant to the effect of herbicides, could yield high data of effect since they possess the ability of producing new sprouts instead of the dry ones. The Dynamics of their amount in the crops treated with 2M-4X (1.5 kg/ha in 1000 l water), is shown in the drawing 2.

Drawing 2 Dynamics of weed quantity. a - in crops treated with 2M-4X, b - control with weeding, c - control without weeding. 1 - <u>Polygononum convolvulus</u>, 2 - <u>Polygonum aviculare</u>. Lines indicate the amount of old sprouts, Dots indicate the amount of new sprouts.

Among perennial root and root-shoot weeds only <u>Cirsium arvense Scop</u>. as biologically most vulnerable, did not restore its surface organs even two months after the effect of 2.4-DU and 2M-4X. Other perennials, on the other hand, - <u>Convulvus arvensis</u>, <u>Lathyrus tuberosus</u>, <u>Euphorbia virgata W. K.</u>- did not perish completely even with the consumptions of 2.4-DU and 2M-4X in 1.5 kg/ha (in 1000 liters of water). A part of plants of these species survived and yielded new sprouts. The registration of their amount during the period up to the restration of the surface organs would lead to the exaggeration of the effectiveness of the herbicides.

We should assume that a prolonged and deep depression of the growth and development of perennial weeds, as well as the complete death of one-year weeds, provides the plant (wheat) with more moisture and food.

DiNOK proved to be very effective in controlling the least resistant one-year weeds, but this insecticide is far behind the 2.4-DU and 2M-4X in its effectiveness in controlling perennial weeds. If (1)2.4-DU and 2M-4X possess the phytostatic effect, then DiNOK is rather a herbicide of immediate phytoncide effect. Its effect which manifests itself quickly by burning (after 1-3 days) is local, due to which a part of one-year plants (Polygonum convulvus, Polygonum aviculare, Chenopodium album, and Amaranthus retroflexus) survive, and all perennials without any exception in some degree restore the surface organs. The curves in drawing 4 show that, while the effect of 2.4-DU (1.5 kg/ha in 1000 litr of water) caused the death of thistles, the effect of DiNOK (10 kg/ha in 1000 ltr of water) caused only the death of old sprouts, which were replaced by new ones.

The regularities which we discovered assist us in a correct utilization of herbicides and of a real registration of their effectiveness.

Krashodarsk Experimental Station for Plant Protection Entered 1-25-51

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Skripitsyna, N. N.
Effect of 2.4-dichlorophenoxyacetic acid on tomatoes during variations of mineral nutrition. (In Russian) Akad. Nauk SSSR. Dok. 75: 457-460. Nov. 21, 1950. 511 P444A

Transl. 247: Growth Substances

Translacted by R. Dembo

(Presented by the academic N. A. Maximov, IX, 29, 1950)

In connection with a wide introduction of growth stimulators into plant production practice, the problem of their application to garden plants which are produced against a high agrotechnical background is of great interest.

Our problem was to follow the joint effect of growth stimulator (2.4-dichlorphenoxyacetic acid) and of fertilizers.

The soil of the experimental lot is podzol, light sandy loam. (The experiment was carried out at the Institute of Vegetable Farm). The tomatoes of "Bizon" variety were, on the day of planting upon the experimental lots (VII/2), at the stage of starting bud formation. As fertilizers were taken: ammonium nitrate (35 percent N), superphosphate (20 percent P_2O_5) and potassium chloride (58 percent K_2O). Upon control lots (first variation of mineral nutrition) no fertilizer was introduced. Upon the lots of second variation of mineral nutrition fertilizers were introduced with the estimate of nitrogen 200 kg/ha, phosphorus 100 kg/ha, potassium - 100 kg/ha of the active agent. Upon one m^2 was spent 58.8 g. of ammonium nitrate, 50.0 g. superphosphate, 34.0 g. of potassium chloride. Upon the lots of the third variation fertilizers were introduced by the following doses: nitrogen 200 kg/ha, phosphorus 200 kg/ha, potassium 150 kg/ha of the active agent. For 1 m^2 was spent 58.8 g. of potassium nitrate, 100.0 g. superphosphate, 51.0 g. of potassium chloride. 2/3 dose were introduced as the basic fertilizer, 1/3 dose was introduced into holes during the planting. The experiment was carried out in double repetition. The blossoms upon 15 plants

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of each lot were not treated with compounds, and upon 15 other plants were treated by the solution of 2.4-DU of the concentration 0.001 percent (10 mg/l) according to their blossoming. During the spraying of the blossoms, the tops of the sprouts were covered with a shield for protection against formative effect. The first sample (treatment with 2.4-DU, VIII/13) was taken the day following the treatment. The sample contained 60 germs from each of the 15 plants. The second sample (treatment VIII/25) was taken on the third day following the treatment. The sample contained the same amount of germs. The third sample (treatment VIII/2) was taken on the eighth day (10 germs from all 15 plants). The fourth sample (treatment VIII/2) was taken on the 15th day (10 germs from all 15 plants). Fifth sample (treatment VIII/9) was taken on the 22nd day (10 germs from all 15 plants.)

The moisture of the germs according to their maturity increases at the average of 78 to 93 percent. Simultaneously a growth of a dry mass of germs is observed. In the first variation of mineral nutrition the dry mass of germs of the first sample to the last one, without treatment of 2.4-DU, increased at the average from 2.6 up to 218 mg., with the treatment - from 2.7 to 260 mg.; in the second variation, without treatment - from 2.4 up to 263 mg.; with treatment from 2.9 up to 380 mg.; in the third variation, without treatment- from 2.9 to 296 mg.; with treatment - from 2.8 up to 621 mg. In a series of cases the effect of the treatment could be noticed already after 24 hours. Fertilizers and 2.4-DU work in one direction, and namely, promote additional accumulation of the dry substance. Nevertheless, the additions which are caused by fertilizers are lower than the additions caused by 2.4-DU. The effect of applying 2.4-DU manifests itself considerably in the variation of mineral nutrition which surpasses the regular norm of fertilizers for tomatoes.

This corresponds to the condition disclosed by V. R. Williams that, for obtaining the most complete effect, the change of one measure which composes the complex also requires changes of other measures composing the complex.

The weighing which has been carried out during the end of the experiment indicated that the weight of the plants without fruit (including the root system) which were treated with 2.4-DU at the end of the experiment was somewhat lower than the weight of untreated plants. The introduction of mineral fertilizers promoted the increase of the average plant weight. The wet weight of 15 plants of the first variation of mineral nutrition without treatment with 2.4-DU - 2.55 kg, with treatment - 190 kg; of the second variation, without treatment - 3.10 kg., with treatment - 2.30 kg.; of the third variation, without treatment - 2.85 kg., with treatment - 2.70 kg. The wet weight of germs collected at the end of the experiment from 15 plants of the first variation, without treatment of 2.4-DU - 0.51 kg., with treatment 1.17 kg.; the second variation without treatment - 0.78 kg. with treatment - 1.59 kg.; of the third variation, without treatment - 1.35 kg. with treatment - 2.08 kg. The wet weight of the germs increases both during the effect of fertilizers and during treatment with 2.4-DU. Thereby the additions from the effect of 2.4-DU are greater then the additions of the fertilizer effect. 2.4-DU yields the greatest effect at the highest background of mineral nutrition. Additional amount of fertilizers causes best development of the entire plant as a whole. 2.4-DU causes also the redistribution of the growth tempo of various parts.

The samples underwent analyses for sugar, nitrogen, phosphorus and fractions of phosphorus.

The sugars were determined according to the method of Bertran. The percental content of the sum of sugars from air-dry weight is presented in the drawing 1. The percental content of the sugar sum in all variations increases from the first sample to the last one. The most effectivness of the spraying in relation to the sugariness of germs has been achieved under the highest level of mineral nutrition.

The content of the average nitrogen in percentage of the air-dry weight is presented in drawing 2 (the general nitrogen was determined according to K'el'dal' method). In proportion to ripening, the percental content of the general nitrogen in the germs decreases. Nevertheless, the absolute content grows which is connected with the increase of the mass of the germs' dry substance. The spraying of flowers caused the greatest decrease of percental content of general nitrogen upon the highest background of mineral nutrition.

The content of general phosphorus in percentage at air-dry hinge is presented in drawing 3 (general phosphorus was determined by combined method applied by N. I. Sokolov (3). According to the ripening of the germs, the percental content of phosphorus decreases in all variations, and the absolute one increases. The treatment of flowers caused the greatest decrease of the percental content of phosphorus under the highest degree of mineral nutrition.

The analysis of the soil indicated that, even before the introduction of fertilizers, it contained in assimilable forms: potassium - 400 kg/ha of the active agent, i. e. an amount close to the optimal amount for tomatoes; of nitrogen there was 1.5 times over the norm (300 kg/ha of the active agent) and close to the normal for tomatoes the number of phosphorus (200 kg/ha of the active agent) according to data (2). We may count approximately that in the second variation of mineral nutrition, the general amount of fertilizers increased 1.5 times in comparison with control, in the third variation - less than two times. This circumstance already explains the comparatively minor effect of the fertilizers in comparison with 2.4-DU. Besides, it is well known that, starting with some limit which is considered optimal for the given plant, the effect of introducing additional amounts of fertilizers decreases constantly.

The effect of spraying increases in proportion to the increase of the fertilizer's dose. Consequently, in case of applying 2.4-DU the nearest to the optimal variation of mineral nutrition becomes the third variation.

As it is well known, the application of 2.4-DU promotes the growth of seedless tomatoes. In connection with the fact that various phosphoro-organic solutions play, beyond doubt, an important role in the process of seeds formation and of fruit growth, we determined various fractions of phosphorus in the last sample by the combined method applied by A. L. Kursanov (1) and N. I. Sokolov (3) (see table 1).

Table 1.

Variations	Treatment with 2.4-DU	In percentage to air-dry hinge			
		Unlimited phosphorus	Organic phosphorus	Sum of hexozophosphates	phytin
1	Without treatment	0.011	0.22	0.08	0.14
	With treatment	0.007	0.09	0.06	0.03
2	Without treatment	0.023	0.32	0.10	0.22
	With treatment	0.013	0.90	0.08	0.01
3	Without treatment	0.025	0.195	0.11	0.08
	With treatment	0.012	0.080	0.09	Wasn't found

The obtained data indicates that inorganic phosphorus is contained in fruits in an insignificant quantity. The treatment of flowers with 2.4-DU provokes in all variations of mineral nutrition a drastic decrease of the content of phytin. We were unable to disclose it in the third variation. It is known that the seed formation is connected with the concentration of phytin in the central part of the fruit. Thus the absence of phytin indicates the absence of the process of seed formation in tomatoes.

C O N C L U S I O N S

1. Fertilizers increase tomato yield and the vegetative mass of plants by furthering the admission of nutritional substances from the soil. The application of 2.4-DU increases the effectiveness of fertilizers and causes the re-distribution of assimilators, intensifies its inflow into the reproductive organs on account of the vegetative ones.

2. While, in proportion to the increase of the amount of nutritional substances (over the optimal), the difference between the results of individual variations without treatment with 2.4-DU decreases, with treatment of 2.4-DU this difference increases.

3. 2.4-DU is the most effective under the highest doses of mineral nutrition.

4. Under the treatment with 2.4-DU, these forms of phosphorus compound (phytin) which stimulate the process of seed formation do not occur.

5. The nutritional substances which flow to the germs under the effect of 2.4-DU remain(basically) in the form of sugars, because seeds are not formed in the germs. Those seeds would ordinarily use the inflowing nutritional substances for their formation.

The high degree of agrotechnical measures, the creation of the best nutritional conditions, water supply, the selection of the appropriate variety, correct application of synthetical growing substances could yield a high harvest of tomatoes.

Lomonosov Moscow State University Entered May 27, 1950

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Drawing 1: sum of sugars. 1-control, 2-$N_2P_1K_1$, 3-$N_2P_2K_{1,5}$:
a- without treatment, b- with treatment

Drawing 2: General nitrogen. Indications as on drawing 1

Drawing 3: General phosphorus. Indications as on drawing 1

MJA-11-19-51

Nikulina, N. K.
New means for the control of spider mite (Tetranychus althaeae) on cucumbers. (In Russian) Sad i Ogorod 2:72 Feb. 1951. 80 Sa13 NIUIF-100 preparation.

Transl. 248: Insecticides

Translated by R. Dembo

The spider mite is a whip for cucumbers in a protected ground. It is extremely hard to free the nurseries and conservatories in a series of collective and state farms from this pest.

The recommended compounds in controlling spider mites : calcareous sulfate decoction, anabasine sulfate, nikotin sulfate, sol'bar - do not ensure complete destruction of the spider mite and under favorable conditions it appears again.

The scientific institute of fertilizers and insecticides-fungicides (NIUIF) produced a new effective compound for controlling the spider mite - NIUIF-100.

The experiments which were carried out in 1950 under the supervision of the candidate of agricultural science, comrade Popova, in controlling the spider mite indicated the high effectiveness of this compound.

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The spraying of cucumbers by 0.05 percent solution of 50 percent concentration of NIUIF-100 produces a higher economic effect than all the poisons which were recommended previously in controlling the mentioned pest.

The compound does not cause any harm to the plants in any phase of their development.

According to comrades Popova and Gurleva who carried out the testing of this compound in 1950, in Moscow Oblast', in collective farms "Competition". "In Memory of Il'ich", in state farms "Komsomolets" and "Gor'kii", the mortality of the spider mite was from 72.6 to 100 percent after spraying.

The compound NIUIF-100 does not kill the eggs of the mite, therefore the spraying should be done 7-8 times: the first 4 times with the interval of

7 days, and the following 3-4 times - after a month with the interval of 10 days between them.

The compound NIUIF-100 could also be applied for profilactic treatment of turf pots, nursery frames, fallow soil.

NIUIF-100 at the dose of 0.05 percent of the solution of 50 percent concentration (applying the regular precautional measures in working with poisons) could be recommended for productive application in all collective farms which have nursery-conservatory production.

The application of the compound NIUIF-100 will enable the complete destruction of spider mite, prolong the period of cucumber's fertility and increase the yield of this plant in a protected ground.

The compound NIUIF-100 could be acquired at the office of Agricultural Supply of Krasnodarsk krai.

MJA-11-19-51

Kalinkevich, A. F. and Lavrovskii, D. G.
"Chemical Methods of Control of Weeds
on Sowings of Branched Wheat". Sovet
Agr. 9 (4): 87-90. April, 1951 20So84

Transl. 249: Weed Control

Translated by R. Dembo

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The All-Union Scientific-Research
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Lavrovksii-Agronomist of State Farm
"Ramenskoe", of Moscow oblast'

At the experimental-production sowing of branched wheat at the state farm "Ramenskoe", of Moscow oblast', was carried out in 1949 and 1950, besides the horse between-rows tilling, a double manual weeding.

The average of 120 to 160 labor days have been spent per hectar for two manual weedings. The same amount of labor days was spent on weeding plown crops (forage sugar beets, carrots, onions, etc.)

Besides great expenditure for weeding, a very tense situation with labor power occurs yearly in the state farm at the end of June and at the beginning of July. On account of that situation, the sowing fields are weeed too late, they cover with weeds, a great loss in yield takes place.

The application of chemical methods in controlling weeds upon sowings 249
of branched wheat enables us to treat all sowings of wheat quickly, in 1-2 days, and requires less man power. In 1950 the chemical methods of controlling weeds were applied in state farms for weeding of branched wheat.

Upon the continuous sowing of branched wheat - 4.05 hectars and 1.25 hectars of wheat Liutestsens 62 - was carried out an experiment in testing herbicides.

Upon 1.25 hectars of sowings Liutestsens 62 and 0.75 ha of branched spring wheat no weedings has been done in control. On the lot of 0.14 ha of branched wheat a double manual weeding was carried out. Upon the rest of the

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field - 3.16 ha - were tested doses and time of treatments of the sowings by the herbicide 2M-4X (paste) and 2.4 DU (powder).

The methods of care, treatment and the introduction of fertilizers were alike upon all fields, except the method of weeding. Upon the sowing of spring wheat Liutestsens 62, no measures in controlling agricultural pests were carried out.

Herbicides were applied by means of spraying the sowings with solutions calculating 800 litr per hectar.

Upon the field No 4 the spraying was carried out with the colution 2.4-DU (powder), upon the rest of the fields - with the mixture of equal amount of 2.4-DU (powder) and 2M-4X (paste).

The harvest of wheat was carried out by manual labor - sickles with simultaneous harvesting of spikes (lots 1-4 and 6). Lot 5 was harvested with a combine. The harvest from each lot of the productive experiment with herbicides was threshed on a threshing machine MK-1100 separately, the weighing of the grain was done also separately.

The amount of weeds was counted before the harvest of wheat.

The doses and the timing of treatment of branched wheat sowings with herbicides. The spraying of branched wheat sowing was carried out at the beginning of the appearance of stems - May 21, during the phase of appearance of stems - May 28, and at the end of the appearance of stems - when it enters the tube - June 2.

During the treatment of the sowings in early timings - May 21, even with a small dose of herbicide - 0.75 kg/ha, a considerable amount of weeds was destroyed: goose-foot, thistle, rape and chickweed, but after this treatment, a considerable amount of weeds, especially goose-foot sprouted from the seeds. Goose-foot harmed the wheat crops. This lot 4 needed additional treatment with herbicides or with hand weeding. During the harvest, there were upon each square meter approximately 27 pieces of weeds, mostly goose-foot.

The treatment of branched wheat sowings with the solutions of herbicides at the end of appearance of stems - June 2 with the dose of 1.5 kg/ha appeared to be more effective. The treatment of the sowing on June 2 destroyed almost completely all the weeds which spread most widely. The general amount of weeds upon lot 6 did not exceed the amount of weeds upon the lot of double manual weeding.

Under the treatment of crops with herbicides there is an increase in yield, in comparison with the yield of wheat upon which no weeding was carried out, which amounts to 10.71 c/ha, and with a double hand weeding - 8.6 c/ha of branched wheat grain.

Under double manual weeding of wheat of entire sowing some amount of plants was trampled and torn out with the weeds. Each manual weeding lasted at least three days, and the treatment with herbicides - several hours. Under the spraying of wheat with the herbicide solutions upon the field 6 was obtained, a yield of 2 c/ha more than with double hand weeding.

As the result of an early treatment of sowings with herbicide solutions, the weeds: thistle, rape, chickweed and goose-foot were completely destroyed. Goose-foot which was present during the harvest of wheat grew from seeds of plants which grew after the treatment of the sowings with herbicides. A small amount of weeds was observed during the harvest upon the lots of manual weeding as well.

The treatment of the crops of branched wheat with herbicides in dry weather destroys weeds. If immediately after the spraying it will rain, then the weeds will not be destroyed. This happened in our experiment on lot 5. The rain washed out the herbicide solution, and the lot did not differ almost from the lots where no weeding took place (lots 2,5 and 6) neither in the amount of weeds nor in yield.

Types of chemical compounds.

For chemical weeding of the sowings of branched wheat two compounds were used: powder 2.4-DU and paste 2M-4X as solutions. The testing of these two compounds did not yield special advantages of one over the other in destroying weeds. The compound 2M-4X (paste) destroyed goose-foot somewhat better and nettle - worse, in comparison with 2.4-DU.

Taking into consideration these peculiarities of the compounds in the productive testing of herbicides in state farm "Ramenskoe", we applied the mixture of two compounds 2M-MX and 2.4-DU in equal amounts. Seemingly, depending upon the type of weeds this ratio should change in favor of one or the other compound.

The application of manual and chemical weeding on the same crops.

The treatment of crops of branched wheat with the solutions of herbicides was carried out not only upon the fields of the entire sowing, whose experiment's description was indicated above, but upon all fields as well - 12 ha - with between-rows horse treatment and manual weeding.

At the end of June, as a result of abundant rain, weeds started to grow rapidly and to harm the wheat crops. It was impossible to weed out all the 12 ha within a few days. Therefore, in order to check the further weed growth, the crops were sprayed with the herbicide solutions, and then gradually a manual weeding was carried out and between-row tilling of the sowings of branched wheat. The combination of chemical and manual weeding justified itself completely.

Spraying with kit-and horse sprayers of branched wheat.

For the treatment of branched wheat with herbicide solutions in state farm were utilized kit-and horse sprayers.

In applying kit sprayers, two persons worked with the instruments: one prepared the solutions and helped in charging the instruments, and the other - carried water on a horse at a distance of a kilometer. With such organization of work for one eight-hour-day they treated from 0.36 to 0.40 hectars. Factual consumption for consumption for the spraying of one hectar amounted to:

1. Labor - 5 persons with the pay of class 4 - 12 ruble 80 k.-64 r.
2. Labor - class 3 - 10 ruble 80 K. - 54 "
3. Horse days, 2.25 with the pay of one horse day-14 r.....r. 31.50 r.

total " 149.50 "

During the spraying with horse sprayer, one person worked upon two-horse sprayer, the other person delivered water with two horses. During a working day 6 ha of the crops were sprayed. For the spraying of each hectar of the crops 1/3 labor day and 1/2 horse day were spent. The expense for spraying under the conditions of state farms amounted to 11 r. 07k. The utilization of horse sprayers for the treatment of crops in controlling weeds, instead of kit sprayers, increased the productivity for each worker thirty times, decreased the expense by 138 r. 43 k. per each hectar. Besides, by utilizing horse sprayers under the conditions of Moscow oblast' we reach the greatest agrotechnical effect, because in short timings it is possible to check the further growth and even to destroy the weeds entirely. One horse sprayer treated in one shift 6 ha, and with two-shift work - from 10 to 12 ha of crops. The weeding of such a lot in one day by hand weeding would require up to seven hundred persons.

During the work of a horse sprayer the worker should watch the work of all sprayers and, in case of their clogging, to clean them.

On detours, the supply line with the sprayers touches often the soil and bends; therefore on detours the supply line should be lifted.

Conclusions

Weeding of crops of branched wheat at the state farm "Ramenskoe" by means of spraying with the solutions of herbicides justified itself completely and, with a correct treatment of the crops it would not yield a double manual weeding.

The application of herbicides at the state farm "Ramenskoe" for the weeding of crops of branched wheat ensured a speedy efficiency - the treatment of all crops in one-two days; each hand weeding lasted 10-12 days.

The treatment of each hectar of crops of branched wheat with the solutions of herbicides required 1/3 man day and 1/2 horse day. The total expenditure for the treatment of one hectar of crops, not counting the cost of the herbicide, amounted in a state farm to 11 r. 07 k., while each manual weeding required at the average 60 working days, and the expenditure amounted to at least 700 rubls. All the expenditures in chemical weeding, including even the cost of the compound (which is right now very high), are four-five times less than during manual weeding.

The fastest and most advantageous is the treatment of crops with the utilization of horse sprayer. The spraying of crops of branched wheat by manual, kit instruments is very slow. The treatment of each hectar of crops with kit instruments required thirty times more working power in comparison with the treatment by horse sprayers.

The productive experiment which has been carried out indicated that the most correct and safe method is the double treatment of the crops with herbicides and a combination of manual and chemical weedings.

NJA-11-20-51

Dmitriev, G. V.
Cicadula sexnotata - dangerous pest of cereals. Sovet. Agr. 9 (4): 90-92. April, 1951 20 So84

Transl. 250: Pest Control

Translated by R. Dembo

The author is a candidate of Agricultural Science

Among a great number of insect species - pests of winter - and spring cereals - grain cicadulas (Homopfera, Iassidae) are not sufficiently studied. Their ecology and their economic significance are almost unexplored, and measures in controlling them are not worked out either.

A mass propagation of cicadula sexnotata (Cicadula Sexnotata Fll) which occured in 1949, in Zhitomir oblast' enabled us to carry out some observations on the ecology of this species and to verify the dusts of the compounds DDT and HChCH in controlling this cicadula. In connection with the fact that cicadula sexnotata is widely spread along the entire European part of USSR, the data given below are of some practical interest.

In May of 1949 we received disturbing information from a series of collective farms of Zhitomir raion concerning the drying of crops of oat, barley, spring and winter wheat. An observation which has been carried out indicated that the cause for the drying are the damages caused by larvas of the cicadula sexnotata. In all places of investigation, the amount of cicadulas was very great. The damages caused the destruction of spring cereals upon fields which were inhabited by cicadula. The fields of winter rye and of wheat inhabited by cicadula, differed conspicuously from the neighboring fields which were not inhabited by the pest: high thinness of crops, low size, poor bushiness, light green drying leaves, or leaves with light spots, the stems were covered with white spots, pause in development before the throwing of the spike and, in some cases, the loss of feebly developed plants.

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The perished fields of spring cereals were located near winter rye or wheat which were the nidi for the spreading of the cicadula sexnotata.

In controlling the cicadula, 5 percent of DDT and 12 percent of hexachloran were applied. Both compounds were tested previously under laboratory conditions. For this purpose, the cicadulas were placed into glass jars the walls of which were powdered with the dusts of DDT and HChCH.

The results of the testings were given in table 1.

Table 1

Insecticide	Full death occurred of the larvas	of the nymphs	of mature insects
Dust DDT 5 percent	After 35 min.	After 35 min.	After 45 min.
Dust DDT 12 percent	After 55 min.	After 55 min.	After 1 h. 10 min.
Control	After 2 hours, 20 minutes	After 2 hours, 35 minutes	After 6 h. 15 min.

Simultaneously with laboratory experiments pollination was carried out by the indicated compounds of two lots in the field which were abundantly covered with cicadulas.

Upon the lot pollinated with the dust of the compound DDT, we observed after 20 minutes a considerable amount of excitingly moving larvas and nymphs, as well as individual paralysed specimens, after four hours the cicadulas perished completely.

Upon a lot which has been pollinated with the dust of the compound HChCH the death of the cicadulas was noted only after 12 hours.

The amount of cicaddlas upon both fields has been characterised by a three height curve which is explained by the decrease of the amount due to poisoning, and then by its growth from the near-by fields which are untreated. The curve of the amount upon the near-by control field indicates the decrease of the amount on the second day, since at that time the plants perished and the cicadulas migrated upon fresh plants; upon the lots treated with the dusts there was no death of the plants (drawing).

Drawing. The dynamics of the amount of cicadula sexnotata, during the pollination of crops with the dust of the compounds DDT and HChCH.

Thus, both compounds proved to be very effective in controlling cicadula.

A full pollination of fields which are inhabited by cicadulas and which are covered by spring crops, checked damage completely and caused practically the complete destruction of the pest. The death upon the fields which were treated with DDT occurs in one case after 3 hours, in another case after 4 hours; upon fields treated with dust HChCH - after 10 and 12 hours.

The norms of the consumption of DDT and HChCH were 20 kg/ha.

In all collective farms which we examined the damage of oat and barley began from the edge, which was close to the fields of winter wheat and rye. In case the perished lots were located in other places of the field with spring cereals, then near them were contaminated lands of virgin soil, scutellum with weeded cereals, field roads, i. e. the place of wintering of cicadula sexnotata at the stage of an egg were lands which were not replown in fall. Those fields were occupied by cereals and mainly by winter crops.

It was also characteristic to observe the reaction of cicadula to the relief. Even micro-relief specified the concentration of the larvas, nymphs, and of mature insects upon the fields with spring crops. Upon Southern slopes, upon "burgs" and "griva", upon the upper parts of the slopes, there were five-ten times as many cicadulas as there were in ravins, upon slight drops, upon Northern slopes and upon the lower parts of the slopes. Upon light sandy soil, light loamy land and upon sandy soil, there were twice-three times as many cicadulas as upon dark and rich soil.

Upon the fields with winter crops the amount of the cicadulas was determined by the compactness and height of the stem-stand. Upon fields with low bushiness, with a thin grass-land with poorly developed plants, 90 percent of the entire amount of the pests concentrated. Thereby, upon the fields on elevated lots there were three-four times more cicadulas than upon the rest of the field. Lots which were situated nearby with powerful and dense grass stand were inhabited with the cicadula in a small amount.

Thus, high agrotechnic of winter crops is an indespensable condition in controlling this pest.

The damage caused by cicadulas increases considerably during dry weather (Sakharov, Snamenskii, Shchegolev, etc.). Drought increases the viability of the post-embryonic stages, promotes an intensified sucking of plants by the cicadulas. During drought the plants increase the evaporation in places damaged by the prickings of the pest and they stop in their growth.

The mass propagation of cicadula sexnotata is a result of its gradual accumulation during last three years. The droughts of 1946 and 1947, spring and fall of 1948, and, finally, April and May of 1949 were favorable for this insect which prefers heat and drought.

The mass propagation of the cicadula sexnotata in the forest raion of right shore of the Ukraine requires a serious study of bioecology of this steppe pest. A wide testing of DDT and HChCH in various raions of European part of USSR will, apparently, solve the problem of its chemical control.

It is necessary to underline the fact that the eradication of mature insects, when they appear in fall upon winter crops, will exclude the formation of winter nidi-eggs of cicadulas which winter in leaves.

It is necessary to test thoroughly the application of DDT and HChCH upon winter crops in fall.

MJA-11-20-51

Kovda, V. A.
New powerful development of irrigated districts of cotton culture in USSR. Les i Step' 2 (11): 35-41. Nov. 1950. 99.8 L565

Transl. 251: Cotton

Translated by R. Dembo

(Translated from the Russian)

The construction of the Main Turkmenian Channel Amu-Dar'ia-Krasnovodsk is the largest flood-irrigation enterprise of the world. The length of this channel is 1100 km., and the power is 600 m^3/sec. The waters of this channel irrigate a field of 1300 thousand hectars, they will feed 1200 km. of huge irrigation and flood channels, 100 km. of canalization for water supply of industrial enterprises and of inhabited points. Three hydroelectric stations will be constructed of the total power of 100 thousand kilowatt.

The irrigation and flooding of Western Turkmeniia and of Western part of the desert Kara-Kumy is of great national-economic significance.

The waterless Black and Red sands (Kara-Kumy, Kyzyl-Kumy), were for centuries a threat for fields and herds. The river Amu-Dar'ia throughout centuries slowly moved towards the North and North-East, dooming Western Turkmeniia to drought.

During the Ice epoch, the waters of Amu-Dar'ia flowed not into Aral' Sea, but into Caspian Sea. Later on, under the influence of processes of Mountain formation, the bed of Amu-Dar'ia moved towards North, and in the place of its ancient channels and of Sarykamyshskoe Lake, dry salt depressions, dried out beds and accumulations of river sands were formed.

For centuries the Turkmenian people day-dreamed of the moment when the waters of Amu-Dar'ia would turn towards Turkmeniia and could be utilized for irrigation.

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For 200 years did the Russian explorers strive to find the key for conquering the nature of the deserts and for irrigating them with the waters of Amu-Dar'ia, Volga, and Dnepr.

The day dreaming of progressive scientists of Russia came true. The Stalin plan of transformation of steppes and of deserts, the elimination of drought - all this became a reality before our very eyes. This reality is fulfilled through the decision of the government about hydro-technical constructions which change the nature of our country and which eliminate deserts and drought.

The Soviet of the Minisers of USSR determined to shift to a new system of irrigation which the advanced collective - and state farms and scientific research institutions applied with success. According to the system, permanent irrigators are replaced by temporary ones.

In the near future, the development of irrigated economy of the Union of SSR should be followed by a new powerful progress in cotton production. The summary production of raw cotton in irrigated agriculture of the republics of Middle Asia and of Beyond-the-Caucasus will increase 3-4 times, and the average yielding capacity of cotton will reach up to 30 centners from 1 hectar.

The Academic T. D. Lysenko in his article "The Agronomical Teaching of V. R. Williams" underlined that the grass system scheme of agriculture which has been worked out by V. R. Williams could not be applied everywhere and always, without some changes, or disregarding the climatic and soil conditions or the government's plan tasks for agriculture. Such actions not only hamper the development of science, but may also become a hindrance in practice. Based upon the same theory concerning the transformation of the soil and the creation of conditions for its fertility, it is necessary to work out under various conditions various agrotechnical methods in creating a solid structure of the soil with small lumps, various methods of tilling it, various methods in applying fertilizers.

In our article are indicated elements of grassland system of agriculture in the raions of irrigated cotton production of USSR. The following elements enter into this system: 1) state protective forest belts and field protective plantings along the magistral irrigation channels; 2) cotton-grassland crop rotations upon the irrigated land; 3) a correct organization of the territory which provides an expedient utilization of arable land and the distribution of the fields for crop rotation; 4) irrigation; 5) the system of mechanization of productive processes and soil tilling; 6) the system of soil chemisation; 7) the system of hydrotechnical and agrotechnical meliorations which would prevent and eliminate the process of salting the irrigated soil; 8) covering the forests and consolidating the sandy spaces, which are near oasis, for the protection of irrigated oasis against approaching broken sands: 9) covering with forests mountainous slopes of water accumulating river basins which could be utilized for irrigation.

The establishment of state forest belts and forest plantings for field protection is a transformation of the nature of the climate's surface layer and a protection of plants against drought. In the irrigated raions of Central Asia the analogues to drought - winds "garmsili", "afgantsy" acquire special power, and therefore the protection of the irrigated fields against these winds by forest belts acquire special significance. Along with that, the plantings should protect the territory of the irrigated oasis against moving sands, against loess dust.

Besides, state forest belts and field protecting forest plantings in the irrigated raions of Central Asia and Beyond the-Caucasus should fulfill a series of important functions of meliorating and preventive character. It is well known, that the high level of ground waters in the irrigated raions causes the decrease of yield in cotton and grasses, and in case of their high mineralization it causes the formation of salted soils. The decrease of the level of ground waters is therefore the most important measure which prevents the possible decrease in soil's fertility.

Forest plantings which grow under the conditions of Central Asia and Beyond-the-Caucasus, due to prolonged vegetation, abundance of light and heat, with sufficient moisture develop exceptionally powerful. One hectar of wood plantings in the neighborhood of insipid ground waters is able to consume during the vegetative period up to 10000-20000 m^3 water for transpiration. The consumption of soil-ground waters used for plants' transpiration weakens and often excludes the processes of salt accumulation in soils, because salts which are easily dissolved do not reach its surface.

Taking the volume of gravitating water in water carrying horizon for 100 percent, we may consider that the transpiration during the vegetative period "deteriorate" the water carrying layer of ground waters at the irrigated lots of 10-20 cm. As a result, due to the transpirational work of forests, it is possible to keep the level of ground waters upon forest covered irrigated lots at 1-1.5 m. lower than the surrounding territory. Usually, along the huge irrigated channels the level of ground waters is highly lifted, and the latter spread on the side of the channel. In those cases when a channel is surrounded by trees, the level of ground waters is not only increased, but is located at a greater depth than upon the neighboring irrigated territories. The slope of ground waters is directed not towards the channel, as it usually happens, but from the irrigation towards tree plantings which transpire ground water.

Along with the function of protecting irrigated fields against drought winds and with the softening of the climate in the near-soil layer, protecting forests decrease the level of ground waters and by that decrease the consumption of water for transpiration, thus they prevent the processes of salting.

The state forest belts and field protecting forests should be distributed on cotton farms according to the same principles as under the conditions of unirrigated farms of European part of USSR, i. e. perpendicularly towards the direction of predominating dry winds.

The experiment of the projection of state forest belts for Central Asia and Beyond-the-Caucasus indicate that they should be created along narrow valleys and around oases. Such belts are planned for Fergan valley, for Kura-Araksin lowland, for the valley of the river Vakhsh. There are also planned forest belts for the protection of oases against winds coming from sand deserts around Bukharsk, Murgabsk and Tedzhensk oases, as well in Fergan.

The forests in the irrigated regions should utilize the water which is lost in magistral channels, and therefore state forest belts should be distributed along the chief channels (along both sides), including grooves and roads. Such plantings are now growing along the Large Fergan Channel, and they are planned along Chief Turkmenian channel and Kirov's Chief Golodnostep Channel.

During the years of Soviet power, in many irrigated oases of USSR has been constructed a network of huge state water supplying collectors (in central Fergan, Hungry Steppe, in the valley of the river Vakhsh, in Kura-Araksin lowland). These collectors should be covered along both sides by state forest belts of trees which are salt resistant (wild olive, tamarisk, etc.)

Which species should we recommend for the planting of irrigation network which passes in non-salty or slightly salty soils? The following species are most suitable from economical point of view: Populus Bachofeni, Robinia pseudoacacia, Fraxinus pubescens, Morus alba.

The first three species are planted along reservoirs and along large and medium channels, as well as on farm-steads. Morus alba could be planted along branch irrigators. Besides, at the large and medium irrigation network it is possible to plant Populus nigra, Acer negundo, Salix, alba, australia, enuniculata, Gleditschia triacanthos, Ailanthus glandulose, and also fruit trees - apple, apricot, walnut, cherry, pear etc.

Upon soils which are salty, with efflorescence of salt and nearby salty ground waters, the following trees could be planted: Elaeagnus angustifolia, Arthophytum aphillum, Haloxylon, Tamarix hispida etc.

For a correct projecting of field protecting forest planting in irrigated cotton regions we must solve many problems: what is the transpirational ability of wood and bush species which are intended for planting in these regions, its salt resistance and the methods to increase it; the forest growing ability of soils of various saltiness and of various physical characteristics; the size and the forms of forests along belts of various types; hewing and restoration of forests.

By introducing correct cotton-grass crop rotations in the irrigated cotton production the basic problem is to create and support a soil structure which would be water resistant, lump-grainish. Gray soil which is the most widely spread variety of the soils of USSR irrigated zones differ by poor structure. Water deteriorates the structure of the irrigated soils, especially by flooding.

As our observations in state farm "Pakhta-Aral" indicated, a powerful grass cover would be able to transform considerably the over-soil climate due to the shadowing of the soil from above and the increase of moisture of soil air under the grass. In Central Asia the open surface of the soil warms up in July-August up to 60-70^{0}, and the plown horizon of the soil under the grass cover - not more than 40-45^{0}. Due to shade, decrease of heat, and increase of relative humidity of the air, there is in the upper layers of the soil, under grass cover 3-5 percent less moisture than upon the neighboring cotton fields under similar conditions.

The development of grasses under the conditions of Central Asia, with sufficient moisture and nutritious substances, provides a great amount of dry organic substance (in a year 200 c. of hay, and 150-200 c. of roots from one hectar). The formation of such great amounts of organic substances is, naturally, connected with a high consumption of soil moisture. In the first place, the grasses use capillary water which lifts from ground waters towards the surface taking it for transpiration.

Grasses of the second year of usage, with a good development are able to use up to 1000-2000m^3 of water during the vegetative period, due to which the level and the regime of ground water transforms considerably. Usually, upon the fields the level of ground waters during the vegetative period is 100 cm. lower (at the average) than upon the cotton fields (under the same conditions).

It is known that irrigated soils upon cotton fields with close mineralized ground waters undergo a highly conspicuous saltening which is followed by the transfer of salts from ground waters into plown horizon of the soil and by the increase of their content from spring to fall, from 0.3-0.3 percent to 0.7-1.5 percent.

Upon fields occupied by good grass mixtures the transpiration from the soil surface decreases, its structure improves and the level of ground waters decreases. As a result, the season salting upon such fields is expressed slightly. Under grass cover, with thorough watering, the sum of salt in upper horizons decreases.

By wide introduction of cereal-legume grass mixture into the practice of irrigated production, we will have to overcome a few difficulties.

One of the difficulties is the loss of grasses during sprouting, due to the formation of crust upon the field or due to soil's saltiness. This difficulty could be overcome comparatively easy by the methods of correct soil tilling, which would eliminate crustation, and by preliminary washing of the salt upon salty soils which are prepared for grass sowing.

A more serious complication is the loss of cereal component of lucerne-cereal grass mixture which is followed by a gradual elimination of the cereal component. Usually such an elimination is noticeable after first or second mowing.

The data of the All-Union Scientific-Research Institute of Cotton Production, and also the observations in the state farm "Pakhta-Aral", indicate that coexistence of various grasses in grass mixture could be achieved by sowing legume and cereal components by rotating rows or cross ways. It could also be achieved by providing the grasses with basic fertilization, by feeding with nitrogen in summer and, especially, by regularity of waterings. In those cases, when, after grass mixture mowing the harvest of hay laggs and the rotating waterings are delayed, the cereal component transforms into rest and dies. Lucerne which has a powerful, deep going root system is able to overcome the pauses in watering, utilizing ground waters for its development. Cereals whose root system is concentrated in the upper 20 cm. of the soil quickly spend the soil moisture and, when the watering is delayed, they die or stop vegetation.

The observations of Azerbaidzhan scientific-research institute of cotton production indicated that lucerne and orchard grass develop splendidly during fall (and not spring) cross common sowings.

In order to increase the effect of grass mixture in cotton-grass crop rotations, it is necessary to increase the productivity of the surface and under soil vegetative mass produced by grasses. The experiment of progressive farms of the irrigated zone and of experimental stations indicates that the yield of the surface mass of grass mixture could be lifted up to 150-200 c. per hectar under the conditions of good agrotechnic and correct waterings, and this enables the increase of cotton yield after grass plowing.

In the irrigated production with grass sowing of great significance are both the production of the surface mass and the formation of a great amount of roots.

It is very important to achieve the increase of salt resistance of grasses. Here the methods of selection of salt resistant forms among local plants is most important or their introduction from other oblast's. The agrophysiological measures for salt resistance increase should be tested under production conditions.

Due to high moisture produced by artificial irrigation, and due to high temperature, the disintegration of organic substances in irrigated soils of Central Asia and Beyond-the-Caucasus occurs very fast. Usually, in the 3rd or 4th year after the plowing of grass layer, the positive influence of grasses disappears almost completely. It is necessary to strive constantly for the prolongation of a positive influence of grasses after the plowing of the layer. This should and could be achieved by a complex of measures which would be worked out in cooperation with soil producers, microbiologists and agrotechnicians.

Based upon the indications of V. R. Williams concerning the establishment of anaerobic regime in soils for the conservation of their organic substance, it is necessary to learn how to direct the disintegration processes of organic substances in soils. This could be achieved by means of definite timings, depth and special tilling of grass layer, timing and size of soil moisture of watering, of influence upon the content and the activity of microbiological population, etc. By means of these measures it is possible to increase the amount of the content of the organic substance (compost) in the irrigated soils and to prolong the positive effect of grasses in crop rotations up to 6-8 years. It is also evident that here we must apply siderite systematically, we must fill the soil with an additional organic substance with the assistance of concentrated and repetitive sowings.

Most valuable for practice are the suggestions of the All-Union Scientific-Research Institute of Cotton Production to introduce short crop rotations with two-year growth of grasses and a short rotation of cotton. The cotton yield and its summarized harvest, according to Dorman, is higher by this method than by prolonged crop rotations.

Artificial irrigation is a basic and powerful means in reorganizing the climatic and soil conditions of the desert.

Nevertheless, the predatory utilization of water resources in the irrigated oases of Central Asia and Beyond-the-Caucasus during past years, the primitivity of the hydrotechnical constructions, of irrigational and drainage channels and the low level of agrotechnic led to the situation that the irrigated fields suffered in the past considerably from the saltening of irrigated soils.

In previous irrigated systems the water for irrigation used to be carried upon the fields from the network of constant channels, located at a distance of 80-150 from each other. These channels divide the field into small irrigated lots (from 1.5-10 ha). Agricultural machines could not be utilized productively by tilling the soil upon such irrigated lots. Besides, under constant channels 10 to 12 percent of the lot is lost; along the channels grow weeds which shift over to the fields. The care for permanent irrigation channels requires a great amount of labor; labor is required in great amount for the cleaning of the channels from accretion. New irrigators are constructed after sowing, and after waterings it evens out by groove diggers and levelers which are attached to the tractors. The application of the new system will enable to enlarge the irrigated lots and to increase their number upon the irrigated lot and will shorten the length of permanent irrigation network by two, three times.

The advantages of the new irrigation system are obvious. First of all, upon enlarged lots it will be possible to utilize completely the machines for the execution of all agricultural work, introduce progressive agrotechnic which will considerably increase the yielding capacity. Besides, water losses upon filtration of channels during the period of watering will decrease considerably, for the cleaning of the channels will be required less labor power.

In the next three, four years the reconstruction of irrigation systems will be carried out upon a field over 4.3 million hectars.

In order to create favorable conditions in the development of agricultural plants upon heavily salted soils (content of salts over 1-1.5 percent), it is necessary to remove the excess of harmful salts by means of special washings, as well as drainage of salted ground waters with the assistance of drain constructions of various types.

The hydrotechnical measures in meliorating salty soil of natural and repetitive saltening should be executed with due consideration of the natural conditions and processes of salt accumulations.

The Soviet melioration and agrobiological science may be proud of the fact that the problem of melioration of salty soils and of their effective appropriation has been solved. The greatest progress along these lines wasachieved by Mugansk experimental-meliorating station in Azerbaidzhan, Golodnostep and Fergan experimental meliorating stations in Uzbekistan. The achievements of Mugansk experimental-meliorative stations in Dzhafarkhan deserve our special study and popularization. The malicious sterile salty soils of Mugan' which had in the neighborhood highly mineral ground waters (40-60 g/l) are appropriated by means of a correct complex of measures (deep, horizontal drainage, washing, high agrotechnic) and are transformed into highly fertile soils. The yield of cotton upon these soils with 1-2 waterings amounts to approximately 40 centners, and the yield of cereals reaches 40-45 c. per hectar.

Soils which were under treatment, after 18 years were enriched by gumus, became structural and loose. The concentration of soil solution decreased in them up to 2-3 g/l, the ground waters contain salts not more than 0.5-1.0 g/l.

Similar achievements have Golodnostep and Fergan experimental-meliorating stations.

In Williams' teaching considerable attention was dedicated to the correct systems of soil tilling which provides the restoration and preservation of their favorable structure. The chief condition in preserving the soil's structure is, as it is known, its plowing and loosening at the moment of its physical ripeness, when the friability and structuring reaches the best results. In the practice of irrigated economy of great importance is the determination of specific moisture which the soil possesses during its physical maturity.

Many soils which possess solonetz (dark strongly alkaline soil) of especially mechanical content, which have a great amount of mineral colloids of montorilonite group, have a comparatively narrow moisture interval in the condition of ripeness. Those soils "catch" quickly and a crust is quickly formed upon the surface.

A raion precision is necessary of the nature of the physical soil maturity, of the optimal moisture, the structure formations in various soils and the search for methods in the increase of the structure forming effect during its tilling.

V. R. Williams created a system of plowing plown land by plows with coulters, and a tilling of plown land without repetitive turning over the layer. This system of tilling irrigated soils was tested under the conditions of the state farm "Pakhta-Aral" and of other analogous raions of Central Asia and had proven to be quite effective. Such tilling of the irrigated soils reduces the cost of labor and of measures (instead of 3-4 tillings - one tilling), reduces watering, improves the structural condition of the soils and ensures the increase of cotton yielding capacity.

Nevertheless, not upon all soils and not in all raions is this possible. Under some conditions (heavy soils, abundance of weeds) this system is not advisable. It is necessary to improve the systems of soil tilling in cotton zone of Central Asia, based upon the principles of W.R. Williams.

The development of the irrigated cotton production requires urgently the expansion of experimental work in melioration and in acquisition of "takyrs" based upon the complex improvement of their qualities by means of deep loosening, the transformation of the mechanical and chemical content of general enriching with an organic substance.

One of the successful methods in controlling incrustation upon unstructural loamy soils in irrigated economy is the method discovered by the Academy of Science of Azerbaidzhan (D. Guseinyi). The introduction of "Gumbrin"- during basic plowing on the surface or in the rows of cotton field, after its sowing, caused great positive changes in the physical condition of the plown horizon.

"Gumbrin" is a montmorillonite loam which is applied in petrolium industry as refining the ground and which contains up to 40 percent of organic substances of petrolium origin.

There are reasons to assume that the application of gumbrin and of other analogical refineries, as well as the application of petrolium products and of tailings of mineral oils in small quantities (upon which we insist since 1945), and the utilization of bituminous loam, shales, sands, will improve the structure of incrustating soils also in other raions of the cotton zone of USSR.

There is no doubt that, by studying carefully the scientific heritage of the leaders of agronomy and soil science, Dokuchaev and Williams, by grasping the progressive experience in production and by introducing all the achievements of science into the practice of agriculture, the Soviet scientists along with collective farmers will achieve a new powerful progress in Soviet cotton production.

End of article

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Method of improved cultivation of Taraxacum kok saghyz. Sovetsk. Agron. 1940 No 11-12, pp 63-8, 20So84

Transl. 252: Kok-Sagyz

Translated from the Russian by R. Dembo

Methods of cultivating Kok-Sagyz*

* In order of presenting the problem. Editor.

(From the works of the All-Union Institute of Plant Production)

Kok-Sagyz is one of valuable and promising technical plants in our socialist agriculture.

The first productive sowings of this plant began in collective farms in 1937. At the present time the fields with crops of this plant amount already to ten thousands hectare. The reason for such a growth is the tremendous demand for rubber in our developing industry (automobile, aviation, etc.). At the present time, the Soviet Union occupies the second place in the world and the first place in Europe in rubber consumption.

Nevertheless, this growth of sown fields was not associated with a simultaneous progressive increase of the productivity of kok-sagyz. For instance, for the last two years, the average crops of roots in USSR amounted along one-year plantations: in 1938 - 1.7 c/ha and in 1939 - 2.0 c/ha. Along two-year plantations in 1938 - 4.2 c/ha and in 1939 - 3.8 c/ha.

The poor yields of the kok-sagyz roots could be explained, according to our opinion, by the following reasons:

1) lack of a systematic care in cultivating kok-sagyz by means of creating the best conditions for production:

2) lack of at least improved seeds, if not varieties, suitable for definite conditions:

3) the gap between the production appropriation and the scientific gradual reproduction of the nature of kok-sagyz under the conditions of cultiva-

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tion, so that this plant would become in the near future a highly productive plant.

Darvinism teaches that a skillful cultivation of plants is a guarantee for improved plants. In order to direct the vegetative organism into correct development, it is necessary to create such conditions which would have great significance for its further growth and development, taking into consideration the specific biological peculiarities of the plant.

In every system of measures one of the links is always the leading and the specifying. Such a leading link in the system of agrotechnic during the given stage of appropriating kok-sagyz is, according to our point of view, the rational distribution of roots upon a field unit. This would provide kok-sagyz with: 1) enough nourishment, 2) the absorption of the energy from sun rays, 3) the necessary lot for a normal growth of the plant, 4) prevention of sprout loss and weed control.

The productive symptoms of kok-sagyz, as the swelling of the root, the formation and accumulation of rubber, depend entirely upon these factors.

Unfortunately, the optimal lots necessary for the nutrition of kok-sagyz have not been determined up to now, and this problem is the most complicated in the agrotechnic of kok-sagyz. In the existing agricultural rules we recommend a norm for sowing kok-sagyz seeds at least 3 kg/ha, with the width between rows of 44.5 cm. Under such a sowing norm, even with 60 percent of seed sprouts and 50 percent of sprout loss, the density of growth would reach two million plants per hectar. Such density has no theoretical basis and no practical advantage. As it is well known, kok-sagyz is a wild plant, it is only ten years under cultivation. During this very short time and with an unskillful growth, with almost full lack of selection work, we of course, could not expect basic changes in improving it. Therefore, the first task of science is the transformation of the nature of kok-sagyz into a highly productive plant. For this purpose we have two methods mutually connected:

1) the mass improvement of the qualities of kok-sagyz by means of applying the best conditions in developing it from generation to generation and 2) the production of highly productive varieties both in yielding capacity of the root mass and the rubber output.

History indicates that the formation of any cultivated plant depends upon the methods and technic of its production. Without any scientifically worked out agrotechnic which is based upon the biological peculiarities of each plant, it would be impossible to change its nature.

Unfortunately, many scientists-rubber specialists did not understand and still do not understand the close relationship between the conditions of plant cultivation. These scientists explain the entire complex of the factors of kok-sagyz yield by a dense sowing, disregarding the improvement of kok-sagyz under corresponding conditions.

It is unnecessary to prove that such breach between the conditions and concrete requirements of the plant's biology, and between the process of improving and the process of production leads to the situation, that, instead of improving the natural peculiarities of kok-sagyz (increase in weight, rubber content, etc.), the plant deteriorates. This was proven by experimental and productive data.

The advocates of the "yield of the general mass" of roots forget the most basic thing that the yield is not a phenomenon divided from all measures of production and natural peculiarity of the cultivated plant, but it is a result of the biological productivity of the given plant and of able cultivation. Therefore, in our conception, the cultivation of kok-sagyz under definite conditions of production not only provides a yield during vegetative period, but creates a definite type of an organism which is adapted to those conditions. By repeating these conditions from generation to generation, the productivity of the plant increases, because the factors of these conditions become indispensable and provide its maximal productivity. Table 1 fully proves this standpoint of Darvin.

Table 1

Conditions of cultivation and the productivity of kok-sagyz

Conditions of Sowing in 1939	Conditions in 1939	Root weight in g.	Rubber percentage	Absolute Rubber content
Lot No 40, Control	-	13.0	7.41	0.24
-	Seed posterity	23.0	5.53	0.32
Lot No 40, R 60	-	15.0	7.35	0.29
-	Seed posterity	37.5	4.21	0.40
Lot No 40, R 60 (fractional introduction)	-	17.0	9.52	0.42
-	Seed posterity	32.3	5.67	0.46
Lot 40, N 30 R 45 K 60	-	17.0	10.90	0.46
-	Seed posterity	34.6	10.79	0.93
Nutrition fields				
Control concentrated		10.7	5.80	0.16
	Control concentrated	16.0	3.48	0.13
20 X 20	" "	16.5	3.98	0.16
10 X 10	-	19.1	6.80	0.33
-	10 X 10	15.4	5.23	0.21
40 X 40	-	35.6	6.74	0.61
-	10 X 10	19.3	4.89	0.23
20 X 20	-	34.6	7.40	0.64
-	20 X 20	19.1	4.92	0.21
Control concentrated	20 X 20	13.2	3.93	0.13

Table 1 indicates that the conditions of cultivating the preceeding generation have great influence upon the biological productivity of the succeeding generation.

Without dwelling upon the analysis of well known factors which provide the yield of kok-sagyz root mass (nourishment, moisture, sowing terms, care, etc.) we consider it important to indicate the following moments. It is well known, that one of the basic problems of agrotechnic is control which deprive the plant of a considerable amount of nutritious substances, moisture, etc, under the accepted density of kok-sagyz standing, it would be impossible to execute weed control by weeding along the rows. If we add the slow growth of kok-sagyz during the first phase of its development (small rosettes, squeezed to the ground) we obtain a very sad picture.

The plantation of kok-sagyz could be contaminated not only by endemic field weeds, but also by dandelion which are of the same family as kok-sagyz, but do not bear rubber. According to their exterior, the dandelions without rubber are similar to kok-sagyz, but are much more viable than the regular weeds.

The dandelions without rubber are considerably more dangerous for kok-sagyz than the usual weeds.

The biological struggle for the living factors between close taxonomic units is stronger, since their selecting ability to thses factors are identical.

Externally the dandelions without rubber look like kok-sagyz, therefore unexperienced weeders think it is kok-sagyz and leave it in the field.

The danger of leaving the dandelions upon the plantation consists of the fact that they contaminate kok-sagyz since it is very difficult to differentiate them by their seeds.

Table 2

Comparative characteristic of the viability of kok-sagyz and of a plain dandelion (average after two years observations)

Name of Plant	weight of one root	weight of leaves	general weight	length of root	diameter of root	leaf length	leaf width	Amount of leaves upon 1 plant	Amount of Floriferi for 1 plant	Amount of seeds in one basket	
	in grams			In centimeters						sound	poor
Kok-sagyz (average of 10 plants)	3.4	24.6	28.0	21.0	3.0	20.0	2.0	16.0	13.0	89.0	4.0
Taraxacum officinale (average of 10 plants)	36.0	1094.0	1130.0	27.0	8.3	40.0	7.5	258.0	49.0	186.0	1.0

The data of table 2 was obtained upon a regular density of standing. Occasional contaminators were discribed - plants of plain dandelion, for whose control was used kok-sagyz which grew nearby.

This table indicates how much more viable is the plain dandelion in comparison with kok-sagyz. This emphasizes the fact that the control of weeds in general and of related weed in particular plays a very important role.

The next important moment connected with correct distribution of roots - is the loss of kok-sagyz under the conditions of plantational sowing which is widely spread in the South. Agrotechnicians and physiologists are unable to prevent this undesirable phenomenon and are unable to explain why and under which conditions this phenomenon occurs.

Based upon a series of observations under the conditions of industrial sowing in state farms which cultivate kok-sagyz, as well as the experimental registration of plants' loss upon various fields of nutrition, we are inclined to think that the loss of kok-sagyz is a result of the extreme density of plant standing, accepted for plantational sowing.

According to accepted norms of sowing and in between rows of 44.5 cm., the average distance between plants reaches in a row 0.3-0.4 cm. Under such conditions the roots carry on a fight not only for food and moisture, but for flourishing space as well. It is superflous to prove that this reflects harmfully not only upon the growth of the roots, but upon the general biological resistance of kok-sagyz, its blooming, seed formation, rubber content, etc., as well.

The roots of kok-sagyz, under the lack of normal conditions for further growth, intermingle, shaping distorted forms which hamper the normal growth process. Due to the arrest of the growing process and of the biological struggle, the roots resist poorly inner and exterior unfavorable effects before the beginning of the so called "period of rest". As it is well known, during the period of rest the organism stops almost entirely its growing process, and life energy is so feeble that it does not permit any resistance to the unfavorable conditions (high temperature, atmospheric or soil drought, poor transfer of nutritional substances and moisture), and the plants die. The period of rest causes more phenomena than the ones above indicated, but we are able to prevent the death of the plant upon the plantations by means of regulating its nourishing field, at least.

The data which we obtained in the process of observations from the sprouts up to harvesting upon various fields of nutrition (even under the conditions of Leningrad oblast', where the period of rest has not been noticed with a one-year sowing) confirm our observations (table 3).

Table 3

The density of kok-sagyz standing in relationship to the nourishing lot*

Experiment variations	Number of plants upon one running meter *****					
	[illegible]/VI	7/VII	1/VIII	15/VIII	1/IX	1/X Harvest
Control	103	72	61	59	53	50
10 X 10	10	10	10	9.9	9.9	9.8
45 X 5	20	19.7	19.7	19.5	19.5	19.5

*Registration was carried out upon all repetitions of the nourishing field in three repetitions in each experiment variation.

Table 3 indicates that in control the amount of plants decreases twice, while upon a nourishing field of 20x20, 95-100 percent plants are preserved. The same data were obtained at Kursk station.

With a uniformed distribution of plants, the surface part of kok-sagyz has a creeping rosette-like form. With a nourishing field, for instance, of 20 x 20 cm. there would not be a single cm. of soil surface without being covered with leaves. The sun rays will fall directly upon the surface of the leaves and will utilize them. With 1.5 million plants per hectar, at least 300 plants grow upon 1 m^2, while with a normal nourishing field only 50-60 plants should grow upon 1 m^2. It is quite obvious, where the ray energy which falls upon the same field surface will be utilized.

The sun energy, according to the direct experiment, is one of the leading factors in the formation of rubber. Therefore, we have to strive to follow the instructions of K. A. Timiriasev in creating all the necessary conditions (for kok-sagyz) in utilizing fully the energy of sun rays in "the working surface of the leaf".

The advocates of a dense sowing consider their basic argument the height of the general yield of the root mass, without registering the loss of small roots (not more than 3-5 g.) during digging, especially during the drought under primitive conditions (in granaries, attics, etc.) and without registering the absolute yield of rubber. Nevertheless, the yield of kok-sagyz could be judged according to a field unit, and this depends upon the percental content of rubber and upon the increase of the weight of the root mass; the increase of the general weight of the roots depend upon two factors: upon the increase of the individual weight of the root (achieved by creating normal fields at the expense of rarified sowing) and upon the increase of the general weight of the roots (at the expense of dense sowings). We brought sufficient arguments concerning the unfitness of dense sowings.

Let us now turn to factual material which we obtained during the three-year work.

The experiments were carried out in the city of Pushkin (leningrad), at the experimental station VIR, upon a light peat-podzol soil with pH= 6.76; the precedents for the 1937 experiment were: in 1936 - winter wheat, in 1935 - perennial waste land; for the 1938 experiment: in 1937 - winter wheat with a mineral feeding calculating N45 P60 K75, in 1936 - fallow land plus dung 30 t.: for the experiment of 1939: in 1936 - clover, 1937 - spring wheat, in 1938 - flax plus 40 t/ha of dung under deep plowing (spring of 1939).

The timings of the sowings: in 1937 - 15/V, and in 1938 and 1939 - 12/V. The digging was carried out during the appearance of 2 and 3 pairs of leaves. In 1937 the experiment was carried out without repetitions upon the fields of 150 m^2 each; the size of the field in 1938 was 100 m^2, double repetition; in 1939 the size of the field was the same, repetition four times. The harvest time: in 1937 and 1938 - 5/X, in 1939 - 28 and 29/IX.

The registration of the yield was according to the weight of the roots along the entire field. Estimation of the rubber percentage was according to the method of Stolbin - Koialovich.

The results of the experiments according to yielding capacity, root weight and the content of rubber are given in table 4.

Table 4

The yield of the root mass and the rubber content as related to the nourishing field

Experiment variations	Amount of plants per 1 ha (in thousands)	Average weight of the root (in g.)	Yield (inc/ha)	Rubber content (in percent)	Absolute rubber yield	Rubber yield ~~(in kg/g.)~~
1937 r.						
1. Control	1500	7	105.0	4.8	0.07	105.0
2. 10 X 10..............	500	16	80.0	7.77	0.31	165.0
3. 20 X 20	250	17	42.5	8.5	0.34	85.0
1938 r.						
1. Control	1000	10.7	100.30	5.80	0.15	150.0
2. 10 X 10	500	19.1	95.50	6.80	0.5[illegible]	155.0
3. 20 X 20	250	34.6	86.50	7.40	0.63	157.5
4. 30 X 30	111	27.3	30.30	7.11	0.43	47.73
5. 40 X 40	62.5	35.6	22.25	6.74	0.59	36.77
1939 r.						
1. Control	1000	9.3	102.0	4.12	0.09	99.0
2. 10 X 10	500	18.16	90.80	5.33	0.24	120.0
3. 20 X 20	250	21.33	53.32	5.32	0.28	70.0
4. 30 X 30	111	24.23	26.89	5.81	0.37	41.0
5. 40 X 40	62.5	20.9	13.06	5.66	0.29	18.12
6. 45 X 5	440	17.0	74.80	5.27	0.27	96.8

Table 4 indicates that the root weight increases at the average between 10 g. and 25 g. The content of the rubber fluctuates as well, increasing double with some variations, in comparison with control (dense sowing).

The analysis of obtained data indicates that the highest yield of rubber is obtained upon a nourishing field of 10 X 10 and 5 X 45 or approximately that size. These nourishing fields enable us to carry out the entire complex of agricultural measures (loosening, feeding, weed control) and create the necessary conditions for the improvement of the nature of the plant itself. With a dense standing the roots become "mice tails". At the same time a good half of the small roots from a dense sowing is lost during transport from plantations to burts and from burts to the factory.

Once the famous transformer of nature, Ivan Vladimirovich Michurin, observed very keenly: "We want from the orchard fruits for food, and not woods for fuel". And we must create a kok-sagyz with large roots and a good content of rubber.

Let us now discuss the problem of the seed quality, depending upon various nourishing conditions (nourishing fields). We now know well that the conditions of production has direct effect not only upon the vegetative organs in sense of determining the yield, but upon the seeds as well, whose formation is related to the physiological condition of the organism. Our data confirm that (table 5).

Table 5

Yield and quality of kok-sagyz seeds as related to nourishing field

Experiment variations	Amount of flower beds upon 1 plant	Amount of seeds in calathide		Average percent of seeds for calathide		Absolute weight (in mg.)	Germination energy	Sprouting (in percent)		The blooming percent (on 1/X)
		SOUND	Poor	Sound	Poor			Sprouted	Hard	
1938 r.										
1. Control..........	26.6	34.0	11.0	78.2	21.8	410	37.0	80	-	70.3
2. 10 X 10.........	38.9	45.0	2.0	96.38	3.62	470	41.5	76.5	-	98.6
3. 20 X 20.........	51.0	45.0	2.0	96.38	3.62	470	57.5	78.0	-	98.9
4. 50 X 50.........	53.7	59.0	0.9	98.5	1.5	480	54.0	78.0	-	98.3
5. 75 X 75.........	52.6	45.5	0.4	99.1	0.9	470	47.0	67.0	-	96.8
1939 r.										
1. Control.........	31.2	78.0	10.0	88.64	11.36	480	36.0	64.0	30.0	74.2
2. 10 X 10	47.5	81.2	2.7	96.78	3.22	500	50.0	77.0	30.0	99.3
3. 20 X 20	55.6	79.0	3.0	96.34	3.66	500	72.0	72.0	20.0	99.7
4. 30 X 30	61.3	80.7	1.3	98.41	1.59	500	48.0	90.0	8.0	100
5. 40 X 40	47.8	75.6	1.6	97.77	2.21	480	42.2	92.0	6.0	100
6. 45 X 5	45.3	84.1	1.6	99.53	0.47	440	39.0	55.0	38.0	99.3

Table 5 indicates that the basic elements which are characteristic of the yield and the seed quality vary, according to the nourishing lots. This change depends upon such elements of seed yield, as the amount of flowers (receptacles), amount of the seeds in the calathide, the percentage of poor seeds, the percentage of sprouting, etc. A series of indexes (percentage of poor seeds, the germinating energy, sprouting) indicate the advantage of more wide nourishing fields.

All these physiological qualities of seeds determine not only the yield, but the further development of the succeeding posterity as well. The greater is the germinating energy, the better the sprouts. According to our three-year observations, during the first year on a control field only about 70 percent of plants blossom. But in a nourishing field of 30 X 30 or 40 X 40, 100 percent of the plants blossom. As we know, under the conditions of plantational sowing, under various geographical conditions, the blooming during the first year reaches the maximum of 50 percent. It is not an accident that the former management of rubber producers of People's Commissariat of Agriculture of USSR determined the norm of seed harvest from one year plantation - 3-5 kg/ha, and from two year plantation - 30-40 kg/ha. One of the decisive moments in the increase of the sowing field under plants which carry rubber (particularly under kok-sagyz) is the availability of the seed material. It is known that individual advanced workers by means of a skillful production of kok-sagyz achieved during the fall sowing the record seed yield of 215 kg/ha (A. A. Parkusina from the collective farm "Bol'shevik", of Belopol'sk raion, Sumsk oblast', USSR).

Of great significance is the nourishing field for kok-sagyz which under-went the selection-seed production work. The basic and the only method of selection for the production of new varieties is the direct selection. During the kok-sagyz selection we must take into consideration such symptoms as the ability of forming rubber, the general strength of the plant and its form, the root weight, resistance to various diseases, etc. For a full manifestation of any beneficial symptom we must create specific conditions upon whose background we could notice, as soon as possible, the biological peculiarities of the selected plants. Such condition is first of all the production of kok-sagyz under an optimal nourishing field. With a standing density of 1.5 million plants per hectar, it is impossible to select, under field conditions, the plants and collect seeds from them in the first year of their life. Due to great density, the weight of the root is very small (8-10 g.). This circumstance makes it impossible and little effective the selection, according to this most important symptom.

But under a normal nourishing field this symptom (root weight) increases drastically, surpassing some times by 8-10 times the above indicated figures. Along with that we may indicate also another basic symptom - the blooming and the fruit bearing of kok-sagyz.

Then we may ask: what is the matter? Why do some agrotechnicians advocate so persistently the dense sowing? They bring forth two arguments: 1) at the present time we do not have cultivated varieties which would be able to utilize fully the larger nourishing fields, and the existing popular material "does not react" to the cultural measure of production, especially to the nourishing field; 2) in comparison to a rarified sowing, the dense sowing yields a greater amount of roots.

All the data given above which we obtained through experiments, refute completely all these arguments of narrow approach to the solution of a great problem - the improvement of the wild plant by means of educating it and by selection of the best species in the entire mass.

Conclusions

1. The base for the agrotechnic of kok-sagyz upon the given stage of its productive appropriation is the normal distribution of the roots by means of creating nourishing fields which provide individual care for the plant.

2. The increase of the nourishing field up to a certain norm manifests a drastic positive effect upon the general development of the plants (roots and leaves), which determines the process of rubber formation.

3. Depending upon the conditions of production, namely depending upon the nourishing field, the root weight changes drastically, thus the general yield of the entire root mass.

4. With the change of the nourishing field, all the characteristics and qualities of the seeds change: the germination energy, sprouting, presence of "hard" seeds, absolute weight, and the sterility of the calathide decreases. This gives us the right to be convinced that the conditions for production are the basic and leading factors for the cultivation of kok-sagyz.

5. A rational distribution of kok-sagyz roots enables the cleaning of the plantation from contaminators, including dandelions which do not produce rubber.

6. The only criterion for kok-sagys yield could be only the absolute production of rubber from a field unit.

7. The problem of optimal nourishing fields and of the measures for their formation (sowing norms, timing for digging, the form and the size of the nourishing lot) is the most actual problem of kok-sagys agrotechnic. Our data indicate that by distributing 300-400 thousand plants upon one

hectar a higher rubber yield could be achieved and also a more normal development of the individual plant. This nourishing lot could be created at the present time in two ways. Good indexes were obtained in a field of 45 x 5. It is also possible, however, to transfer to 2-3 rows sowing with the distance between the rows of 10-15 cm. and in the rows (after digging) 10 cm.; the distance between 2 and 3 line rows for mechanization of the sowing, tilling and harvesting - 45 cm.

MJA - 11-27-51

Ovcharov, K. E., and Kiskovskaia, E. K. Effect of growth substances on the fruit formation in strawberry (Fragaria bucharica) Akad. Nauk SSR 59: 585-586 Jan. 21, 1948. 511 P444A

Transl. 253: Growth Substances

Translated from the Russian by R. Dembo

(Presented by the academic N. A. Maksimov, 15/XI, 1947)

Available data (1,2) indicate the fact that the blossoms of strawberries, treated by the compounds of growth substances are able to yield seedless berries. Along with that was discovered that the treatment of strawberries by growth substances leads to the improvement of berries' germination and to the increase of their size. These factors incited us to carry out corresponding experiments with wild growing strawberry (*Fragaria bucharica*) which grows in the mountains of Tadzhikistan, along the canyon of Khodzha-Obi-Garm, at the altitude of 2000-2200 m. over sea level.

It is interesting, that this strawberry, despite abundant blooming and despite the presence, as it seems, of perfect blossoms, does not form any berries. We tried to achieve fruit production with this plant by applying growth substances.

As growth substances were taken the following compounds: 2.4 dichlorphenoxy acetic acid, 2.4 dichlorphenoxy-n-oil acid and a-naphthlacetic acid. We decided upon these substances because they are already known as good activators for fruit formation (2). On May 8, 1947, during the period of mass blossom, the bushes of *Fragaria bucharica* which grow at the altitude of 1100 m., at the Varzob Mountain Botanical Station, were sprayed by 0.01 percent solutions of the indicated compounds.

Already two weeks later, after the treatment of the blossoms with 2.4-dichlorphenoxy-n-oil acid and a-naphthylacetic acid, we observed fruit formation, and three weeks later, after treatment, the size of the berries reached 1.1 x 0.9 cm. (drawing 1).

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Drawing 1. Influence of a-naphthylacetic acid upon fruit formation in wild strawberry: 1 - without treatment (control'), 2 - treated by a-naphthyl acetic acid.

The amount of fruits registered on June 2, is indicated in table 1.

Table 1

Amount of berries formed in Frugaria bucharica after treatment of the blossoms with growth substances

VARIATIONS	Amount of treated blossoms	Amount of formed fruits
Control'	138	0
2.4-dichlorphenoxy acetic acid.....	56	2
a-naphthylacetic acid.	80	15
2.4-dichlorphenoxy-n-oil acid.........	98	31

The table indicates that the treatment of Fragaria bucharica' blossoms by a-naphthyl acetic acid promotes fruit formation. Nevertheless, the most effective of all concentrations was 2.4-dichlorphenoxy-n-oil acid.

The experiments which we carried out in the canyon of Khodzha-Obi-Garm, namely at the locality where Fragaria bucharica grows in wild condition, and also repeated experiments at the Varzob mountain botanical station in July, i. e. during the period of second mass blooming, also yielded good results.

The given results indicate that with such plants, like Fragaria bucharica, in which under usual conditions function only pollens (3), with the help of growing substances we are able to produce fruit formation.

The Timiriazev Institute of Plant
Physiology of the Academy of Sciences
of USSR

Presented
15/XI, 1947

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MJA-11-28-51

Rakitin, IU. V., and Kritskaia, L. M.
Retardation of bud burst in fruit trees with the aid of chemical preparations. Akad. Nauk SSR. Dok. 76: 295-297. Jan. 11. 1951. 511 P444A

Transl. 254: Growth Substances

Translated from the Russian by R. Dembo

254

Presented by academic N. A. Maksimov, 17/XI, 1950

Spring frosts which often occur during the blooming of fruit trees cause great harm to orchards. Killing the blossoms and harming germination, spring frosts decrease the yield considerably or even destroy it completely.

Aiming to protect the blossoms against the destructive effect of spring frosts, the following protective measures are applied in fruit production: fumigation which prevents the radiation of heat by soil and by plants; artificial increase of air temperature with the assistance of petroleum heaters; delay in the beginning of plant vegetation by means of retardation of soil thawing which is achieved by trampling the snow in the root circles (1,2). But all these measures do not solve the problem as a whole, since they are hard to be executed on a large scale.

Starting with 1945, we undertook a series of orienting experiments in retardation of the beginning of vegetation of fruit plants with the assistance of chemical compounds which affect considerably the growth processes (3,4). After having obtained positive data, as a result of these experiments, we decided to study this problem more circumstantially.

In this article we describe our research which was carried out with seed plants. The work was carried out in the Lenin state farm near Moscow during the period from 1948 to 1950 inclusive*.

* In this article are circumstantially described the experiments of 1948-1949; during 1949-1950 the experiments were repeated and their results were analogous to those described in this article.

As objects for research were taken 17-year old trees of three apple varieties - Moscow Grushevka, Cinnamon triped, Plain Antonovka, and five-year old trees of two pear varieties - Thinleaf and Seedless.

Two compounds were tested: potassium chloride a-naphthyl acetic acid (KNU) and 2.4-dichlorphenoxy acetic acid (DU). Both compounds were applied in the form of water solutions in the following concentrations: 0.0125; 0.025; 0.05; 0.075 and 0.1 percent.

The experiments were carried out upon individual branches of the third order. Upon each tree were taken out 6 branches. One of them served as control, and the others were sprayed by the solution of some of the compounds (one branch upon each concentration of the compound).

The effect of the compounds was compared along seven terms of treatment: 25/IV, 3/VI, 20/VI, 3/VII, 20/VII, 10/VIII, 10/IX. During these terms of spraying, the experiments were carried out in two repetitions (two trees for each compound.) The spraying was done in the mornings, the branch surface was moistened completely.

The research indicated that, under the influence of chemical compounds, the bud burst is considerably retarded and that the blooming starts later. We discovered simultaneously that the compound DU has a more retarding effect than KNU. But the application of DU caused a series of undesirable effects which makes this compound unfit for our purpose. While hampering the bud burst, compound DU depressed considerably the growth of sprouts, appeared to be more toxic and caused formative transformations with the growing leaves. It is characteristic that these formative transformations manifested themselves not only during the year of treatment, but during the succeeding vegetative season as well.

Due to the unfitness of DU for the retardation of bud burst, we do not dwell more circumstantially upon the experiments with this compound.

The spraying which was carried out with the solutions KNU on 25/IV, 1948, i. e. during the first of seven accepted terms for treatment, was little effective. The retardation in bud burst (during the year of treatment) did not exceed in this case 1-2 days and could be noticed only with the highest concentrations of the compound (0.075 and 0.1 percent). The treatment during the other terms was more effective.

In connection with the term of treatment and with the concentration of the compound in the solution the retardation of bud burst upon apple trees in spring of 1949 was the following: fruit buds from 3 to 10 days, leaf buds from 6 to 15 days.

As to pear trees, due to the fact that the trees of these plants, which were in our possession, did not enter the stage of fruit bearing, we were able to observe upon them the time of burst of leaf buds in the given pear varieties retarded in spring of 1949 for a period of 3 to 20 days.

Observations indicated that with the increase of compound's concentration, the retardation of the fruit and leaf bud burst increases. During the treatment of branches in June and at the beginning of July, the solutions which contain 0.0125 and 0.025 percent of the compound, caused approximately the same retarding effect as the stronger solutions during the succeeding terms of spraying.

During the year of treatment, especially by spraying in June and at the beginning of July, the leaves, and sometimes young sprouts of treated branches as well, manifested epinastic bendings. With two highest concentrations of the compound (0.075 and 0.1 o/o) the treatment at the given terms caused also the retarding of the sprouts and of the fruits, and in a series of cases caused burnings of leaves and the tips of young sprouts. During the succeeding terms of treatment, the application of the compound under high concentrations (0.05, 0.075 and 0.1 percent) caused epinasty and accelerated the ripening of fruits by 7-10 days.

We must mention also the fact that both chemical compounds (KNU and DU), by all applied concentrations and by all terms of treatment, excluding the April treatment, decreased considerably the falling of fruits in comparison with control.

We discovered that, with the retarding of bud burst, by means of chemical compounds, in the plant occurs a weakening in the process of respiration and a decrease in the activity of oxidizing fermentations. Consequently, this indicates that the retarding in the bud burst is caused by the decrease of the intensity in exchange of substances.

Thus, we may arrive at the following conclusions:

1) Among the tested compounds for the retarding of bud burst the most fit is the compound KNU.

2) The best time for plant treatment is the period of termination of sprouts growth. In our experiments the best results were obtained in bud burst retarding by treating the plants in the first or second half of July, depending upon the species and the variety of the plant.

3) The optimal concentration of the compound, depending upon the plant's species and variety, was in our experiments 250-500 mg. for one litr of water.

4) The bud burst retardation, achieved with the assistance of chemical compounds, is caused by the decrease of the intensity of exchange

of substances.

Timiriazev Institute of Plant Physiology of the Academy of Sciences of USSR

Presented 17/XI. 1950

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End of Article

MJA- 11-28, 1951

Mazlumov, A. L.
Selection of Sugar Beets
Gos. Izd.Selkhoz Lit-ry,
Moskva, 1950

Transl. 255: Sugar Beets
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in part, by R. Dembo

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Selektsiia sakharnoi svekly
(Sugar beet selection)
Sel'Khozgiz, 1950: 112-175 66 M45

255: Sugar Beets

Translated by R. Dombo

The author is a laureat of Stalin prize,
Doctor of agricultural Science

PROGRESS IN SUGAR BEET SELECTION

Every sugar beet selection station of the Soviet Union, in some degree, made some progress in the field of studying sugar beets, as a plant and as a product. Every station worked out new directions and methods for selection, discovered new regularities in the life of sugar beet plants. This is natural, because, without theoretical assumptions, it is impossible to carry out scientific work. But in selecting agricultural plants, the progress of science should be realized in varieties, first of all. Therefore, we think that the work of any selection station could be best evaluated according to those varieties which it delivers to production. This is the most correct criterium, and we will apply it in our survey of the selection progress of Ramon station. (The progress of other selection stations is not considered in this survey.)

GENERAL CHARACTERISTICS OF SUGAR BEET VARIETIES PRODUCED BY RAMON STATION

The work on selection of sugar beets at the Ramon station is convenient to analyze, according to periods. Each period is characterized by its peculiarities in the field of selection methods, selection schemes, scales and technics in carrying out the selection process,etc.

During the period between 1920 and 1930, when the work on sugar beet selection in the Soviet Union was fully established and strengthened in scientific and organizational sense, the sugar beet varieties, produced by Ramon station, occupied yearly the first place in sugar yield from every hectar and were widely used in production.

Sugar beet selection at the Ramon station began in 1922. The first variety 25-42, produced by the station, received in 1925 an outstanding rating. Three years later, at the collective variety testing of mother seeds, in 1928, the Ramon sugar beet variety 28-13 occupied in USSR the first place in sugar harvest which is shown in table 29.

Table 29

Results of collective variety experiment during 1928
(the average along the Union)

The name of the selection station	No. of Var.	Tuber yield (in c/h)	Percent of sugar	SUGAR YIELD in c. from h.	order	group
Ramon	28-13	292	19,0	55,3	1	I
Khar'kov	28-15	291	18,6	54,1	2	I
Ramon	28-06	284	19,0	53,7	3	I
Ramon	28-05	285	18,9	53,7	4	I
Uladov	kp.ct.	287	18,8	53,6	5	I
Verkhniachock	28-24	278	19,3	53,6	6	I
Ivanov	28-19	284	18,7	53,4	7	I
Il'inotskaia	28-01	285	18,7	52,8	8	II
Tetkin	28-25	280	18,8	52,8	9	II
Uladov	28-16	279	19,0	52,7	10	II
Veselopodo	28-29	277	18,9	52,3	13	II
Belotserkovskaia	28-26	274	19,0	51,7	15	II
Verkhniachoskaia	28-18	266	19,2	51,1	17	II
Tetkin	28-07	270	18,9	51,0	18	II
Il'inotskaia	28-02	274	18,3	50,1	21	III
Nemerchanskaia	28-10	258	19,4	49,9	24	III
Nemerchanskaia	28-09	259	19,3	49,8	25	III
Mironovskaia	28-20	263	18,9	49,4	27	III
Il'inotskaia	28-22	234	19,8	46,2	30	IV
Mironovskaia	28-04	238	19,3	45,8	31	IV
The average of the varieties		269	19,0	51,1		
Exactness of the experiment, R percent		0,9	0,3	0,9		

According to the data of N. P. Korbut (VNIS, 1928), during the years from 1926-1928, individual selection station of Main Sugar made the following progress in producing the best sugar beet varieties: sugar harvest for the record worker, expressed in perecentage to a single standard of 1926, yielded at Ramon station 109, Uladov - 109, Ivanov - 108, L' gov - 107, Verkhniachesk - 105, Ialtushkov - 102, etc.

Not only in USSR, but abroad as well, did our varieties compete with foreign sugar beet varieties. Thus, for instance, in 1928, at the experimental station of the state North Dakota (America) the Ramon variety E occupied the first place in production, and in South - the second place, among the 18 varieties which participated in the contest.

In 1929, during the variety testing in Kvasov (Poland), the Ramon variety F. 29-10 occupied the first place in sugar selection, among 15 numbers which were compared.

In Canada, upon the island of Prince Edward and in the state Ontario, the sugar beet varieties of Ramon station also occupied the first place.

The progress in sugar beet selection was at that time so important, that the varieties of Ramon station were delivered to production without preliminary testing, and afterwards, in collective variety testing, they received high ratings.

From 1922 until 1930, the Ramon station delivered to production 14 highly productive sugar beet varieties. Their rating is indicated in the following table.

Table 30

RATING OF SUGAR BEET VARIETIES OF RAMON STATION WHICH WERE DELIVERED TO PRODUCTION DURING THE PERIOD 1922-1930

No. of the varieties	Years of Exper.	Amount of Var. under Experiment	Yield of tubers (inc/h)	% of Sugar	SUGAR YIELD inc/h	Place Order	$ of M variety	Exactness of the experiment D Percent
26-14	1926	28	251	19,35	48,4	4	103,2	0,85
26-13	1926	28	254	19,09	48,3	5	102,9	0,85
27-03	1927	39	309	19,25	59,3	2	108,4	0,77
27-27	1927	39	304	19,19	58,2	5	106,3	0,77
27-31	1927	39	298	19,36	57,3	11	104,7	0,77
28-13	1928	31	292	18,95	55,2	1	107,9	0,90
28-05	1928	31	285	18,90	53,8	3	105,1	0,90
28-06	1928	31	283	19,04	53,7	4	105,0	0,90
28-27	1928	31	278	18,97	52,3	10	102,2	0,90
29-32	1929	40	199	17,99	36,6	3	106,7	1,27
29-11	1929	40	198	17,92	36,5	4	106,3	1,27
30-11	1930	44	306	18,52	56,2	3	105,4	0,86
30-09	1930	44	302	18,60	55,7	7	104,5	0,86

At that time, the elite seeds were delivered to production, according to the principle of average rating. If the variety, according to the basic symptom - the sugar yield from one hectar - surpassed the average of the varieties in total results of the entire Union (along all varieties), it usually was delivered for mother sowings. Among them should be especially indicated the following sugar beet varieties.

1. Variety 27-03, which occupied the first place, according to yielding capacity, in Voronezh oblast', and second place in the Union. It was produced by mass selection.

2. Variety 28-13 - the all union recordist, according to productivity. Produced by mass selection.

3. Variety 28-06 which differed by high yielding capacity and high saccharinity and which could belong to better varieties with combined symptoms. It occupied the first place, according to sugar yield in Voronezh oblast'. Formed by the method of group selection.

4. Variety 30-11 is characterized by better quality and high responsiveness to the improved conditions of the product. It occupied in the Union the third place, according to production, under the conditions of winter field. Under the conditions of fallow land, this variety occupied the first place, indicating the general increase in sugar yield by 29.6 c. from 1 hectar, in comparison with the winter field. It was produced by the individual selection method.

5. Variety 27-27 - combined an exceptional ripening speed with a high production of sugar. During early digging (First of September), it occupied the first place in sugar harvest from hectar. It was produced by the individual method of selection.

Starting with 1931, for the first time in the Union, the delivery of sugar beet varieties for industry was carried out, not according to average rating, but according to the principle of material raioning, i.e., according to the rating of the effectiveness of the variety under specific natural conditions.

The sugar beet producing regions of Voronezh and Tambov oblast's as well as the Southern regions of Kursk oblast', were included into the zone of activity of the Ramon selection station. During those years we worked out and put into effect our method of selection, whose basic features are discussed in the preceeding division. This is most important, because, without any correct method in the work, everyone could become confused and waste the time. Unvoluntarily, we recall the suggestion of Stalin on the meaning of theory. In an address at the conference of agrarian-marxists, Stalin said: "It is known, that theory, if it is really a theory, provides the workers with a strength of orientation, clarity of the perspective, self-confidence in the work, faith in the victory of our purpose". (Problems of Leninism, edition 11, page 275).

Two famous events promoted the further development of the selection science at the R amon station. In 1937, at the reception of scientific workers of Main Sugar, A. I. Mikoian placed a task before the selectioners - to deliver to the country new highly productive sugar beet varieties with combined symptoms of high yielding capacity and with high saccharinity, non blooming and resistant against mound rot. Our country is interested in the maximal sugar yield not only from hectar, but from a unit of the raw material weight. Therefore, when the sugar beet varieties were delivered for production, the State Commission began to pay more attention, besides of sugar from hectar, to the percentage of sugar in sugar beets, to non blooming, to the resistance against mound rot, etc., i.e. to those symptoms which produce, at the end, the largest production of white sugar in the factory. The selectioners concentrated their attention to the production of such sugar beet varieties which would yield high yields of sugar both from hectar and during the refinery in the factories, and would possess the smallest amount of negative symptoms.

At the All-Union conference of sugar beet selectioners and seed producers which took place at the Ramon station in 1939, a great progress was made in agrobiological sense in the field of sugar beet selection. The conference discussed the problem concerning the unchangeability of the genotype, with the change of conditions of the environment. It considered as incorrect the gap between selection and seed production which then existed and which was expressed in the fact, that varieties, under the process of propagation, did not undergo any improvement, and the very process of reproduction was carried out mechanically, without the assistance of the selectioner.

A fight started against many varieties and against frequent change of sugar beet varieties in production, as a result of which the new varieties were not only superior, but even inferior to the old varieties. The principle of long utilisation of the valuable variety in industry became the basic principle in selection-seed production work.

The Ramon station started its active work, according to the suggestions made by A. I. Mikoian and according to the decrees of the All-Union conference of sugar beet selectioners.

The great work, which has been carried out on sugar beet selection at the Ramon station, was not in vain. It manifested great progress already in

1938. In 1938, the new variety of Ramon station R. 1537, was the All-Union recordist at the sugar beet state variety testing.

The state commission on variety testing of sugar beets made the following statement in respect to this variety: "In 1938, the variety R. 1537 of the Ramon Station which is characterized, besides its yielding capacity, by its lowest percentage of the appearance of blossoms, is a variety of little nitrogen and little sensitive to black leg". (N.P. Korbut, Summary of work on sugar beet variety testing in 1938, p. 16).

The general rating of useful characteristics of sugar beet variety R. 1537 is indicated in the data given in the following table.

THE RESULTS OF THE STATE SUGAR BEET VARIETY TESTING DURING 1938
(THE AVERAGE ON THE UNION)

The name of the selection station	No. of Var.	Yield of tuber (inc/h)	Sugar %	SUGAR-COLLECTED (inc/h)	Order	Group	The order, according to non-blooming
Ramon	1537	268	18,6	49,8	1	I	6
Ivanov	1531	269	18,3	49,2	2	I	13
Klein-Wantzleben (Germany)	N	262	18,6	48,7	3	I	1
L'gov	1533	257	18,6	47,8	4	II	4
Uladov	1526	250	18,9	47,3	6	II	33
Belotserkovskaia	1550	254	18,6	47,2	7	II	25
Dippe (Germany)	N	255	18,4	46,9	9	II	5
Biiskaia	1549	256	18,3	46,8	10	II	23
Zapotil (Chechoslovakia)	N	245	19,0	46,6	11	II	7
Verkhniachoskaia	1514	244	19,0	46,4	14	III	27
Vil'moren (France)	C	245	18,7	45,8	21	III	19
Uladov	1030	245	18,6	45,6	247	III	20
Dobrovitsy (Poland)	N	241	18,9	45,5	26	III	16
Khilleskhob (Sweden)	N	238	19,0	45,2	28	III	3
Voganka (Chechoslovakia)	Z	233	19,2	44,7	34	IV	8
Pervomaiskaia	1545	229	18,9	43,3	38	IV	41
Veselopodolianskaia	1519	224	19,3	43,2	39	IV	15
Kal'nik-Veselopodolianskaia	1521	223	19,3	43,0	40	V	22
Ianash (Poland)	Z	208	19,6	40,8	41	VI	17
Klein-Wantzleben (Germany)	ZZ	205	19,7	40,4	42	VI	2
The average of varieties		244	18,8	45,8			
The preciseness of the experim. in percent		0,8	0,5	0,9			

In this table are indicated the characteristics of every best variety of Soviet and foreign sugar beet selection which occupied the highest place in respect to sugar yield from hectar. As we see, the variety R. 1537 occupied the first place, according to productivity. It kept its high record on sugar yield during the succeeding years as well: in 1939 - the second place, in 1940 - third place, in 1945 - first place. These average ratings are interesting in that sense, that they, first of all, indicate the rich, hereditary base of the variety R. 1537, second, its ecological plasticity, and, third, its generative immunity to seed propagation without selection. Only with these characteristics, is sugar beet variety able to occupy the first places, in various years, among the mother and factory seeds, in respect to sugar yield average in the Union.

The variety R. 1537 is for raion utilization only, despite its rich hereditary basis and wide ecological plasticity. In Southern and Eastern regions of sugar beet industry, the useful symptoms of this variety are manifested in highest degree. During the years with insufficient amount of rainfall, in the regions of short vegetative periods, this variety is always the victor, as the drought resistant and fast ripening one. (drawing 12).

During the years of the Great National War, the Ramon station produced and delivered for production a new sugar beet variety R. 306. It occupied in 1944 and 1945 the first place, according to its productivity in various regions - from the Western Right Shore Ukraine up to Altai and Central Asia.

Sugar Beet variety R. 306 is of little blooming and is characterized by high yielding capacity and high saccharinity. This variety is obtained, as a result of crossing four components. Two of them manifested, at the

Ramon station, during drought years, highest productivity as if growing under regular conditons (45 X 20 cm.), and the other two - in a nourishing lot of 45 X 40 cm. The formation of the variety was as follows: a seed mixture was produced, with the calculation of 25 percent of seeds of each variety, and it was delivered to the repsoductive sowings, in Petrovskii sugar beet state farm in 1942. The mass crossing was done at the stage of seed elite, in 1943.

In the state variety testing, in 1946, the All-Union recordist, as far as sugar yield is concerned, was the sugar beet variety of Ramon station R. 407. The high rating which it received in 1945 was confirmed in 1946 as well.

In the variety testing of 1947 and 1948, a new variety of Ramon station, R . 632 stood out. In 1947, it occupied a record place, according to productivity in the central zone of RSFSR (Voronesh and Tambov oblast's), in Northern zone of RSFSR (Kursk, Tul'sk and Penzen oblast's), in Eastern and South-Eastern zones of the Right Shore of the Ukrainian SSR (Kirovograd and Kiev oblast's), in South-Eastern zone of the left shore of Ukrainian SSR (Poltava, Kherson and Sumskaia oblast's), in Drogobychesk oblast's in Krasnodarsk and Altai krais and in Kirgisian SSR. Good productive ratings of this variety were confirmed during variety testing in 1948. This variety was produced from the old variety R. 1537.

The variety R. 632 is characterized by little blooming, high yielding capacity and good saccharinity. The state commission on variety testing of sugar beets counts this variety, as one of the best varieties of Soviet selection in respect to sugar yielding capacity.

In the state variety testing of 1949, two new varieties of the Ramon station, R. 831 and R. 832 stood out. In the zone of the Ramon Station, the variety R. 831 occupied, according to sugar yield, the first place, manifesting high yielding capacity, high saccharinity and slight blooming. Both these varieties are delivered for reproductive sowings in 1950.

From 1938 to 1948, the Ramon station produced 14 sugar beet varieties, valuable for production. The characteristic of the best among them are indicated in table 32.

Table 32

DRAWING 12. THE ROOT SHAPE IN THE SUGAR BEET VARIETY R. 1537

The raions of sugar beet sowings	1946 Sugar Yield Variety number	c/h	Place	1947 Sugar Yield Variety number	c/h	Place	1948 Sugar Yield Variety number	c/h	Place
The zone of Biisk station Altai Krai	P. 1537	47.6	1	P. 632	65.7	2	P. 731	47.2	1
	P. 1537	45.4	1	P. 631	54.6	1	P. 632	50.4	3
Zone of Ramon station Voronezh oblast'	P. 306	43.6	2	P. 632	53.6	3	P. 631	50.3	4
	P. 407	41.1	5	-	-	-	P. 731	50.2	5
Zone of L'gov station Kursk oblast'	P. 306	40.4	1	P. 632	59.7	1	P. 632	75.1	2
	P.1537	40.1	2	P.1537	58.1	4-5	P. 47	74.9	4
	P. 47	38.2	5	-	-	-	-	-	-
Zone of Ivanov station Sumskaia oblast'	P.1537	54.8	1	P. 632	51.0	2	P. 632	64.1	1
	P. 407	54.2	2-3	-	-	-	P. 407	63.5	2
Zone of Veselopodoliansk station Poltava oblast'	P. 306	57.2	1	-	-	-	P. 632	56.4	1
	P. 407	56.4	2-3	-	-	-	-	-	-
Zone of Belotserkov' station Kiev oblast'	P. 47	53.0	1	P. 632	56.0	2	P. 632	40.3	2
	P.407	52.6	3	P. 306	54.7	5	-	-	-
Ieltuchkov station Vinnitskaia oblast'	P. 407	44.5	3	P. 632	67.0	4	P. 47	66.9	2
	P. 306	44.2	4-5	-	-	-	P. 632	64.3	5
Zone of Pervomaiskaia station Krasnodarsk krai	P.1537	43.8	2	P. 632	32.2	1	P. 407	50.2	4
	P. 306	43.6	3	P.1537	31.7	3-4	P.1537	50.0	5
Zone of Frunzen station Frunzen oblast'	P.1537	82.7	1	P. 632	105.4	3	P. 631	110.6	3
	P. 306	81.4	3	-	-	-	-	-	-
Dzhambul oblast'	-	-	-	P. 632	105.6	3	P. 731	109.6	2
	-	-	-	P. 306	103.8	4	P. 632	107.5	4

In this table are indicated the ratings of sugar beet varieties of R amon station which occupied the first five places, in respect to sugar yield from hectar, during the last three years of experimenting. (There almost never exists a definite difference between the varieties which occupy the first and the fifth place, in respect to sugar yield). These ratings are made along individual zones of sugar beet sowings during the experiment of the period 1945-1948. The table indicates, that in 1945 the varieties: R. 1537, R. 306, R. 407 and R. 47, of the Ramon station received high ratings. In the succeeding years, the recordist was variety R. 632, and the other varieties confirmed their high ratings in the seeds of factory generation.

The following varieties of the Ramon selection station were placed according to raions - 1) R. 1537 - for Voronezh, Tambov, Tul'sk, Kuibyshev, Taldy-Kurgan, Dzhambul and Grodno oblast's and Zhashkov raion of Kiev oblast'; 2) variety R. 306 - for Poltava oblast'; 3) variety R. 47 for Fundukleev raion of Kirovograd oblast', Rakitian raion of Kursk oblast' and for Bashkirian ASSR; 4) variety R. 407 - for Mogv raion of Vinnits oblast'.

In respect to the variety R. 632 - the State commission noted: "To consider the variety R. 632 perspective for he raions of sugar beet sowings of Poltava, Kursk, Voronezh and Tambov oblast's. This variety received record high ratings at the state testing in 1947 and in 1948, upon all variety lots of the counted oblast's. To consider expedient the acceptance of decisive measures for a speedy propagation of the seeds of the indicated variety in the amount which is required for mother sowings, starting with 1951 and for factory sowings, starting with 1953". (The outline for the delivery of variety seeds for other sowings of sugar beets for 1949, point 10).

In connection with the progress in the selection of sugar beets, the specific gravity of the Ramon station in delivering mother seeds for production has increased considerably, which is seen from the following figures:

Table 33

DELIVERY OF MOTHER SEEDS BY RAMON SELECTION STATIONS ACCORDING TO YEARS (IN PERCENTAGE FROM THE GENERAL DELIVERY IN THE ENTIRE UNION)

Name of the selection station	Zones of sugar beet sowings served by the station	The theoretical outline in percent to the Plan of USSR	Years 1938	1939	1944	1945	1946	1947
Ramon	Central zone of RSFSR	11.3	0.2	4.6	12.2	18.4	20.4	24.8

As we see, the productive significance of the Ramon station had increased during the last years. It delivered elite seeds for mother sowings, in the year 1947, in the amount of 24.8 percent of the general delivery for the Union of the plan, 11.3 percent.

The seeds of Ramon varieties were raioned for mother sowings of 1948 and 1949 upon a lot of approximately 20 percent for each year, and in 1950 - 23.2 percent.

Nevertheless, our varieties do not combine, as yet, all the useful characteristics in such a form, as it is possible to realize in practice.

Therefore, we continue our firm striving for a further improvement of sugar beet varieties.

The comparison of best sugar beet varieties of Soviet and foreign selection was many a time made with the materials indicated above. The Soviet varieties always were best, according to its basic charactoristic - sugar yield from hectar - the best varieties of European and American selections. Among the foreign varieties of recent years, the best is the variety Klein-Vantsleben S (Germany). In table 34 are indicated the average indexes for this variety and for Soviet varieties for the years 1930-1946, based upon the data of state variety experiments. (The index was produced by D. N. Pazikov, scientific secretary of State commission).

Table 34

COMPARISON OF BEST VARIETIES OF SUGAR BEETS OF SOVIET AND FOREIGN SELECTION (DURING 1939-1946)

Oblast', Krai	Increase in percentage from the average yield and in sugar content: Klein-Vantsleben E (Germany)		Soviet Variety		The symbol of the Soviet Variety
	Sugar yield	Sugar content	Sugar Yield	Sugar Content	
Kamenets-Podol'sk	+4.2	-3.3	+7.2	0.0	Y. 465
Vinnitskaia	+4.7	-1.9	+5.0	-1.7	H. 1805
Zhitomirskaia	+6.0	-0.6	+8.1	+0.1	P. 47
Kievskaia	+2.2	-2.7	+7.0	+0.4	P. 407
Poltavskaia	+4.7	-1.1	+8.5	+0.7	P. 306
Sumskaia	+6.2	-0.8	+7.2	+0.4	P. 306
Khar'kovskaia	+2.2	-0.4	+8.7	-0.8	H. 1745
Kurskaia	+4.3	-1.7	+6.7	-1.2	H. 1531
Voronezhskaia	+4.5	-0.6	+5.8	-0.3	P. 1537
Tul'skaia	+5.1	-1.5	+8.1	-0.4	P. 1537
Altaiskii	+6.4	-1.9	+7.2	-0.1	P. 1537
Kazakhskaia SSR	+7.7	-1.3	+10.7	-0.3	P. 407
Kirgizskaia SSR	+7.6	-1.8	+9.9	+2.2	P. 533

Footnote. In the graph "The symbol of the Soviet variety," the letter U indicates, that the variety was produced by Uladov station, letter I - Ivanov station, and letter R. - Ramon station.

This table indicates, that the best variety of the foreign selection, Klein Wantsleben E is considerably inferior to the best Soviet varieties, both according to sugar yield and to sugar content in the sugar beets.

The basic progress in selection of sugar beets during the period of 1922-1930 was made by Ramon station. In the production of highly productive sugar beet varieties during this period the following selectioners participated: academic O. V. Iakushkin A. L. Maslumov, P. V. Karpenko, O. V. Iakushkina, B. A. Rubin, D. P. Khalizova, A. A. Abrameno, M. I. Kharchenko, etc.

A further work in sugar beet selection (from 1934 up to the present) is carried out by selectioner A. L. Maslumov, chief scientific workers N. A. Savchenko and N. Ia. Artiushenko, the assistant scientific worker A. S. Tiurichkina, etc.

The All-Union scientific-research institute of sugar beet production (M.P. Panasiuk and I. F. Dusanov), as well as the variety production-seed trust (V. S. Pogorelov and V. A. Trokhimovski,) gave considerable assistance in the production of good varieties.

Biological Differences in Sugar Beet Varieties

In recent years, the selectioners in sugar beet production produced a number of valuable varieties, for which a regular relation between productivity and variety peculiarities has been determined. Valuable material of the state variety testings according to their authenticity and exactness, sufficiently prove the progress in this direction.

Fifteen-twenty years ago, the solution of the problem concerning the geographical boundaries for the extension of various sugar beet varieties, and of the problem, concerning the varieties themselves and the conditions of the environment which are most productive, met the well established opinion, concerning the high universality of the sugar beet. The majority of scientists, based upon the universality of sugar beets, thought, that there is and could be no noticeable change in the quality of sugar beet varieties, in relation to individual conditions of the raion, and that, in connection with this fact, the varieties-recordists could occupy the first place in all raions and significance to such important problems for sugar beet production, as early ripeness and late ripeness.

This "theory", concerning the universality of sugar beets, is based upon the study of Weissman-Morgan genetics, that the change in the organisms (varieties), which took place under the influence of living conditions, a re not inherited by posterity. Denying the inheritance of the changes, caused by living conditions, the followers of universality insist, that sugar beet varieties preserve their high or low productivity, regardless to the conditions of the plants' existence, as: variety in the soil, in food, climate etc. Such "theory" was advantageous for the capitalists countries and gained high profits. The German firms supported the "theory" of the universality of sugar beet varieties, because this promoted the sale of seeds. Since varieties are unchangeable, it indicates, that the seeds could be sown and sold everywhere.

The Soviet selectioners exposed the reactionary idea of the teaching about the universality of sugar beet varieties. They proved, that, for various regions which sow sugar beets, depending upon the conditions of the environment, special varieties should be produced. At the present time, special sugar beet varieties are produced here for specific regions. Since 1931, the delivery of seeds for production is carried out, according to the principle of raioning the material. Now we may say with full firmness, that for the varieties of the majority of Soviet selection stations, regions are fixed for their most successful extension, which coincide, basically, with the locality of their production. The Ramon varieties, for example, are produced for years for the Southern and Eastern oblast's of RSFSR (Voronezh, Tambov oblast's, Southern raions of Kursk oblast', Altai Krai) Ivanov varieties - for Southern and South-Eastern raions of the Ukraine (Khar'kov, Sumsk, Chernigov oblast's), the varieties of First of May station - in Kuban', etc. This fact solves the problem of producing raioning varieties by a number of stations, and in some localities it is being solved in the right direction. In production, both local and widely plastic varieties are utilized. For both varieties, regions are fixed of optimal spreading, with that difference, that in the first case, the utilization of the variety is limited to a special natural complex of a small zone of sugar beet sowing (pervomai varieties yield high harvest of sugar only in Kuban' and are used only there), in the second case - the area of variety spreading, due to their ecological plasticity, extends upon a series of sugar beet zones (varieties of Ivanov station 1305 and 1531), Verkhniachesk - 1408, Ramon - 1537 and 306 etc.). The degree of the variety's ecological plasticity is caused by the variety of sensitivity of biotypes which are included into the population of the given variety.

When we discuss the raioning of sugar beet production, we "enlarge" both the regions of variety production and the regions of variety utilization. We are not followers of sugar beet production with natural complex and specific peculiarities of sugar beets are excluded. For instance, for the watered regions of sugar beet sowing, and especially for Uzbekistan, the production of drought resistant varieties of more saccharinity should disclose a new epoch in the development of sugar beet production in Central Asia. The effectiveness of narrow raioning selection leaves doubts for Altai Krai, where early ripening, drought resistant varieties are required, or for Kuban', where varieties are required which resist firmly the critical period during fall moistening of the soil, and for some other regions. But, as a whole, the production by all selection stations of sugar beet varieties with a narrow one sided reaction and with limited complex of physiological biotypes in population is not required by practical necessity and, possibly, inexpedient.

In tables 35, 36 and 37, which are given below, are indicated the evaluation of sugar beet varieties which are delivered for central sugar beet zone of RSFSR, i. e. in the region of Ramon station activity during the years 1945, 1947 and 1948.

The data given in the tables indicate, that during recent years, the recordists in sugar yield in the central sugar beet zone of RSFSR are the varieties of the Ramon station. They belong to the first ten of the best varieties, according to their productivity. In 1949, for instance, among the first ten of the best varieties, were seven varieties from Ramon station (R. 831, R. 631, R. 731, R. 832, R. 306, R. 833 and R. 47). It is necessary to make a note, that the varieties of Ramon station yield, upon the variety lots of their zone, maximal effectiveness. Thus, for instance, in 1945, at the Zematchinsk variety lot, the variety recordist R. 306 surpassed M varieties by 26.1 percent, according to sugar yield, variety-recordist R. 1537, upon the Shakhter variety lot - by 22.5 percent and at the Ramon variety lot - by 11. 4 percent.

The variety-recordists of the Ramon station, combine, in their zone, the useful characteristics (high yield and high saccharinity, non-blooming) better than in other zones of sugar beet sowings.

Thus, based upon the above discussed, we may come to the conclusion, that the Ramon station applies successfully the method of creating raioning sugar beet varieties and, that the sugar industry possesses already good specialized varieties for the Central and Eastern sugar beet sowing zones of RSFSR.

Table 35

THE RATING OF SUGAR BEET VARIETIES IN 1945, IN THE CENTRAL SUGAR BEET SOWING ZONE OF RSFSR

The Origin of the variety (selection station)	Variety No.	TUBER YIELD		SUGAR CONTENT		SUGAR YIELD	
		in c/h	Order	%	Order	in c/h	Order
Ramon	1537	253	1	18.0	4	45.4	1
Ramon	306	242	2	18.0	4	43.6	2
Ivanov	1305	243	2	17.6	22	42.6	3
Germany	KVP-V	230	11	18.0	4	41.4	5
Ramon	407	231	10	17.8	16	41.1	6
Ramon	47	236	5	17.4	25	41.1	7
Ramon	156	232	8	17.7	20	41.1	8
L'gov	408	229	12	17.9	11	41.0	9
L'gov	1739	229	12	17.9	11	41.0	10
Ivanov	1531	235	6	17.4	25	40.9	11
L'gov	1425	233	7	17.4	25	40.5	13
Ivanov	321	227	15	17.8	16	40.4	14
L'gov	1057	227	15	17.8	16	40.4	15
L'gov	1741	224	19	18.0	4	40.3	16
Uladov	1718	226	17	17.8	16	40.2	18
Verkhniachesk	1025	223	21	18.0	4	40.1	19
L'gov	1533	224	19	17.9	11	40.1	20
Verkhniachesk	1408	220	22	18.2	1	40.0	21
Belotserkov'	1551	228	14	17.4	25	39.7	22
Uladov	305	220	22	18.0	4	39.6	23
Verkhniachesk	23	218	25	17.9	11	39.0	25
Germany	KVP-98	206	27	18.2	1	37.5	26
America	A.215 X216	213	26	17.5	24	37.3	27
America	A.215X216	213	26	17.5	24	37.3	27
M varieties	Imp. 40	192	28	17.3	29	33.2	28
		227		17.8		40.4	

Table 36

RATING OF SUGAR BEET VARIETIES IN 1947, IN CENTRAL ZONE OF RSFSR

The Origin of the variety (selection station)	Variety No.	TUBER YIELD		SUGAR CONTENT		SUGAR YIELD	
		in c/h	Order	%	Order	in c/h	Order
Ramon	631	303	1	18.0	10-15	54.5	1
Ramon	632	298	2	18.0	10-15	53.6	2
Ramon	633	293	4--6	18.0	10-15	52.7	3
Ivanov	1305	293	4--6	17.9	16-24	52.4	4--5
Ramon	633	290	8	18.0	10-15	52.2	7--8
L'gov	1739	287	11-12	18.2	6	52.2	7--8
Ramon	1537	291	7	17.9	16-24	52.1	9
Verkhniachok	202	284	16-18	18.3	3-5	52.0	10--12
Ivanov	1531	294	3	17.7	29-30	52.0	10--12
Verkhniachok	23	283	19-20	18.3	3-5	51.8	13
Biisk	641	287	11-12	17.9	16-24	51.4	14
Uladov	1030	283	19-20	18.1	7-9	51.2	15--16
Uladov	852	285	15	17.8	25-28	50.7	22
Bolotserkovsk	1206	281	21-23	18.0	10-15	50.6	23
Verkhniachok	611	272	28	18.5	2	50.3	24
L'gov	522	280	24	17.9	16-24	50.1	25
Uladov	652	278	26-27	17.9	16-24	49.8	26
Germany	M622	246	29	19.2	1	46.1	29
M varieties		285		18.0		51.5	

Table 37

RATING OF SUGAR BEET VARIETIES IN 1948, AT THE RAMON SELECTION STATION

No of the Blind Key	The Origin of the varieties (selection stations)	No. of varieties	TUBER YIELD In c/h	TUBER YIELD Order	SUGAR CONTENT %	SUGAR CONTENT Order	SUGAR YIELD in/c/h	SUGAR YIELD Order
48-52	Ramon	R. 731	393	2-3	19.0	20-29	74.7	1
48-22	Ramon	R. 306	381	14-16	19.4	7-11	73.9	2
48-33	"Meshanka"	M2-E	400	1	18.4	62-63	73.6	3
48-51	"M eshanka"	M16-Ts	393	2-3	18.6	51-58	73.1	4
48-82	Ialtushkovskaia	IA. 476	372	30-31	19.6	4	72.9	5
48-117	Ramon	R.	383	8-10	19.0	20-29	72.8	6
48-44	Verkhniachesskaia	V.	374	28-29	19.4	7-11	72.7	7
48-10	Ivanov	I.	389	4	18.7	42-50	72.6	8
48-06	Biiskaia	B.	381	14-16	19.0	20-29	72.4	9
48-99	Uladov	U.	380	17-18	19.0	20-29	72.2	10
48-66	Belotserkovskaia	BTS	378	20	18.9	30-33	71.4	16-19
48-07	VNIS	BN	383	8-10	18.6	51-58	71.2	21
48-74	L'gov	L.	362	48-49	19.3	12-15	69.9	33
48-71	Pervomaiskaia	P.	360	52	19.1	19	68.8	48
48-31	F unzenskaia	F.	369	35-38	18.6	51-58	68.6	49-50
48-77	Veselopodolianskaia	VP.	344	63	19.9	1-3	68.5	51-54
48-39	Meshanka	M6-TSTS	315	64	19.9	1-3	62.7	64
	Variety coefficient		370	-	18.9	-	69.9	
	Individual Standard I. 1206E		375	-	18.8	-	70.2	
	Individual standard V. 1612E		359	-	19.5	-	69.9	
	The exactness of the experi. R. percent		1.5	-	1.0	-	1.8	

Which product differentiations are characteristic for the best varieties of sugar beets of the Ramon station? First of all, we should mention their early ripeness, combined with the high productivity during early harvestings.

A great deal has been written in literature, conerning sugar beet product, in respect to its early ripening and late ripening, but still we do not have full clarity in this problem. The ripening degree has been determined by various authors in various ways. It is not our task to discuss all these contradictory opinions, since the laboratory on selection of VNIS, namely Prof. N. I. Orlovskii (Scientific Notes on Sugar Industry, No. 3, 1933) made the survey of various approaches to the differentiations of sugar beet varieties, according to the degree of their early ripeness. We shall limit ourselves to our basic approaches to the production of highly productive, early ripening varieties.

Already in our early work (Scientific-Agronomical Magazine No. 4, 1928) was indicated the experimental material concerning various varieties during a short vegetative period. We indicated, that the early ripening and late ripening of sugar beets are caused by hereditary characteristics of the plants, and not only by the external factors of the environment. Now we may add, that the symptom for early or late ripening could be inherent to the plant or to the variety, irrelevant to the fact how the useful characteristics are combined in them.

Varieties and separate biotypes, as prof. N. I. Orlovskii, correctly indicates, might be early ripening, according to the energy of root-and leaf formation, and at the same time may be late ripening, according to the energy of sugar accumulation or according to other characteristics. Therefore, it is incorrect to pertain, as it used to be done in the past, the varieties or groups of sugar beet varieties to the category of early ripening or late ripening, according to all characteristics simultaneously.

By early ripening we have in mind such characteristic of the plant, which provides the maximal sugar yields from hecter during early sugar beet harvesting. The study of this quality leads us to the dynamic profile in the growth process and in plant development. Under these conditions, we may easily disclose the difference in the development types of individual biotypes and varieties. The largest tubers are usually obtained in plants which grow energetically at the beginning of vegetation. Their haulm develops during the summer months stronger, and during digging always poorer than in plants with small tubers. An analogical picture of the growth yields the majority of the best varieties of the Ramon station in respect to yield. During the first half of vegetation, these Ramon varieties possess higher tuber weight, both the absolute and the relative, in comparison to varieties with higher saccharinity. Therefore, if we consider the early ripening from biological point of view (the energy of mass accumulation of the tuber), then the earlier ripening would be the large tubers, or varieties with yielding capacity.

The sugar content in the sugar beet is closely related to the indicated peculiarities of the plant's growth. The degree and the time of the tuber tissue development are of great significance for the accumulation of sugar. The tuber is not a simple storing place for assimilators. The accumulation of sugar is accompanied by the active participation of the tuber tissues. The storing of sugar is an active physiological process. The academic R. F. Votchal indicated many times that in the growing tuber occurs the differentiation of tissues in old parts of the tuber, simultaneously with the formation of new rings with their new vascular-fibrous fascicle. In connection with this, the peculiarities of the plant's growth during individual periods reflect upon the entire tuber as a whole, and not upon the corresponding parts of the rings.

With individual plants or sugar beet varieties, with high energy of the initial tuber formation, a greater part of the tuber is formed at the expense of older tissues (the "star" zone and the old of the first, second and third rings). Late ripening plants with small tubers are capable for further growth at the end of vegetation. With them, the percentage of ontogenetic young tissues is higher than with plants with large tubers. With sugary sugar beet varieties, a stronger development of the peripheral tissues (the sixth and the succeeding rings) and a relatively poor development of the tissues "stars", in comparison with well yielding varieties. And the oldest parenchymatic tissues and the zone of "star" are characterized, as it is well known, by low saccharinity. Therefore, with sugary varieties, the sugar content will be higher, than with sugar beet varieties with an earlier type in the development of tubers.

Thus, if we analyze the early ripeness of sugar beets from point of view of absolute sugar content in the tuber (technical ripeness), which is incorrect, then the most early ripening should be considered the varieties of ultra-sugar yielding, and the most late ripening - the yielding varieties.

Based upon the work of the biochemical laboratory WNIS, according to the study of the locality of saccharose and of the peculiarities in the growth of tuber tissues in the varieties of sugar beets, A. S. Okanenko thinks, that the basic problem, in improving the yielding sugar beet varieties, is providing them with early tuber formation, combining with the early differentiation of vascular-fibrous system of sugar beet tubers. This condition is for practical selection of great interest (Scientific notes on sugar beet industry, No.1-2, 1940).

The problems indicated above pertain to the general biological problems and could not be considered separately from the biochemical peculiarities of th e plants, their hereditary characteristics, the development of the assimilating apparatus, etc. The ability of the tuber tissue to synthesize saccharose from monose migration of sugars in the sugar beet occurs in the form of monose, and not of saccharose, as it used to be indicated), caused by the presence of fermentation, is, as it is well known, the most important factor, upon which the general wealth of tuber's sugar depends. Prof. B. A. Rubin thinks, that the sugar beets are richer with sugars the higher is its synthesizing activity of the invertase. The more clearly expressed synthesizing activity of the fermentation with sugary varieties enables them to transform the average sugars which migrate in their tissues into saccharose, as a result of which the flow of carbohydrates from the leaves passes more energetically.

Nevertheless, this does not diminish the significance of the problems, concerning the degrees and the time of the development of individual tuber tissues. The physiological preparation of the tuber tissues for the assimilation of sugars, produced by the leaves, is of great importance for the production of saccharinity within the sugar beet variety. On the other hand, during the entire life of the plant, the transfer of sugars occurs also upwards, from the initial growth, where the formation of new leaves occurs. All this underlines the fact, that in practical work, the selectioner is not able and should not avoid issues which pertain to biochemical and physiological characteristics of the material under study.

The principle of agricultural ripeness is the basis for selection as to early ripeness. Early ripening varieties should yield maximal amounts of sugar from hectar during early harvesting or should stand out in the regions with short vegetative periods, combining in themselves high yielding capacity and high saccharinity. The selection is done, according to the power of the initial growth and energy of the tuber and leaf formation, during the vegetative period, as was indicated above.

The systematic, methodical selection, according to the initial growth and energy of root formation, which has been carried out at the Ramon station during two decades had to inoculate biological early ripeness to the Ramon varieties. The Ramon sugar beet varieties 27-27, 32-06, and others, were always victors during early harvesting. But the best example which proves the possibility of creating specialized sugar beet varieties is the Ramon variety R. 1537. In table 38 are given the ratings of this variety during the five years of its testing at the Biisk selection station, i.e., in the region of the shortest vegetative period.

table 38

THE CHARACTERISTICS OF SUGAR BEET VARIETY R. 1537, ACCORDING TO THE DATA OF BIISK SELECTION STATION

	1938				1939				1940				1943				1945				Average for 5 years			
	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order	Tuber Yield (in c/h)	% of Sugar	Sugar Harvest (in c/h)	Order
uperior var. R. 1537	298	15.7	46.8	1	323	17.0	58.9	2	252	16.2	408	4	286	185	529	1	277	17.2	476	1	287	16.9	486	1
verage Variety	239	16.0	38.1	24	295	16.7	492	28	235	162	381	32	260	188	489	17	253	171	433	20	256	17.0	43.5	22
nferior Variety	220	15.4	33.9	42	256	16.4	42.0	55	183	15.9	291	61	236	186	439	30	238	17.1	407	31	227	16.7	37.9	40
ifference between the superior and inferior varieties	78	0.3	12.9	-	67	0.6	129	-	69	0.3	117	-	50	0.1	9.0	-	39	0.1	6.9	-	60	0.2	10.7	-
rror in the experiment	7.1	0.2	1.2	-	7.7	0.15	1.3	-	7.0	0.14	1.2	-	3.8	0.14	0.8	-	8.5	0.21	1.5	-	6.8	0.17	1.2	-
xactness of the xperiment	3.0	1.1	3.2	-	26	0.9	2.7	-	3.0	0.9	3.1	-	1.5	0.7	1.7	-	3.1	1.2	3.6	-	2.6	0.96	2.9	-

6

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During the first three years (1938-1940), are compared the same seeds of 1937, and in 1943 and 1945 - the second seed reproductions, propagated under the conditions of Altai krai. For comparison, are indicated in the table the ratings for varieties of other stations which occupy an average and inferior place, in respect to sugar yield from hectar. The data given in the table are interesting from two points of view: first, they indicate the great importance of the existing method in the delivery of varieties to production, according to the principle of raioning materials (the correspondance of the variety of the sum of all the external conditions of the given region), and, on the other hand - they confirm the availability of specific variety reaction of the sugar beet to any natural complexes, as well as the fact, that the biological differences of the varieties are caused, mainly, by the hereditary characteristics of the sugar beet plant.

In the natural complex, which is characteristic for the Altai krai, the most typical factor, which prevail always, are the short vegetative period (late spring and early harvesting) and the drought climate (small amount of waterfall). Consequently, early ripeness and drought resistance are the peculiarities, by which the high productivity of the sugar beets will be determined, along with the plant's rich hereditary basis. In the population of the variety R. 1637, predominate the early ripening and drought resistant biotypes, therefore it firmly occupies, from year to year, the first place in the Biisk raion, in respect to the harvesting of sugar, indicating its adaptability to local conditions.

Among the practicians-sugar beet producers, the opinion is widely spread, that for production is important to have sugar beet seeds with good physical characteristics. This is correct. Seeds with a low sprouting energy, even with the availability of normal sprouting, yield relatively inferior sugar beet crops. But only few among the workers of state and collective farms are interested in the sugar beet variety, in its peculiar symptoms, and in its natural characteristics. It is considered, that the variety characteristics of sugar beets are not significant for the stakhanovite yields. But this assumption is erroneous. The given data indicate, that, on the average, during five years, the Ramon variety R 1537 yielded, under the conditions of Biisk raion, an increase in tuber yield, approximately 60 c. per h., and the increase of saccharinity by 0.2 percent, in comparison with the variety which is not adapted to local conditions. The sugar beet productivity increases then by 25-30 percent. As it is well known, sugar beet varieties, whose seed sprouting is not inferior than the normal, are accepted by the state variety testing. Consequently, the indicated increase was obtained strictly at the expense of variety differentiation of sugar beets. Ten centner of sugar per hectar, in comparison with poor variety, and about five centner of sugar, in comparison with the average variety - these are the increase obtained, as a result of variety reactions upon the natural complex of the Altai krai. This effect, from point of view of production, should be considered as high.

The biological peculiarities of each variety are fixed. Each variety, depending upon its nature, requires, for its development, different environment conditions. These biological peculiarities should be familiar to every practician.

The task of the agrotechnic consists of creating the most favorable conditions for various stages of plant's development.

In the given case, the sugar beet variety, R. 1537 differs by high energy of the initial root formation and is not too demanding for moisture.

This variety develops fast at the beginning of vegetation and, by creating corresponding conditions during this period, yields outstanding sugary crops from hectar. But if we delay with the shooting, then its superiority is lost. On the top of that, in this case, other varieties, which are characterised by high energy in root formation during fall, will surpass it in yielding capacity and saccharinity, and, in the long run, the superior variety might become an average one. The agronomists and practicians should be familiar with the biological symptoms of the varieties, especially raioned sugar beet varieties, and should provide all necessary conditions for their most favorable development in corresponding zones of sugar beet sowing. This willprovide our country with extra millions of poods of sugar.

In creating better conditions for the development of various varieties, very important is, besides climatic and other external factors, the application of agrotechnical measures which correspond to the nature of these varieties (heredity). Of the general complex of agrotechnical measures, the best worked out, in variety profile, are the measures, connected with soil chemization. Experiments which were carried out at the Ramon station during 1925-1950 indicated, that the sugar beet productivity changes considerably by shifting, for instance, from winter field to fallow land, fertilized with dung (norm 400 c. of dung for 1 hectar). Data which confirm this statement are given in table 39.

THE CHANGE IN THE SUGAR BEET VARIETY PRODUCTIVITY BY SHIFTING FROM WINTER FIELD TO A FERTILIZED FALLOW LAND

Varieties	Direction	Upon winter field Exactness in the experiment: E= 3.1 in 1936. and E= 2.7 in 1927				Upon fertilized fallow land. Exactness of the experiment: E= 2.6 in 1936 and E= 3.9 in 1937			
		Sugar Yield		Order	Group	Sugar Yield		Order	Group
		from c/h	≠ -			from c/h	≠ -		
26-16 Uladov station	N	50.6	1.69	1	1	57.1	2.45	15	11
25-25 Bolotserkovsk station	E	47.7	1.08	7	1	52.9	0.82	29	111
27-28 Verkhniachsk station	N	63.4	2.05	1	1	64.1	-	8	11
26-05 Nemerchansk station	Z	41.9	1.00	24	11	59.4	2.50	8	1
27-28 Uladov station	E	55.3	1.22	18	11	68.1	2.62	2	2
27-01 Verkhniachesk station	N	53.8	1.51	22	11	67.2	2.97	4	1
26-29 Khar'kov station	E	49.3	1.49	2	1	61.9	1.25	3	1
27-27 Ramon station	N	59.0	1.58	10	1	64.2	2.72	6	1

As we see, the capacity for maximal utilization of improved conditions with various sugar beet varieties is uneven. Some varieties (26-16, 26-25, 27-08 and others) occupy the first place in winter field and receive lower rating when grown upon fallow land. From the first group they, no doubt, transfer into the second and the third group. Other varieties, on the contrary, increase drastically the productivity under the best conditions of growth (26-05, 27-28, 27-01 and others). Sugar beet varieties, sown along fallow land, yield an increase in sugar yield from hectar by 13-18 c. more, than those, sown upon winter land. This increase is, mainly, at the expense of the increase of sugar beet yielding capacity in the limits of 30-80 c/h; but the saccharinity remains the same. During the experiments of 1930, the fluctuations in the productivity against various backgrounds were expressed especially sharply. The general increase of sugar harvest from one hectar of sugar beets, grown along fallow land, in comparison with sugar beets sown upon winter field amounted to 26.1 c. The first place, according to productivity under the conditions of fallow land, was occupied by sugar beet variety of Ramon station 30-11. The variety of Khar'kov station 30-25 manifested a low sensitivity to the improved conditons of growth, and, instead the first place, it occupied along the basic field the fifteenth place, thus falling into the second group. Of definite productive value, under the conditions of intensive cultivation, became the variety 30-14 c/h, and, due to this circumstance, it shifted from 42nd place, during the sowing after winter crops, to the tenth place upon fallow land.

For more clarity, we show here the relative rating of the variety 27-17 of Totkin station (now L'gov), according to the place order which it occupied from August 1 to October 1, according to productivity (table 40).

THE PLACE ORDER OF VARIETY 27-17, ACCORDING TO PRODUCTIVITY, OCCUPIED BY IT IN 1927 AMONG 38 COMPARED VARIETIES

Predecessor	1/VIII	15/VIII	1/IX	15/IX	1/X
	Place Order				
Winter Land	11	16	21	13	8
Fertilized Fallow Land	1	1	1	1	1

The favorable rating of the variety 27-17, during the entire vegetative period, during the sowing along the fertilized fallow land, surprises by its constancy. After having occupied the first place, according to productivity, already, since August 1, it preserves this place until the completion of the harvesting, indicating the unquestioned ability of yielding maximal crops of sugar, under the best conditions of growth. During the sowing upon winter land, possibly, this variety is not found under optimal condtions of existence and feels constrained in its struggle for the general amount of nourishing substances.

The L'gov station has determined varied sensitivity in sugar beet varieties to the nourishing elements and to various combinations of mineral fertilizers. Some varieties are characterized by especially high sensitivity to phosphor nourishment, others - to nitrous potassium, etc. The difference in the reaction of the varieties to individual nourishing elements reaches 40-50 centner from hectar, according to the harvest of tubers. Thus, the agricultural value of the variety is caused, to a considerable degree, by agrotechnical measures, by those conditions of existence, under which the variety is able to yield the greatest productive effect.

In general, it is necessary to indicate, that sugar beet varieties with the combined characteristics and the varieties of saccharinity direction are more sensitive to the improved conditions of existence, than the c varieties of the yielding type. In the Southern sea-country of the Far East, in 1930, we were witnessing how the variety of saccharinity of Nemerchansk station, in all series of the comparative field was among the first five best varieties, according to sugar yield. The conditions for sugar beet growth were there, in 1930, especially favorable, close to conservatory ones. High relative humidity of the air was combined with high temperature of the air, the surplus of food - with the optimal moistening of the soil. The extremely favorable conditions for the plant growth, which took place in this raion that year, could be evaluated, for instance, by the following factor: the roots which were removed during registration and which were left upon the soil surface acclimatized, continued their growth and did not die. Under such conditions, the sugary variety entered the number of recordists, according to sugar yield (table 41).

Table 41

THE BEHAVIOR OF SACCHARY VARIETY 30-39 in 1930, UNDER THE CONDITIONS OF SOUTHERN SEASHORE OF THE FAR EAST

	Harvest of tubers (from c/ha)	% of Sugar	Sugar Yield (from c/ha)
In the Principal raions of Sugar Beet Sowing			
Variety 30-10 (harvest standard)	294	18.3	53.8
Variety 30-09 (sacchary standard)	253	19.0	48.1
In The Southern Seashore of the Far East			
Variety 30-10 (harvest standard)	218	16.4	35.7
Variety 30-09 (sacchary standard)	199	18.0	35.8

The data of the state variety testings for the past years confirm the high productivity of sugar beet varieties of normal and sacchary kind in the irrigated raions of sugar beet sowing (especially in Uzbekistan and Grusiia), as well as in Kuban'. In respect to sugar yield, theyare victors every year. We may, thus, arrive at the basic conclusion, that, by introducing the grass rotating system of agriculture, by applying the complex of agrotechnical measures, directed towards the creation of especially favorable conditions for the development of sugar beets (intensive soil chemisation, irrigation, artificial raining, etc.), the sugar beet variety of sacchary kind will occupy in production higher specific gravity.

The specific peculiarity of the best productive varieties of Ramon station is their great sensitivity to the improved conditions of cultivation. In table 42 are given the evaluations of variety R 632 compared with tubers of varied yielding capacities, during the testings in 1947 and 1948.

Table 42

RATING OF VARIETY R. 632 COMPARING WITH THE VARIED YIELDING CAPACITY OF THE TUBERS

Variety Fields	Krai, oblast'	Years	Tuber Yield from c/h	Tuber Yield % of Var.	Sugar Content from c/h	Sugar Content % of Var	Sugar Yield in c/h	Sugar Yield Order	Sugar Yield In perc. from N. var
Korenovskii	Krasnodarskii	1947	172	108.2	18.5	101.1	31.8	4	109.3
		1948	234	110.1	18.7	100.0	43.8	1	110.0
Peskovskii	Poltavskaia	1947	199	109.3	15.7	100.6	31.2	2	109.9
		1948	314	109.4	19.4	102.7	60.9	1	112.8
Nizhnee-Kisliaiskii	Voronezhskaia	1947	269	106.3	19.0	100.0	51.1	2	106.2
		1948	155	106.9	20.5	102.0	31.8	3	107.1
Malo-Viskovskii	Kirovogradskaia	1947	340	106.9	17.3	100.6	58.8	2	107.8
		1948	287	105.5	20.5	101.5	58.8	4	107.1
Biiskii	Altaiskii	1947	353	106.3	17.5	101.7	61.8	3	108.2
		1948	314	109.0	17.8	98.3	55.9	3	107.3
Kozhanskii	Kievskaia	1947	368	108.2	16.2	100.6	59.6	1	109.0
		1948	216	116.1	17.2	101.2	37.2	1	117.7
Deringinskii	Kurskaia	1947	370	109.5	19.6	100.0	72.5	1	109.5
		1948	153	113.2	19.6	100.0	30.0	3	113.2
Ramonskii	Voronezhskaia	1947	370	109.5	19.6	100.0	73.1	2	107.3
		1948	260	103.3	19.4	101.0	50.4	3	104.2
Ialtushkovskii	Vinnitskaia	1947	431	109.9	17.0	100.0	73.3	1	110.1
		1948	355	105.0	18.1	100.0	64.3	3	105.1
Dzhambulskii	Kazakhskaia SSR	1947	640	106.7	16.5	100.6	105.6	3	107.3
		1948	618	103.8	17.4	100.5	107.5	4	104.6

Table 42 indicates, that this variety firmly occupied the first places in sugar yield in the same raions, compared with varied yielding capacity of the tubers. The sugar content in the sugar beets does not decrease with the increase of the yielding capacity of the tubers. The sugar content in the sugar beets does not decrease with the increase of the yielding capacity of the tubers. The saccharinity is either equal or higher than the average varieties, which factor is very important in respect to production.

In the state variety testing of 1938, the variety R. 1537 yielded upon the Frunzen variety field (Kirgizia) 125.3 c of sugar from hectar, having occupied the first place, according to productivity (The tuber yield amounted to 700 c. from hectar with 17.9 percent of saccharinity). During the same drought year, at the Kastorinsk variety field (Kursk oblast') this variety, having occupied the first place in productivity, yielded only 35.5 c. of sugar from hectar (it yielded tuber crops of 157 c/h, with saccharinity of 22.6 percent).

Thus, the contemporary sugar beet is a perfect plant, and the possiblities for creating corresponding conditions for her development are great.

The experimental testing of the changeability of variety differentiations, depending upon other agrotechnical measures, has not been worked out sufficiently. It is only known, that good sugar beet varieties which are widely plastic even ecologically, could not pretend for the first place at all sugar beet sowing raions and that their productive rating fluctuates considerably, depending upon various cultivating conditions. This is indicated in table 43.

THE BEHAVIOR OF PRODUCTIVE VALUABLE SUGAR-BEET VARIETIES IN VARIOUS ZONES OF SUGAR BEET SOWINGS IN 1940

Variety Number	The central zone of the right shore of Ukr. SSR		Kirovograd zone of the right shore of Ukr. SSR		North-Western zone of the left shore of Ukr. SSR		South-Eastern zone of left shore of the Ukr. SSR		The central zone RSFSR	
	Sugar Yield (in c/h)	Place among 46	Sugar Yield (in c/h)	Place among 54	Sugar Yield (in c/h)	Place among 54	Sugar Yield (in c/h)	Place among 54	Sugar Yield (in c/h)	Place among 54
R. 1527	48.8	1	68.3	1	39.0	34	45.7	2	41.3	8
I. 1631	48.8	2	66.2	9	41.0	5	44.2	23	41.6	2
V. 1025	-	-	-	-	41.7	2	42.3	44	-	-
V. 1621	47.4	7	63.5	37	40.8	6	42.8	38	38.4	41
L. 1533	-	-	66.0	22	38.7	37	45.4	4	41.1	5

Such fluctuations in the rating of the same varieties are the result of the influence of factors of natural and agrotechnical causes which are still insufficiently examined. Nevertheless, what has been studied, is not fully introduced into life. We saw, that, the more the conditions of the environment correspond the requirements of the variety, i. e. its nature, the better are manifested the useful characteristics of the sugar beet plant. Consequently, as we already indicated, the collective farms and the state farms which produce sugar beets would become familiar with the biological differences of the varieties, with their requirements to specific external conditions, etc. and, according to these data, should carry out the necessary complex of agrotechnical measures. Only in this case will it be necessary to create the agrotechnic, in agreement with the requirements of the variety and skillfully direct the sugar beet yields.

THE PROGRESS OF SELECTION

The problem of the sugar beet variety's transformation, as to time, is of great theoretical and practical interest. In 1925-1930, a few selectioners insisted pessimistically upon the deadlock in sugar beet variety production during the last 2-3 decades.

These opinions were based, on one hand, upon the theory that there exist a physiological limit in the accumulation of sugar within the sugar beet, and on the other hand, upon the impossibility of combining in one variety high yielding capacity and high saccharinity. The Soviet scientists, based upon the analysis of many data, according to collective variety testing, during the five year, 1923-1927, pointed out the progress in the Soviet selection of the sugar beet variety quality. In respect to Ramon varieties was written: " Here we have a great progress inproductivity. There is a slow, but constant increase in saccharinity". (Sbornik SSU, No. 4, 1928, page 20.). The academic I. V. Iakushkin indicated, that during the three years, 1926-1928, the sugar yield in USSR increased for variety-recordists by 5-8 c/h, in comparison with Uledov standard which was considered the best up to 1926. (Works of the All-Union Conference on selection and genetics, v. IV, 1930, page 446).

At the present time, the progress in the work of sugar beet selection stations is recognized by everyone, but this progress is explained by various authors differently and is expressed by uneven numbers. This depends, mainly, upon the registration method which is the basis for the progress in sugar beet selection. Our method was based upon the following premises:

1. The rating of selection materials, according to time, could not be carried out by comparing absolute figures, according to separate years, because the absolute variety values change from year to year and are characteristic for the given year, but not for a length of time. The answer to this problem is found in the shift from absolute figures of value to their relative significance.

2. The data for considerable time should be brought to a general standard. This work would not be too difficult, if the very same varieties were used in the variety testing during a number of years. But as it is, we carry out the seed testing of the same variety only for the three years in a row, at the most, because, when the seeds grow older, the energy of the sugar beet growth weakens, and this leads to more or less decrease of the final productivity of the variety. Consequently, there could be no variety testing for several years. In very recent time, was possible to find only general varieties presented by seeds of various localities and of various years of reproduction. But it is risquy to use the rating of such seeds for determining the progress of selection, because the genotypical content of the population of sugar beet variety, sown by seeds from various localities of reproduction, could acquire various characteristics, according to productivity. Therefore we took the rating of general varieties for every two adjoining years and thus we brought the indexes for variety of Uladov station - the standard of the first Five-Year-Plan.

3. In reducing to one level, we utilized the two-year ratings of the group standard (two producing ratings of the Ramon station plus singular standard). In this case any of the standards was tested three years in a row, and the old varieties, as well as the new ones which replaced them, had two-year parallel ratings. This method, suggested by professor N. I. Orlovskii (VEIS), should be considered the most satisfactory.

For instance:

1937	1938	1939	1940	1941	etc.
A	A	A			
	A_1	A_1	A_1		
	-	A_2	A_2	A_2 etc.	
B	B	B			
	B_1	B_1	B_1		
		B_2	B_2	B_2 etc.	
C	C	C			
	C_1	C_1	C_1		
		C_2	C_2	C etc.	

The method of bringing to a single standard which occurs once with the new variety, which replaces it (that is applied in practice most frequently), is not too satisfactory, because the index of productivity will depend to a considerable degree from the specific peculiarities of an individual variety during various years of testing.

The general picture of progressive shift in sugar beet selection is expressed as follows:

Table 44

PROGRESS IN SUGAR BEET SELECTION DURING THE PERIOD OF 1926-1947

For a decade	In percentage of the standard of the first-Five-Year-Plan accepted for 100 (1926)		
	Tuber Yield	Sugar Content	Sugar Yield
1926---1936..........	112.6	100.3	112.9
1937---1947..........	117.5	102.1	119.6

The given figures indicate, that during the first decade (1926-1936) the progress in sugar beet selection was expressed in an increase of sugar yield (basic symptom) by 12-13 percent, or almost by 6 centner from hectar. Really, the increase of sugar yield during that period secured basically, due to the increase of sugar beet yielding capacity, but not due to saccharinity which remained without any change.

We indicated previously, that in 1937 A. I. Mikoian placed a new task before the selectioners- to yield varieties which combine high yielding capacity and high saccharinity, and thus to provide the greatest sugar yield from hectar and from weight unit of raw material. The selectioners started actively with their work, according to the indications of A. I. Mikoian and achieved noticeable progress in the improvement of the sugar beet quality. The Better varieties in state variety testing, during the second decade (1937-1947), yielded, in comparison with the standard of the first Five-Year-Plan, up to 20 percent more in their productivity, or approximately 10-12 centner sugar per hectar, with a simultaneous increase of saccharinity, approximately, by 0.4 percent.

The possibility of a favorable combination of high yielding capacity in the same variety and of high saccharinity was never questioned in our country. But this problem could not be considered without taking into consideration the environment, the conditions of the plant's existence. It is necessary to emphasize, that we have in production sugar beet varieties which, under most favorable conditions for their development, yield almost an ideal combination of high yielding capacity and high saccharinity. Thus, for instance, in the Northern zone of RSFSR, in 1945, the recordist in productivity, the Ramon variety R. 306 occupied the second place, according to the tuber yield, and thefirst place, in saccharinity and sugar yield. Analogous indexes could be indicated for better varieties of Verkhniachesk L'gov, and other stations as well. The Soviet selectioners indicated in practice, that useful characteristics with the sugar beet plant, including saccharinity, could accumulate in a free relationship, without being physiological antagonists.

Discussing the progress of selection, concerning the production of new better varieties, we should not undermine the existing sugar beet varieties. The contemporary sugar beet is a perfect plant which comprises great possibilities. In Kirgiziia, in 1942, we obtained a sugar yield for the best variety upon a comparative field (2226) of 117 c/h, without introducting a basic fertilization. The stakhanovites of sugar beet lots, after having applied fertilizers, obtained often sugar yields of 150-180 c/h. During the years of the first Stalin Five-Year Plans, in Voronesh oblast's, the team worker of the collective farm "Progress", of Dobrinsk raion, E. S. Baskakova, harvested in 1936, upon her lot, over one thousand centner of sugar beets from hectar. The team worker of the collective farm "Upon new rails", of Panin raion, A. M. Chernykh, obtained in 1947 from her lot of 2 hectars a sugar beet yield of 707.5 c/h, with saccharinity of 17.8 percent, which amounts to 125 centner of sugar from hectar. Thus, we do not utilize sufficiently all the possibility which are available in contemporary sugar beet varieties.

The significance of the indicated data on the progress of selection is still comparative, because, for the better varieties, produced in recent years, and belonging to a specific raion, we did not create conditions necessary for their better development, hence, the useful characteristics of the variety could not be manifested in a maximal degree.

The progress of selection could not be considered separate from agrotechnic. Even if the variety is very good, in case of absence of corresponding conditions of the environment, it will not manifest fully its useful qualities. Therefore, as a synthesis of these basic moments - variety plus agrotechnic - we may expect further progress in sugar beet selection.

ML: 12-28-51

THE IMPROVEMENT OF SUGAR BEET ELITE SEEDS

For sugar industry, the production of constant varieties which would preserve useful qualities for many generations at a high level is of great productive importance.

It is well known, that sugar beet fields of state and collective farms are sown with factory seeds, obtained by propagation; without selection of mother seeds or of seed elite. Most significant is the problem: in which degree is the quality of factory sugar beet determined by the quality of seed elite or of mother sugar beet. If, by the shift from seed elite to factory seeds, the tuber yield and the saccharinity of the varieties will decrease considerably, then such varieties are unable to and should not be widely spread in production. They will be eliminated from industry after a single usage of factory seeds. If the seeds of seed elite of good varieties differ by high resistance, i.e. during propagation without selection they do not regress, then such variety is ensured for a long life in production. Its factory seeds, for many years will be able to be delivered repeatedly to production as mother seeds, and thus the best variety could occupy the dominating position in industry.

Then the question arises: how does the qualitative content of the variety changes during reproduction?

For many years an opinion was established, that sugar beet varieties, during propagation without selection, decrease the tuber yield and the sugar percentage. The regression of saccharinity has been studied at many selection stations. The Ivanov station indicated, that the average decrease in the sugar percentage in the first generation of the sugary variety is expressed by 0.17 percent, and for the yielding variety - 0.28 percent. The succeeding reproduction of seeds without selection, according to the data of the same station, decreases the sugar percentage in the beets according to the same size. (Bulletin of Ivanov experimental-selection station for 1927).

The Il'inetsk station, discussing the problem of decrease of yielding capacity and of saccharinity of sugar beets, indicates, that, during the propagation without selection the highly sugary varieties decrease first of all in their saccharinity, the yielding varieties decrease in yielding, striving towards the average of the variety. The coefficient of regression of saccharinity, at the average for four years, equaled 0.01 (Sbornik SSU for 1927, No 1).

According to the data of Nemerchansk station, the average decrease of saccharinity, after a single reproduction for 13 varieties of individual selection amounted to 0.3 percent.

During later work, along this question, were observed most varied cases of increase, decrease and stabilization of useful qualities of sugar beet varieties during their reproduction without selection. The analysis of the results of government variety testings of sugar beets for the last ten years indicates, that the regression of productivity with various varieties is differently expressed. This phenomenon is closely connected with the method of forming the variety, with the degree of heterozygosity of the material, the place of seed reproduction, the leveling of the population, etc.

In table 45 is indicated the regression of useful qualities of sugar beets upon the varieties of individual selection (pedigree breed) and upon productive varieties of Ramon station. In table 45 are indicated the most characteristic cases.

The table indicates, that the first four varieties of the individual selection decrease drastically the tuber yield and the sugar percentage already after the first reproduction. The succeeding two varieties preserve in the first generation a high position, but, after the second reproduction of seeds, impair the productivity. Finally, the individual varieties 1300, 1115 and 1083 firmly keep good values during three reproductions.

In selection practice such examples are usual. The inconsistancy of any quality is caused by both genotypical and modifying variations. In each population we find individual tubers whose weight is several times higher than the average weight of the tuber of the given variety. Selected as new ancestors, the better tubers are able to represent modifications, caused by various external factors. Such plants, after their first propagation decrease drastically their productivity and usually are rejected. Besides, the value of the selected ancestor and the succeeding values of the posterity is determined not only by a specific complex of hereditary qualities, but by the degree of its heterozygosity as well. By bringing the heterozygous plant to a relative uniformity, its yielding capacity decreases drastically. This usually occurs after a double narrow propagation of the material. Finally, among the selected variations we really discover most valuable plants with a changed hereditary basis. The latter preserve good productivity for several generations, during the propagation without selection.

In each of the indicated cases, the regression of useful qualities in sugar beets will be different, and it will be expressed by various figures. The productive varieties, during the process of reproduction change as well, but these changes are of a different character. The fluctuations in productivity are not as great here, and the changes are more regular. In general we can not spread the conclusion concerning the regression of useful qualities of materials of station elite (individual generations) upon productive varieties. Contemporary sugar beet varieties are complex populations, composed of a great number of biotypes. A rich natural composition of population determines the relative resistance of the variety, according to a complex of qualities. The new biotypes which emerge in the process of splitting are repeatedly crossed among themselves, and the population is able to be in a state of some equilibrium during many reproductions. Such constant sugar beet varieties are available in production. The varieties R. 1537 of Ramon station, I. 1305 of Ivanov station, L. 1739 of L'gov station, V. 1408 of Verkhniachesk station and others, after 2-4 propagations without any selection do not decrease the productivity and, at the present time, are widely spread in industry. They are characterized by a rich hereditary basis and by a high ecological plasticity.

As a good example of the firm preservation of high qualities of the variety during propagation without selection, we may indicate variety R. 1537. In table 45 are given the evaluations of this variety in 1938, i.e. during the first year of testing the original seeds of seed elite, and evaluations for 1945, when factory varieties of the second reproduction were tested. Absolute indexes, of these years according to utilitary symptoms, are indicated as the average varieties, which took part in government variety testing of 1938 and 1945.

The table indicates, that at the average of the Union, the sugar production from factory seeds is somewhat higher than from the seeds of seed elite. This increase of sugar production goes at the expense of increase in saccharinity which is in factory sugar beet of all sugar beet zones regularly higher. Thus, in the process of propagation, variety R. 1537 not only impaired its useful qualities, but, on the contrary, improved its saccharinity, without decreasing the high tuber yield. It is not accidental, therefore, that is was the all-union recordist, according to its productivity both in 1938 and 1945.

Along with this variety, there are such sugar beet varieties which, after first reproduction of seeds, did not pass the competitive testing and were rejected.

Before 1938, sugar beet industry received for sowing of mother sugar beets a very small amount of factory seeds obtained from the reproduction of best varieties of seed elite. The production's demand for mother seeds was mainly supplied at the expense of new varieties. This circumstance would not cause any objections, in case the new varieties would prove to be better than the old ones. But in reality, due to fear of sugar beet regression, the selection stations often delivered to industry new varieties which were not superior to the old ones, and as a result of that, they lost the productively valuable varieties.

A great amount of new varieties, which are tested yearly at the government variety testings, determined the variety and frequent change of variety seeds in production. In many sugar beet sowing oblast's several, sometimes more than ten, varieties have been raioned, which fact complicated the regular production of sugar beet seeds.

At the present time, these shortcomings are successfully corrected. For instance, in the outline of delivering variety seeds to mother sowing of sugar beet for 1949 was written: "to consider variety R. 632 of Ramon station perspective for the raions of sugar beet sowing for Poltava, Kursk, Voronesh and Tambov oblast's, since this variety was highly evaluated in government variety testing in 1947 and in 1948 upon all variety fields of indicated oblast's."

This decision of Government's commission in respect to variety R. 632 and to best varieties of other selection stations indicates, that many varieties in seed production of sugar beets will be liquidated entirely in the very next future. Already in 1949, the number of varieties, studied at Government variety testings, decreased almost double, in comparison with previous years.

With the production of comparatively resistant, highly productive sugar beet varieties, the highest specific gravity of the delivery of mother seeds pertained to factory seeds of first, second and older generations, obtained by means of reproduction of best variety-recordists. For instance, 68 sugar beet varieties are included into government variety testing of 1949. Among these varieties 16 were seed elite, 14, were repetitive and 37 varieties of factory generations. This is absolutely correct. But success in this direction does, by no means, decrease the importance of the problem in improving elite seeds of highly valuable varieties in the process of their propagation. A number of years will go by, and the good variety, propagating repeatedly, is able to change, after all, into undesirable direction. Such facts already exist. In sugar beet selection we do not advocate the invariability of the genotype during the change of conditions of the environment.

Two opposite points of view exist as to the form producing processes of vegetative organisms. The Michurin genetics consider, that the conditions of growth and development play a very important role in the change of hereditary qualities of plants. By changing the conditions of existence or organisms, directing the plant development correctly, we are able to create new varieties without questioning.

Darvin, after discussing the importance of change under the influence of climate, food etc. indicates: "although it is necessary to assume, that new living conditions affect occasionally the organic beings in a specific manner, we may question whether unusual breed would be able to appear, due to the effect of changed conditions, without the assitance of man or of natural selection" (Tamed Animals and Cultivated Plants, chapter 23, page 320.) Michurin pointed out in his works many times, that we can not expect any favors from nature: our task is to take it from her".

The quoted words of the classics of natural science, Darvin and Michurin, contain the same thought: man directs the nature of the living organism and changes it in the required direction. I.V. Michurin produced during his life-time over 300 valuable varieties, and all of them were obtained by a strictly directed selection.

The agricultural value of a variety depends, to a considerable degree, upon the measures of agrotechnic, upon those growth conditions, under which the variety is able to produce the most productive effect. If there are no such conditions, then the good variety will and must regress - either due to a prolonged hereditary propagation, or due to unforable, for its nature, living conditions, or due to other reasons.

On the other hand, the basic problem of the selectioner consists not only of producing a good variety, in the given case of sugar beets, but of the fact, that factory seeds of this variety would reach production as improved varieties.

Based upon government and raion variety testing of sugar beets in 1936, the best seed varieties of the station's elite, which propagated in order to obtain mother seeds, yielded, in comparison with the delivered varieties of seed elite, more sugar of 1.3 c per hectar, and saccharinity of 0.3 percent. According to the data for 1938, this increase in sugar yield reaches 2.2 c. per hectar. In the process of obtaining seed elite from station and factory seeds of the seed elite, we should not only strengthen the increase of sugar yield of 1.2-2.0 c. per hectar, but increase it constantly. Thus we will be able to obtain additional tens of millions of poods of sugar.

We could solve this problem successfully, if the selection stations will join the variety forming process and will improve the varieties during their propagation.

It is of some difference to the selectioner what kind of tubers and what kind of a seed yield will be obtained during the propagation of his variety. The selectioner, as well as the seed producer deal here with a living plant which has to be improved both during the process of production and during the process of propagation.

Among the selectioners still exists the old opinion to consider seed production as a plain variety propagation. In seed production the erroneous opinion, is widely spread that, during storage and planting of tubers, the largest tubers should be removed and that "steklingi" are of great value. Upon motherplantations does not exist the necessary control of theplant's blooming. Selection of seedlings, i. e. the rejection of undesirable bushes, according to form, depressed in development, deseased, etc. is, as a rule, not carried out.

Without paying due attention to the selection of seedlings, we acquire in the succeeding generations irregular interrelation of various, according to quality, genotypes in the population, which, of course, reflects upon the regression of useful qualitites of the propagated material. It has been proven, that the quality of sugar-beet seeds is closely connected with the increase of the plantation's yielding capacity. But very little has been done for the study of measures in educating plants which would influence in the best fashion the improvement of the physical qualities of sugar beet seeds. Here we should pay attention not only to the soil, fertilization, care, but we should also think of the distribution of nourishing substances in the plant itself.

It is quite useful to recall old measures of removing superfulous parts of the plant, topping, pinching of seedlings which provide a great stream of nourishing substances and a considerable improvement of seed qualities. Mass experiments which were carried out in 1934 at 55 sugar beet state farms had proven, that pinching of seedlings increases the yield of sugar beet seeds by the average of 2 - 3 centner per hectar and also improves considerably the physical qualities of the seeds. According to the data of Ramon and of other stations, pinching increases the yield of sugar beet seeds up to 4 centner per hectar and improves their quality. The pinching of the tops of the central sprouts of one stem bushes, which has been carried out at the Ramon station during the drought years of 1938 and 1939, increased the yield of sugar beet seeds by 5 centner per hectar.

When discussing the quality of sugar beet seeds, we must keep in mind, that, besides the sprouting and the energy of germinating, the increase of the sugar beet productivity depends largely upon the size of the seeds hidden in the tubers and upon the strength of the sprouts. In selection work with sugar beets we pay great attention to the production of tubers with large seeds, as it has been explained above in detail. Best seeds are more frequently found in large tubers than in small ones. Therefore, the sowing of mother and reproductive sugar beets should be carried out by seeds, assorted upon sieves with meshes not of 2.5 mm, as it is used now, but with meshes of 3 - 3.5 mm. The material should be propagated by selective tubers with large seeds.

The most serious shortcoming up to recent time was the production of the reproducing and mother sugar beets under one kind of living conditions (with a nourishing lot of 36 X 9), and the production from seeds upon factory plantations - under different living conditions (with a nourishing lot of 45 X 18 cm.). The living organism is in such degree related to the environment, that the latter's changes are unable to cause any changes in its development.

Darvin thus considered the possibility of creating new varieties: "The possibility for the realization of selection is connected with the irregularity which is caused, as we shall see later, by the changes of living conditions. Selection becomes sometimes difficult and even impossible, when the conditions counteract the desirable symtom or quality". (Changes in animals and in plants under domestic conditions, edition of IU. Lepkovskii, volume VIII, page 484).

Was the selectioner unable to interfere actively into the variety forming process under the previous measures of propagation and reject successfully the undesirable biological types?

No, he was unable. The small nourishing lots leveled down the individual differences in plants and did not permit the selectioner to direct correctly the development of the organism. In cultivating the plant under crowded conditions, the tubers are small, due to the poor living conditions of the sugar beets, Academic T. D. Lysenko indicates, that"...the conditions of the environment which cause good development of some organs of the plant, for instance potato tubers, - these conditions improve the plant's species in the same direction". (Agrobiology, 1948, page 297).

The best sugar beet seeds will be those which are obtained from the fields of high yielding capacity, considering both sugar beets of the first year (tubers) and sugar beets of the second year (seedling). Artifical division of the vegetative organism into two parts contradicts the Michurin teaching concerning the tendency for change in the plant's species, under the influence of the living conditions. Therefore, it was necessary to change the nourishing field from dense ones to more spread ones. At the present time, this problem has been already favorably solved for reproductive plantations, but in respect to mother sugar beets this condition is often ignored. In 1947, at Stalin state farm, of Tambov oblast', the lots intended for mother and factory sugar beets were sown with the seeds of Ramon variety R. 306. We observed that at the mother plantation, upon a nourishing field for plants of 36 X 9 cm., there was 3-4 times less blooming than upon factory plantation, where the sugar beet was growing under the nourishing conditions of 45 X 18 cm. Would it be possible to improve successfully the mother sugar beet variety, according to the symptom of blooming? Of course, not.

The conditions of cultivating mother and reproductive sugar beets should be analogous to the conditions of cultivating plants upon factory plantations.

Thus, in order to improve the variety during propagation, it is first of all, necessary to create such conditions which would provide the possibility of selection. Such growing conditions for the seeds should be found, such agrotechnic should be worked out which would improve more the seeds of the given variety.

We should not tolerate small tubers with the propagation of highly valuable elite seeds. Small sprouts of the planting material and small tubers do not improve the variety during its propagation, but factually liquidate it.

Poor yields of seeds which are, to some extend, caused by planting small tubers and by poor agrotechnic upon the seed plantations hamper the work of the selectioner and force him to expect "donations from nature". The period of "shtekling", when the yield of sugar beet seeds was counted in 10-15 c. per hectar, came to an end, and at the present time we are unable to return to that period. Stakhanovite teams in sugar beet state farms determined long ago, that the utilization of large tubers provide a yield of sugar beet seeds of 40 and more centner per hectar.

The old point of view, which considered seed producing work, as the simple propagation of the variety, causes the gap between the selection process and the seed producing process, although these processes are really indivisible ones.

But there are selection stations which, at the present time, take very minor part in this important process. We should not tolerate such situation.

The hero of Socialist Labor, A. Iakovlev, mentioned in his article "The Constructor and the war" (newspaper "Pravda", from June, 1944) the words of Stalin, concerning the problems of Soviet constructor, and the creation of a good construction of the vegetative organism, but a constructor of a vegetative organism, i.e. of productively valuable variety, requires from the selectioner the same amount of creative power, as the creation of a good construction of a tank or airplane demands from the engineer.

The selectioner must observe its variety and work over it during the entire time of the utilization of the seeds of this variety in production. As much as the variety is perfect, it always possesses some negative qualities, along with definite positive qualities.

The functions of the selection stations should not be limited to the production of a good sugar beet variety. The selectioner should know what has been done with its variety in practice and how the factory seeds of this variety quantitatively and qualitatively reach production.

Summarizing the above, we would like to underline, that the improvement of elite seeds is closely connected with high agrotechnic of producing sugar beets and seedlings. Only thus will be created conditions which provide good selection and a directed development of sugar beet plants.

The data of the six year experience of F. I. Adamenko (VNIS), given in table 47, indicate, that the conditions under which the sugar beets were produced, and, particularly, the high background of agrotechnic, influence the effectiveness of selectioner's work.

The figures given in table 47 confirm the great significance of high agrotechnic in the improvement of the variety during its propagation without selection.

The basic measures for the improvement of elite sugar beet seeds during propagation are presented, as follows:

1. Intervariety crossing of the material which are propagating under the conditions of various nourishing lots (45 X 20 and 45 X 40 cm) and at

various times of sowing (spring and summer-fall sowings).

This method, applied by Ramon selection station, enables the differentiation of population, according to biological symptoms and is used for selection of plants for succeeding crossing. These plants are sensitive to the living conditions during humid and drought years. This method is also used for the selection of biological varieties which are relatively ripening more quickly, with the high energy of the growth agent.

The crossing of the material, sensitive to various nourishing lots, yields increase in sugar crops from 5 to 18 percent.

2. Intervariety crossing of the propagated material, according to the principle of sensitivity to various nourishing grounds, and based upon this premise, the creation of a single variety genotype, enriched in its hereditary basis with a high sensitivity to all the elements of full fertilization.

This method is applied by L'gov selection station which established a varied sensitivity of the varieties to various elements and to various combinations of mineral fertilizers. Some sugar beet varieties are epitomized by especially high sensitivity to phosphoric food, others - to potassium nitrate, etc. The difference in the reaction of varieties to individual elements of nourishment is expressed in the increase of tuber yield by 40-50 c. per hectar.

A skillful crossing of the material, which is sensitive to individual elements of complex fertilization, improves the population drastically.

According to the date of L'gov selection station (selectioner S. V. Oudvil), the intervariety crossing of the variety L. 1058 yielded a tuber increase by 51 c. from hectar and the increase in sugar yield by 0.3 percent.

in comparison with average evaluation of cultivation products upon various mineral nourishment. The mechanical mixture of variety seeds of various cultivation indicated less increase in the tuber yield - 14 centner from 1 hectar. Intervariety crossing with variety L. 1241 yielded an increase in tuber crops by 35 c. from hectar, and in sugar content in the size of 0.2 percent, in comparison with the average index of cultivating products. It has become evident, that the increase of yield of the intervariety hybrids is the stronger, the higher the level of sugar beet yield. Of course, the effect of various mineral nourishment should spread not only upon the sugar beets of the first year, but during the second year, during the formation of the new seed-still in higher degrees

3. The intervariety crossing of the propagated material, educated under various ecological conditions of various state farms. Micrological conditions, which are often difficult to be analysed, cause the differences between plants, which fact is noticed during intervariety crossing, directed towards the acquisition of more viable posterity. We are convinced, that the better varieties - recordists should be produced not only in the raions where they are delivered, but under various raions, according to humidity and soil conditions.

In 1940, the Ramon station carried out an intervariety crossing of the variety R. 1537 cultivated under various conditions of three sugar beet state farms of Voronezh sugar beet trust: Petrovsk, Stalin state farm and Krasnoarmeisk state farm. The lot for intervariety crossing was six hectar in the Voroshilov division of Krasnoarmeisk state farm, where tubers were delivered from other sugar beet state farms. The seed yield fluctuated from 20 c. from hectar of Stalin state farm and up to 9 centner at Krasnoarmeisk state farm. The low yield of seeds and their inferior quality at the Krasnoarmeisk state farm were caused by the damage from sugar beet bug ,Poecilloscytus cognatus, Fiebl.

The material was compared in 1941 at the raion variety testing of the variety lots: Ramon, L'gov, Ivanov and Verkhnischesk. In connection with the war, the experiments were carried out only at the Ramon variety lot. The results of these experiments are indicated in table 48.

As the table indicates, the results prove to be in favor of intervariety crossing. The seeds of the variety R. 1537 propagated clean in various sugar beet state farms, acquired inferior evaluations in sugar yield than the seeds from intervariety crossing. Despite inferior physical seed qualities, the effect of intervariety crossing is quite authentic. In practical work, in connection with the difficulties of transporting great masses of tubers, the same sugar beet variety could be reproduced in various state farms. It is possible to produce seed mixtures for intervariety crossing, when the factory sugar beet is cultivated.

In selection work with sugar beets, it is imperative to deal directly with the tubers produced at various locations of reproduction. The effect of intervariety crossing will be in this case more important.

Charles Darwin indicates"...profits which result from cross pollination depend upon the circumstance, that the sexual organs of the parents were differentiated to some dgree due to the fact, that their ancestors underwent the effect of varied conditions, or due to the fact, that they were crossed with species which underwent the effect of similar conditions, or, finally, due to the fact, which we call, arbitrary variability. Consequently, the person, who intends to cross animals closely related, should keep them under most varied conditions". (The effect of cross pollination and auto-pollination in vegetative world. Sel'khozgiz. 1939. page 315).

Thus, in the general work on improving elite seeds, the intervariety crossing, according to the principle of cultivation under various ecological conditions, should extend widely. The intervariety crossing of the propagated material composed of seeds of various years has not been sufficiently studied. We have in mind the utilization of plant differences, connected with the effect of meteorological conditions of various years of cultivation upon the seeds. We possess some data indicating, that the mixing of seeds of various years' yield for the very same variety is able to improve the material during its propagation. But this method does not always yield positive results.

6. Mass selection of better plants in collective and state farms.

It is possible to produce new varieties and to improve the existing varieties in production, as well as protect them against deterioration and decay by means of selecting better plants upon the Stakhanovite lots of collective and state farms.

The national selection should be based upon the suggestion of K. A. Timiriazev, that the study of cultivated plants, the study of their requirements, i.e. hereditary, is the basic task of scientific agriculture. The familiarity with the plants' reaction to the environment is always helpful in producing new and improved old varieties.

We know, that Stakhanovites create the most favorable conditions for plant cultivation. The selection of best tubers for seeds by Stakhanovites should strengthen economically the valuable qualities of the propagation variety. Usually, the good variety is epitomized by a rich hereditary basis (genotype) and by the adaptability to local conditions. The correct selection of better plants, according to genotype is tested by their posterity. This work is usually carried out at selection stations. But a direct selection of better plants, according to their health, and an indirect selection, according to genotype could be carried out by Stekhanovites at collective and state farms. For instance, in summer, during hot hours, we are able to observe upon the plantations of sugar beets, that some plants wilt considerably, others - grow poorly, and the third ones - look absolutely normal. Plant selection, according to biological immunity to unfavorable natural conditions and simultaneously according to the size of the tuber during harvesting (better plants are noted with pickets during their growth) will enable to produce seeds more adaptable to local conditions and to protect productive varieties against deterioration and decay. Practically, this work is carried out by the selection station through the house-laboratories. The most productive tubers, selected by collective farmers upon Stakhanovite fields (at least 100 tubers from each field), cultivated under the conditions of high agrotechnic of one or various sugar beet raions, arrive at the selection station, where, after the rejection of parts of the material, according to high saccharinity, the tuber form and other qualities, obtain a wide collection of tubers. The intervariety crossing yields good material for the production and improvement of variety seeds. Through this method we carry out inter-variety crossings of sugar beets.

Under productive conditions, the intervariety crossings should be carried out by sowings upon mother plantations of two or several, previously selected, varieties. During the sugar beet harvest, the tubers of various varieties are stored together and, in this case, the intervariety crossing do not cause any technical difficulties.

5. The selection of large seed tubers upon transplanted plants. We indicated some data which prove, that the selection of better tubers, located upon the central stem and at the base of the first branches, increases the productivity of sugar beets. This increase reaches at the average 2.5 centner of sugar from hectar. Consequently, by selecting large tubers upon seed plantations, we are able to improve productively the valuable sugar beet varieties during the process of their propagation. For this purpose it is sufficient to obtain 3-5 centner of improved seeds (large seed tubers), in order to reproduce a good variety for the second time. This method is simple and convenient. It should acquire a great productive significance.

As a concrete illustration of the effectiveness of improved selection, could serve the following data of the selectioner of Verkhniachesk station, T. F. Grin'ko (the improving selection was carried out, according to the size of the tubers and the strength of the sprouts during the digging of two varieties, reproduced at the Shevchenko state farm in 1945).

6. The method of numerical elite.

The method of numerical elite enables the solution of the problem, concerning the strengthening of a series of useful qualities in the productive variety: freeing from bolting, controlling hollowness and woodiness, best immunity against fungi diseases, etc. The basic task of the selectioner consists not only of producing yearly new varieties, but of eliminating entirely the negative, undesirable symptoms in the existing variety as well. We face the task of selecting at the seed plantations at least 3000 -4000 bushes, whose seeds should be tested individually, according to a simplified method. After the rejection of the inferior posterity, according to the harvest of tubers, sugar percentage and according to other qualities, a wide tuber mixture is composed, which yields improved seeds of the propagated variety. If it is possible to improve the variety in respect to saccharinity, then the main attention should be given to posterity with high saccharinity; if it is necessary to decrease bolting, then the seeds are sown vernalized etc.

At the moment, when the seed elite will obtain high evaluations in state variety testing, the station presents an improved material of the same variety for reproductive sowings upon large lots. In this case, the regularity of the variety in production is fully provided.

In 1939, at the seed plantation of the variety R. 1705, before ripening 350 bushes were selected with the succeeding individual harvesting. The content of the harvested transplanted plants differed by considerable variety. There were seedlings of early ripeness and of late ripeness, with pressed and bulged out branches, with large and small bracts, short and gigantic, bushes of various types, according to the dynamics of branchiness, etc. When selecting transplanted plants of great variety, we paid also attention to their seed productivity. Basically were taken seedlings with the amount of 150 to 320 seeds. The selected material was studied in 1940 in a special experiment by the method of numerical elite (one row lots in double repetition, after every ten varieties, was sown a single standard).

The results indicated a drastic differentiation of plants, according to physiological peculiarities. There were lots with plants, blooming well and non-blooming, depressive in development and strong, with a poor or ideally leveled form of the tuber, etc. How much did the individual varieties differ, according to useful symptoms, we may see from figures, indicated in table 50, in which are given evaluations for 20 most characteristic varieties.

Table 50 indicates, that the variety R. 1705, divided into a series of components, obtained an unequal evaluation of these parts. We do not think, that the obtained difference in productivity is authentic for the majority of varieties. But we confirm, that about 10 percent of generations, especially defective in respect to utilitarian qualities, occurs in the experiment. Their rejection from the population will be only useful. Really, during the succeeding comparison of the variety R. 1705, propagated without any selection and improved by the method of numerical elite, the effect was quite great. The material, improved by the method of numerical elite, indicated in 1944 some increase in the tuber yield by 19 c. from h. and the increase of saccharinity by 0.2 percent.

If we take into consideration, that the increase of sugar percentage in sugar beets, even by 0.1 percent, would provide the country with additional one million poods of sugar, then the indicated difference of 0.2 percent is of great productive importance. But, this method is quite bulky and requires an even and full planting by sowing sugar beets in one-row fields.

7. An important role in improving elite seeds belongs to the place of reproduction. The practicians sugar beet producers always underlined and still underline, that the increase of yielding capacity of sugar beet plantation is closely connected with high quality of seeds. In reality, a good sugar beet variety ceases to be good, if its seeds are non conditioned. There are raions, where, even with high agrotechnic, sugar beet seeds are epitomized, as a rule, by low physical qualities (Eastern Siberia and others).

This is the one side of the question. The other side consists of the circumstance, that the seeds of various places of reproduction often yield a sugar beet, different in its quality. For cereals there are known difference in the yield of the same variety, reproduced in different places, up to 88 percent.

Analogous facts, not so obvious, exist also in sugar beet seed production. A varied behavior of sugar beet varieties of various localities depends, probably, upon the content ofthat pollen which pollinated the material under varied climatic and soil conditions. Of great importance is the correlation of races, included in the population, and some other causes.

During the selection and propagation, our task consists of the increase in the amount of highly evaluated biotypes which characterized some varieties. But even a simple propagation of the variety, under drastic, unadaptable conditions is able to regress the hereditary content of the population into undesirable direction, is able to produce a different correlation of genotypes in the population.

In table 51 are indicated the order places, according to sugar yield from hectar for the Ramon variety R. 1537, from various localities of reproduction, based upon data of state variety testing for 1941. In the same table are given the evaluations, carried out based upon the studies of those seeds at the comparative field of Ramon station.

According to these data, the seeds of the variety R. 1537 of the reproduction of Merken sugar beet state farm, received upon all variety lots worse evaluations than the seeds of reproduction of other localities.

Consequently, a simple propagation of the variety, under agricultural conditions unadaptable to it (watering), decreased its agricultural value.

The results of the state variety testing for 1943 indicate, that the seed of the variety R. 1537 from Biisk sugar beet state farm, upon all variety lots of non irrigated zone (Eertil'sk, Zematchinsk, Bashkirsk, Biisk) yield a decreased content of sugar in the sugar beet, in comparison with the same variety, but reproduced by Borinsk sugar beet state farm

(Voronesh oblast'). At the average for the zone, the decrease in sugar content reaches great height - 0.3 percent, with almost equal yielding capacity.

In 1947, in a special experiment at the Ramonsk station were examined seeds from various reproduction localities for the variety of yielding capacity, I. 1305, and varieties of saccharinity VP. 1621. These varieties were propagated in 1946 under varied natural conditions, starting with the Right shore of the Ukraine up to Central Asia. The results of the testing are given in table 52.

The table indicates, that the amplitude of variations for seeds of both varieties from various cultivating localities is quite high. The yielding variety I. 1305 yields the greatest difference in the yield of tubers (up to 35 centner from hectar), and the sugary variety VP. 1621 yields more in sugar content (up to 1.2 percent). At the same time, the seeds of the variety I. 1305, from one place of reproduction yield fluctuations in yielding capacity and in saccharinity almost three times less, than the seeds of this variety, but from different places of reproduction. If we take into consideration a good preciseness of the experiment (according to tuber yield, P - 2.0 percent, according to sugar content, P = 0.86 percent), then the difference in tuber yield and in saccharinity for various seeds should be considered as authentic. Analogous results were obtained also in 1948. The above indicated is plausible. Any quality, any symptom in the plant is a result of the development of the organism under specific conditions, and this development, under various conditions and under various raions, occurs differently. Therefore, during propagation of productively valuable sugar beet varieties we should not ignore various natural and agrotechnical conditions of seed cultivation. On the contrary, the disclosing of a better locality for reproduction of specific materials will assist the selectioner during many generations to keep the cultivated valuable varieties at a high level, in respect to many characteristics.

8. In the work of sugar beet study, as a plant and as a product, there are many moments which are of great significance for the acquisition of positive results. At the first glance, these problems seem minor ones, which do not deserve special attention. But in reality, the execution of a series of minor measures often provide the success of selection in general and the improvement of elite seeds in particular. Here belong the following problems: leaving strong plants during digging and testing, rejection of poor deformed tubers, during harvesting, the removal of the top bud at the moment of sugar beet harvesting, high agrotechnic at the seed plantations, etc.

The many year experiments of the Ramon station with the cutting of the top bud upon the tubers, during the sugar beet harvesting, yielded an average increase of seed yield, by 3.5 c. per hectar. Spring removal of the top bud caused a decrease in the seed yield. This phenomenon could be explained thus. The preparation of the sugar beet at the second year of its life begins in the roots even during winter storage. If the tubers are kept with the upper bud, then the mobilization of the nourishing substances occurs most energetic during the sprouting of the central eyes, and the peripheric eyes remain of poor viability. The central buds possess greatest intensity in breathing during the storage of tubers in "kagats". Such tubers yield a small percentage of blooming sprouts from the peripheric and central buds.

It is possible to increase the breathing intensity of the peripheric eyes of the tuber and the inner living processes, connected with the breathing, by removing the central bud in fall, before storing the tubers. In this case, the central and peripheric eyes will be better preserved, become more viable and provide a more productive form of seedling and, consequently, a higher seed yield from hectar. It is further known, that the selection for productivity will always occur along with the selection by the plant for more nourishing substances. Under the conditions of poor agrotechnic, the yielding capacity of the most valuable plants will drop lower, than with some species which are requiring less mineral and water nourishment. As a result of that, the plants which are genetically more productive could be rejected during the process of selection, and the selection itself will lead to the change of hereditary qualities of the population in undesirable direction. On the other hand, if such plants will not be rejected, then they will yield less seeds, due to their exhaustion and to their formation under the conditions of greatest mineral starvation, and their specific gravity in the population will decline regularly. By this, the propagation of elite seeds, under the conditions of poor agrotechnic could lead to the decrease of productivity of the variety.

All this is familiar to selectioners and seed producers.

These measures of preserving and improving the selection should be given due consideration.

The economic value of the sugar beet, selected, according to positive characteristics, increases with the increase of the amount of generations. This is explained by the creative role of the repetitive selection in the accumulation of positive characteristics.

Darwin has the following famous utterance along this problem: "Under a methodic selection, the cattle or the plant producer is selecting with some specific purpose in mind, and, if he permits a free crossing of the species, then his work would be entirely in vain. If a great number of persons, without any intention of changing the species, but still aiming towards perfection, will care for the production of better cattle, then, as a result of this subconscious selection, they will obtain a slow, but certain perfection of the species, despite the fact, that there was no isolation selected species". (Origin of species through natural selection, publication of Academy of Science of USSR, volume III, 1939, page 344).

In sugar beet selection we are able to indicate many examples of the effect of the methodical, accumulating selection. The Uladov station always rejected poor plants during the selection work. As a result, the varieties of Uladov station differ by high immunity to mound rot and to other diseases, although there was no special selection in this direction. The systematic selection, as far as the energy increase of the growing agent under the conditions of a short vegetative period, injected to the Ramon varieties a biological early ripeness. As a result, the varieties of the Ramon station occupy in the regions with short vegetative period first places in productivity, etc.

The existing productively valuable varieties which yield high sugar crops from hectar, always possess some amount of negative characteristics. It is impossible to decrease or eliminate entirely the negative characteristics and to improve the positive qualities of the sugar beets, without the systematic work of the selectioner with his variety. This problem could be solved easily, if the reproductive and the mother sugar beet will receive more attention. In connection with that, the problem of improving elite seeds should be considered one of the most important in the thematic outline of VNIS and of selection stations.

The suggested measures should be carried out upon reproductive and mother sowings, in agreement with the peculiarities of selection work at individual stations and with the concrete plan worked out by the selectioner, according to the requirement of the Institute of sugar beets. The experiment of our work in this direction indicates, that the selectioner is able to join actively the form producing process and to improve his variety, if the state farms will create the necessary working conditions.

There are many unclarified questions in the problem of improving the sugar beets seed production. Therefore, if, based upon a wide discussion and by suggesting new methods, the road, which selectioners and the seed producers should take for the improvement of elite seeds would be clearer, then the problem of sugar industry to yield to the country more white sugar - will be solved successfully.

End of book

ML:1-7-52

Zubovich, I. A. and Kobozev, N. I.
The problem of microdoses in chemistry and in biology (growth substances as activators of catalytic sytems). Biokhemiia 16: 12-23, Jan./ Feb. 1951 385 B523

Transl. 256: Growth Substances

Translated in part from the Russian by R. Dembo

256

Summary

Among the physical-chemical objects, the maximal effect of microdoses is characteristic for adsorbing catalytic agents which are constructed according to the type: active substance plus carrier.

The influence of various doses of growth substances has been explored, as well as the influence of fat aromatic acids and oxy acids, upon the catalytic activity of ion-adsorbing catalytic agents (Fe^{3+}, Ag or Cu^{2} plus carbon). Small doses of growth substances (0.005 percent), as a rule, activate, and high doses (0.01 - 0.1 percent) disactivate ion-adsorbing catalytic agents, i. e. during the action of phytohormones upon adsorbing catalytic agents and upon the plants a definite parallelism has been observed.

The adsorbing ions of copper (heteroauxin) are the most activated and most selecting, and the ions of iron are the least activated and least selecting. Fat and aromatic acids practically have no influence upon the activity of ion-adsorbing catalytic agents, oxy acids disactivate them drastically, and the etherification of the oxy group by phenyl radical decreases this disactivating effect and forms the transition to growth substances.

The substantial effect of the solvent (water, ethyl alcohol) upon the action of phytohormones as the activators of ion-adsorbing catalytic agents has been disclosed. The specific reproduction of activization degree of the adsorbing catalytic agents by phytohormones has been indicated, and this explained the possibility of physico-chemical characteristic of

the phyto-hormones. An assumption was expressed, that the activating effect of phyto-hormones upon the adsorbing catalytic agents are one of the types of aggravation effect in the field of biologically active structures and that a close analogy in the action of the growth substances upon catalytic agents exists in general nature of phenomena.

Zubovich, I. A. and Kovozev, N. I. Transl. 256:
The problem of microdoses in chemistry and in biology (growth substances as activators of catalytic systems).
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The problem of microdoses in biology is of great practical and theoretical importance and attracts the attention of a wide circle of explorers. Of the 89 elements known to contemporary chemistry (without transuranium) 60 more were discovered in the living organisms. The majority of these elements belong to the micro-elements which are present in the organisms in the amount of thousandth and hundred thousandth part of per-cent. In recent time the important role of micro-elements in the life of plants and animals (1) has been convincingly proven.

Nevertheless, the mechanism of a high physiological activity of micro-elements could not be considered entirely clarified. The majority of explorers came to the conclusion that the basis of biological effect of micro-elemants is their capacity of catalytically accelerating complicated physiological processes which occur in plants and in animals. In literature the point of view has been supported that the physiological role of micro-elements consists of their effect upon physico-chemical qualities of the plasma colloids.

In order to grasp the biological effect of microdoses, we lack the physico-chemical link of this phenomenon, since the influence of "trace substances" which we observed in chemistry until recent time had the peculiarity which differ essentially from their biological effect. Here belong the following phenomena: the influence of traces of water upon the burning of some gases and upon the boiling temperature of organic substances, the effect of inhibitors upon the oxydizing processes, the influence of promotors upon the activity of catalysators, etc. For these chemical effects the basic peculiarity of the biological effect of microdoses is not characteristic. This effect is the availability of the maximum of the positive effect with very small concentrations with a consecutive shift to a negative effect. For the chemical effect is more characteristic not the availability of the maximum effect, but the saturation: with the increase of the dosis (concentration, partial pressure, etc.) the positive effect of "trace" substance soon reaches the limit and stays upon that level for a long time, changing only with considerable concentrations. Such is the effect of water, of inhibitors and of many promotors.

Although the most qualified glance is able to see in the biological effect of microdoses the special kind of catalysis, yet, up to recent time, in the field of simple catalysis similar phenomena have not been determined definitely: in homogenic systems the speed of catalysis usually grows monotonous with the increase of the concentration of the catalisator; the same could be observed in microgenic (colloid) systems. In microheterogenic systems the conception of catalisator's concentration is meaningless.

Microdoses in the field of catalysis

During recent time we discovered a special class of catalytic systems for which the existence of a maximum of catalytic effect is quite characteristic. This effect is noticeable by high dilutions of catalytic agents (2). These adsorbing catalytic agents which are a catalytic active substance (atoms, molecules, ions) which are brought upon dispersing adsorbent carrier.

It became evident that, by the concentration of the adsorbing layer of the catalytically active substance upon the surface of the adsorbent, the catalytic activity, as a rule, passes through a maximum, and sometimes even produces a system of maxima. The described correlations are explained quantitatively by the theory of active ensemblees (2-5).

The fact, that the maximum of the effect in the field of minor concentrations has been noticed, on one hand, in the biological systems, and on the other hand - in the adsorbing catalytic agents, is not a simple coincidence. This is explained by the fact, that catalytic processes in biological systems (in the cell) occur factually in adsorbing layers - on the surface of albumens, cellular membranes, etc. Thus, the adsorbing catalytic agents constructed according to the type: active agent plus carrier, are the nearest physico-chemical models of natural, biologically active substances, for instance, ferments. Therefore it is not a coincidence, that a most conspicuous physico-chemical effect of microdoses was disclosed for the first time upon adsorbing catalytic agents of the type: ion of heavy metal plus carbon (6). It has been discovered, that if, for instance, we add to the adsorbing catalytic agent (carbon + 0.1 percent Fe^3) 0.0005 percent Cu^{2+}, then the catalytic activity (decomposition H_2O_2) decreases immediately 15 times, and the oxydation (activity (oxydation of sulphite) increases seven times. Further addition of Cu^{2+} changes the activity slightly. Thus, the first "traces" of copper are effective in this instance.

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Iakushkin I. V.
O Kul'ture Vazhneishikh Polevykh rastenii v SSR (On the cultivation of the most important field crops in USSR). [n.p.] Ogiz Chkalov Publ. 1949. 68 p. 64 Ia 50.

Transl. 257: Cereals

Translated in full
Translated from the Russian by R. Dembo

Table of Contents

Foreword

In this book, offered to the readers, are discussed the principles of socialist plant production.

The last year, 1948, has been marked by a crisis in the development of Soviet agro-biological science upon which plant production is based. The crisis in the development of agricultural science was achieved as a result of July-August session of the Lenin Academy of Agricultural Science. The result of the session was the victory of the Micurin-Lysenko teaching which proves the effect of the environment upon the inheritance and heredity acquired by plants and by animals of useful symptoms, and a complete rejection of formal genetics which denied the effect of the environment upon the inherited qualities of animals and plants.

Hundreds of highly valuable varieties of fruit trees produced by Michurin are the undeniable proof of the power of Michurin methods. Lysenko accomplished vegetative hybridization with garden and field plants with great success. By means of graftings and crossing were produced new varieties of tomatoes and potatoes.

The basic result of the session was the fixing of a close relationship between the teaching of Michurin-Lysenko and that of Dokuchaev-Williams. One of the expressions of this relationship could be determined as follows: higher yields are obtained only upon slightly crumpled soil of firm structure, and such structure is formed only under the effect of grass stand system of agriculture. Best varieties manifest their best qualities only upon fields of highest yield, namely upon fields of grass stand systems of agriculture.

The resolution of Soviet of Ministers and of CK WKP(b) "Concerning the plan on field protecting forest plantings, introduction of grass standings crop rotations, construction of ponds and reservoirs for the provision of high and resistant yields in the steppe and forest-steppe regions of the European part of USSR" - a gigantic Stalin plan of soil reproduction, transformation of plants and of climate, namely the entire nature of dried out steppes. This plan spreads also upon the Chkalov oblast' which particularly needs the protection against drought winds".

The Chkalov oblast' is famous by good hard wheat, by millet and by other plants and wide fertile steppes.

Many drought resistant plants, including "sorgo", Sudan grass and others, are very promising in this region.

The basic grass mixture should become the mixture of lucerne and "zhitniak".

The field crop rotations of grass standing system in Chkalov oblast' should differ by the highest yield of spring wheat.

This book is written for all collective farmers of the Union, and the author trusts that the collective farmers of Chkalov oblast' will find in it many useful points.

The agriculture of the Union of SSR entered into the forth year of the post-war five-year plan. In 1949 should be accomplished the fulfillment of the five year plan along all indexes. The collective farmers of Chkalov oblast', in solving these most important problems, should be in the avanguard of the collective farmers of our great motherland.

During the pre-and post-war years, the socialist plant production has been characterized by a mass development of Stakhanovite(Hf remog) movement. It is sufficient to indicate that during the year 1947 alone, about 2000 collective farmers(women), collective farmers(men) and agronomists were awarded with the name of Hero of Socialist Labor, and close to 50 thousand were rewarded with orders and medals of the Soviet Union.

Along the major part of field crops, the collective agriculture achieved yields of such magnitude which are unknown to any country.

The achievements of the Heroes of Socialist Labor and of Stakhanovites are based, first of all, upon collective organization socialist form of labor and national socialist competition.

In biological sense, these achievements of the heroes of socialist labor are based upon the measures and the system of thorough coercion upon the plant. These measures and system are based upon data of progressive Soviet agricultural science.

Stakhanovites and the agronomists who supervise them were able to develop such a system of coercion upon the growth and the development of the plants, due to which it will be possible to provide the plant with water and with food and simultaneously improve the provision with heat, air and light. In order to utilize light best, the Stakhanovites apply a more regular distribution of plants upon the field. They also achieve improvement in light regime by closer between-rows, eliminating in short terms those parts of the field which are not covered with leaves.

The combination of socialistic forms of labor with the progressive Soviet agricultural science opens before agriculture of collective and state farms unlimited possibilities for the increase of yields in field and other plants.

According to the content of the book, academic Lysenko said with full right: "Two worlds - two ideologies in biology, one hostile and the other Soviet which leads to communism".

Field plants which are produced in collective and in state farms along huge spaces of the Soviet Union are varied. The measures of obtaining high yields of individual plants with high qualities are the subject of that branch of agricultural science which is known under the name of plant production.

In Tsarist Russia, in plant production measures were often recommended which were adapted from various countries, mainly from countries of Western Europe, which are under entirely different natural conditions. These adaptations, as a rule, caused mass failures. Thus, for instance, the varieties of spring and of winter wheat which were imported from abroad were absolutely unfit. Among the standard varieties of winter wheat which were introduced after October revolution, foreign varieties are entirely absent, and among the standard spring wheat there are only a few of those from abroad. All high crops and records in wheat production were achieved with varieties which were produced by Soviet selectioners. Various crop rotations accepted in European countries were unfit for our conditions.

The Russian agronomical science in the field of plant production developed for many dozens of years based upon scientific and experimental data obtained within our country. In 1947 eighty years have been completed since historical experiments were carried out in testing the effect of mineral fertilizers in field environment near Simbirsk (now Ul'ianov oblast'). These experiments were carried out by Kliment Timiriasev (1843-1920) according to the teachings of the greatest Russian chemist Dmitry Mendeleev. Timiriazev paid his main attention to the utilization of the achievements of biology, chemistry and of other sciences in order to reconstruct agriculture upon scientific basis. Timiriazev united most closely plant production with the physiology of plants. It was he who gave the best characteristic for the flax plant.

One of the founders of Russian plant production could be considered professor of Moscow Agricultural Academy, Ivan, son of Aleksander, Stebuts (1833-1907) who elucidated the most important agricultural biological peculiarities of a great number of field plants. His two-volume work "Fundamentals of field plants study" laid the foundation for the development of scientific plant production; the chapters which are dedicated to potatoes, tabacco, hops, did not lose their significance until present time.

The closest student of Timiriazev and Stebuta and the successor to Stebuta as chairman of the Academy is the academic Dmitrii Nikolaevich Prianishnikov (1865-1948). Prianishnikov is credited with the working out of some fundamentals of agricultural chemistry and a successful solution of a series of problems in plant production. He paid special attention to the cultivation of lupine and of potatoes, carried out a series of research with Siberian wheat and with some peculiarities of sugar beets. The works of Prianishnikov on the physiology of plant nourishment and nitrous exchange occupy one of the first places in world science.

A great contribution into the development of Russian plant production was made by professor Petr Rodionovich Slezkin (1862-1927) who supervised the department of plant production at the Kiev Politechnical Institute. The most important works of Slezkin on plant production are dedicated to the biology of cereals and to the generalization of data on sugar beets.

At the Novoaleksandrovsk, now Khar'kov Agricultural Institute, for some time, professor Petr Vasil'evich Budrin(1857-1929) was supervising the department of plant production. He contributed a great deal in the studies of legumes and especially in the production of lupine in Western oblast's of Russia and Poland.

During the last quarter of the nineteenth century experimental stations acquired great significance in the development of Russian plant production. The directors of Poltava experimental field, the great Russian agronomists of their time, Vasilii Nikolaevich D'iakov and Sergei Fedorovich Tret'iakov created a perfect system of cultivation of fallow land with an obligatory depth in loosening the soil when the time of sowing was approaching. The Poltava experimental station achieved oustanding results with winter and spring wheat, with rye, in the production of lucerne and camp-fire.

The outstanding Russian agronomist, A.A. Ismail'skii, who, along with the study of the regime of soil moisture, produced "sorgo", as a plant of high drought resistance, worked closely with the Poltava experimental field.

Upon Odessa experimental field were carried out, at the end of the nineteenth century, important explorations on the root system of field plants and on drought. Academic Rotmistr was credited with this work. Aleksander Nikolaevich Engel'gardt(1832-1893) worked simultaneously with non-black soil. He suggested the application of chemistry to agriculture, explored deposits of phosphor, indicated the most favorable conditions for the utilization of phosphorite powder as fertilizers. Later on, Prianishnikov and Kossovich produced plants which were able to extract phosphoric acid even from inactive soils. To these plants belong lupine and a few other legumes, and among non-legumes - buckwheat.

Some great Russian scientists of the nineteenth century were the predessors of Uilliams in the gigantic work which he carried out on the creation of grass standing system of agriculture. Among the scientists who accomplished a great deal in this direction, we may mention Pavl Andreevich Kostychev(1847-1895). He established the change in plant formations upon natural deposits and worked out a system for the tilling of black soil ("Tilling and fertilizing of black soil").

Alexander Vasil'evich Sovetov, the first doctor of agriculture in Russia, carried out valuable research in the field of crop rotation. N.N. Klingen carried out crop rotations with grasses on a large scale in various regions of Beyond-Volga. These crop rotations were introduced upon government's "alloted" lands of that time. Vasilii Semenovich Bogdan has played an important role in grass standing system. He introduced one of the best perennial cereals without roots - "zhitniak". This plant, named wheat grass has been subsequently exported from Russia to America. In our country "zhitniak" became one of the plants which formed the Williams' grass mixture (yellow lucerne plus "zhitniak") which is the best for drought belt.

In the production of scientific flax production, the services of the explorer and outstanding lecturer, prof. of Agricultural Academy, Ivan Semenovich Shulov, are great.

Based upon the works of his predecessors, academic Vasilii Robertovich Williams(1863-1939) created the theory of a unified soil forming process and a study of grass standing agricultural system which is connected with it. The composites of this system are not only a correct crop rotation with many grasses, as it was erroneously considered sometimes, but the combination of two crop rotations - of field crop rotation (with the necessary participation of legume-cereal crop mixture) and of forage crop rotation (with a longer standing of grasses) with forest field protecting strips and with a specific system of tilling and fertilizing of the soil.

All the progress and records of Stakhanovites of various branches of agriculture are based upon a thorough influence upon the plant. Such a thorough influence is achieved by the application of measures which are not divided, although perfect, but which are a well studied complex of measures which has been foreseen by the grass standing system of V.R. Williams.

In 1936, in a conversation with a delegation of collective farmers of Shatsk raion of Riazan' oblast', V. R. Williams said:

"The fertility of the soil is determined by the availability in it of water and nourishment for the plants. With unstructural, loose soil, the collective farms are always doomed to half of the possible yield. And, on the contrary, with structural soil the elements of fertility are better provided, and the yield is more certain. Of all agricultural systems which have been suggested through the times, we have at the present time one scientifically founded system - agricultural grass standing system. Only with the assistance of perennial grasses are we able to produce a firm, loose soil structure. According to this system, we introduce every 6-7 years perennial grasses into crop rotation."

On the majority of collective farms should be, by all means, introduced two crop rotations: the field one and the farm one. Meadows should be transformed into meadow crop rotations. It has been often assumed that forage crop rotation should occur only upon meadows. In reality it could be a pre-farm one. According to this measure, the transport of the green mass and of root fruits from the fields to the farm is facilitated. The first condition for the grass standing system are two crop rotations: the field one and the forage one.

The correct crop rotation is composed of four systems. This is the system which provides a firm soil structure, the system of rotation, plant rotation, the system of tilling and the system of fertilization".

The teaching on plant transformation which has been created by the academic Trofim Denisovich Lysenko (born in 1898) is of great significance for the further development of plant production. Based upon the teaching of Timiriazov and upon the works of Michurin, as the creator of new methods in producing new varieties, Lysenko worked out an entirely new direction in plant production which he named agro-biology. By this nomenclature "agrobiology" is indicated the close relationship between agricultural and biological science. In his report at the historical session of the Academy of Agricultural Science, T. D. Lysenko indicated: "the more biological science discloses the regularity of life and the development of living organisms, the more effective is the agronomical science". An obvious confirmation of this basic idea is easily found in the entire teaching of academic Lysenko based upon the teaching of Darwin, Timiriazev, Michurin. Based upon the discoveries of Michurin in the field of hereditary irregularity (Michurin genetics) grew the Soviet creative Darwinism. It contains the entire materialistic basis of Darwinism, but the erroneous ideas of Darwin concerning the danger of over-population have been rejected.

Lysenko's discoveries embraced a great number of problems and a considerable part of most important agricultural plants. Each of them is based upon a thorough study of individual plants. The teaching of T. D. Lysenko which he worked out about the stage development of a living organism is the basis for all problems. By stages we understand the availability of critical moments in the plant's life. As a result of the stage teaching came the practice of vernalization. By vernalization we understand the pre-sowing influence upon the seeds. This influence occurs under definite temperature and definite moisture for each individual plant. Vernalization accelerates the primary development and ripening and assists wheat in resisting drought in some regions and in other regions to resist frost. The system of vernalization, which has been worked out first for wheat, was gradually spread upon a great number of plants, became a mass measure and yielded good results in socialist agriculture.

Vernalization was followed by a series of other great discoveries which are connected and which are based upon a deep understanding of plant development and the conditions of the seeds. Here belong the selection of fallow land for crossing, topping(cutting) of cotton bushes, control of potato degeneration, summer sowings of lucerne, production of new varieties of tomatoes and of potatoes by vegetative hybridization and other measures.

New measures in controlling weevil (using chickens) were worked out.

Lysenko contributed greatly to agricultural production during the war. He suggested and performed in mass amounts: the utilization of the tops of potato root as a planting material, the increase of sprouting of seed material by means of heating, valuable measures in soil tilling, stubble sowings of winter wheat.

Biology has been greatly discussed previously, but it has been little applied. Lysenko connected in the closest way the production of new plant varieties and the agrotechnical measures of influencing the conditions of plant production and the peculiarities of their development. Having suggested the method of inter-variety crossing, Lysenko achieved a definite restoration of a series of varieties. Applying the winter sowings of spring and early spring sowings of winter crops, he was able to transform winter crops into spring crops and vice versa. Under his supervision has been created winter wheat from spring varieties (transformed wheat). Winter barley has been produced with higher frost resistance. Lysenko's discoveries are strengthened by a fast and mass introduction of suggestions which he made for agricultural production.

Academic Lysenko realized all his discoveries and suggestions by closely working with the collective farmers. In order to execute his suggestions, millions of collective farmers were invited. Lysenko always considered the connection with the masses as most essential, thus fulfilling the orders of Stalin about the close connection between theory and practice.

For many years did Lysenko carry on a decisive struggle with the followers of formal genetics who were ideologically captured by the bourgeois science of capitalistic countries and denied the influence of the environment upon formation of new varieties. This struggle came to an end at the session of Academy of agricultural science in August of 1948 with the complete victory of Michurin-Lysenko teaching. Michurin's genetics studies the influence of the conditions of life upon the transformation of plants and upon the inheritance of those symptoms which originate under the influence of the environment.

A wide network of many scientific-research institutes, experimental and selection stations work now on the development of Soviet plant production. Tsarist Russia had only 44 experimental stations. During the years of Soviet power there are three hundred and three experimental stations. Eighty seven agricultural scientific-research institutes were created. The institutes of cereal production which are located near Saratov, Dnepropetrovsk and Moscow are working on the study of cereals; the most important technical plants are studied by branch institutes(three cotton institutes, two sugar beet institutes, the institute of bast plants, the institute of hemp and makhorka) and by adjoining experimental stations. Agricultural universities are participating actively in the development of plant production. The Lenin All-Union Academy of Agricultural Science is performing the general supervision over agricultural science in our country.

One of the most important parts of plant production is its wide branch which plays an important part in the national economy of the country. The present book is dedicated to field plants.

1. GRAIN CEREALS

Rye

Rye is one of the basic cereals. It is sown upon large lots almost in all parts of our country. Rye is the most important plant next to wheat.

During recent years, individual collective farms and even regions harvested a yield of rye, 20-25 centners per hecter. The hero of Socialist Labor, P.A. Liubchenko, from the collective farm "Udarnik" of the second five-year plan" of chkalov oblast', obtained in 1947 a yield of winter rye, 30 centners from hectar upon a field of 25 hectars, and 21 centner per hectar from the other 98 hectars. Especially high yields of rye are obtained in the central part of USSR.

There is a winter and a spring rye. The winter rye utilizes better the winter moisture, ripens earlier and therefore resists drought easier. It yields better and more resistant crops and is sown everywhere in our country. Spring rye is produced in those places where severe winters with little snow do not enable us to sow winter rye, mainly in Eastern Siberia.

In the Soviet Union are produced a few rye varieties, with high yielding capacity and of high resistance. In the European part of the Union the most widely spread are: "viatka", rye "lisitsina", "saratovskaia No. 1", in Siberia - "omka", in Chkalov oblast' -winter "bezenchuk yellow grain", "saratovskaia No. 1" and a very promising variety "volzhanka".

Drawing: "Saratovskaia" rye and "bezenchukskaia yellow grain" rye. (left)

Rye is important as a plant which cleans the field from weeds. Already starting in fall, rye develops well and yields a strong bush, and in spring it grows so fast, that it supresses even such harmful weeds as thistle. Rye is harvested before the seed falling of wild wheat begins. Therefore, rye controls weeds by itself and does not require weeding.

The rye spike is a stalk, upon whose every projection is a small spike. In every small spike are two grains; sometimes, with high yields, in rye small spikes develop three grains. Unlike wheat, the first rye leaves are of reddish-violet color, and not bright green.

15-20 days after sprouting, rye starts forming a bush, i.e. it forms new additional stems and new roots from the under soil knot (the knot of spiking). The appearance of spikes occurs with all cereals, but it is especially abundant with rye. Each rye grain which sprouts yields a bush with a considerable amount of stems and spikes.

In the South and in the West of the Soviet Union, rye is replaced in a considerable degree by winter wheat, but rye moves farther North. Rye is able to resist greater frosts than does wheat, hence it is called a frost resistant plant. For instance, in 1939, rye overcame the winter near Moscow perfectly, but wheat was rarified, due to February ice crusts and due to March frosts which reached 18 degrees. In fall and in the beginning of winter, rye is able to resist the strongest frosts without significant losses.

Drawing: Germination of cereals: 1. wheat, 2. oats, 3. rye, 4. barley, 5. millet, 6. corn.

If in fall, snow falls upon a thawn ground or if in spring the melted water remains too long, then rye could suffer more than does wheat.

The roots of rye develop well already in fall, therefore rye suffers less from spring drought. Rye continues bushing also in spring. It begins blooming 12-15 days after appearance of spikes. The blooming lasts for 12-15 days.

Rye has cross pollination by the wind. During blooming, there is a cloud of pollens over the rye field. Each rye blossom is able to pollinate only by pollens which are brought from other plants. Almost always, a part of germination does not develop, and many spikes do not form grains. This phenomenon is called absence of grain in some small spikes. It has been proven in recent years that we may get rid of absence of grain by applying an artificial pollination of rye; for that purpose the spikes are bent with a rope which is held by two men walking along the field. Such bending causes the pollens to transfer from plant to plant, and it causes a more abundant yield of pollens. The experiments which were carried out in Saratov oblast', as well as in Timiriazev Academy, the artificial additional pollination increased the yield by two, and even by three centners from hectar. With an artificial additional pollination the grains are larger.

The time which is necessary for the growth and the development of the plant from its sowing up to its ripening is called the period of vegetation. This period lasts with rye from 270 to 300 days, and in the North even longer - almost a year. Rye is harvested 10-15 days earlier than winter wheat.

The sowing along clean fallow land is not as obligatory with rye as it is with wheat. On fallow land rye is sown in Eastern and South-Eastern regions: in Kirovsk oblast', in Tartar ASSR, in Kuibyshev, Saratov, Stalingrad, Chkalov and in nearby oblasts.

In the Western part of podzol belt, rye is sown along fallow land, mainly with vetch and potatoes. In steppe oblast's of the Ukraine rye is sown with sun flower and barley. In humid regions, rye yields good crops with peas and lentils, and also with clover of one-year usage.

The plowing of plown fallow land under rye has to be done as early as possible, even before the removal of the crops of the preceeding plant from the field, so that the sowing of rye would not be delayed. For this purpose, wetch hay is piled into heaps; and cereals into shocks in rows, and between the rows is done some plowing. If rye is sown upon sun flowers, then it is sown in the South after the harvesting of sun flowers. In the East, where the sun flower could not be harvested before the sowing of rye, its sowing is done between the rows could pass a sowing machine or an aggregate of sowing machines. The stems of sun flowers which are left in the field to winter check snowfall and protect the rye from freezing.

Dung is introduced under rye in those parts of USSR, where little winter wheat is sown. In wheat regions dung is used primarily under winter wheat. A considerable increase in rye yield, in the majority of rye regions, is obtained by the introduction of phosphorite powder, and also potassium fertilizers. The feeding of rye is useful early spring as soon as it is possible to go out into the field, before harrowing.

Rye is sown with a regular row sowing. In many localities, upon clean fallow lands fertilized with dung, rye yields good crops with a wide row sowing, with between rows up to 30 cm. One loosening of the between rows is sufficient, due to the fast growth of rye.

With row sowings, the norm of rye sowing fluctuates between 110 and 150 kg. per hectar.

Near Moscow, rye is sown around August 20. The further South, rye should be sown later so that it would not overgrow in fall, because an overgrown rye winters worse. But the delay in sowing of rye is still more dangerous, because in this case rye develops poorly in fall.

Rye is more sensitive than wheat to a deep placing of seeds. The deepest placing of seeds for rye is 7-8 cm., and for wheat - 6-11 cm.

In fall should be no harrowing done after the sowing, because a fall leveling of the soil affects the wintering unfavorably and decreases the yield considerably. In spring, rye should be harrowed, but this work should not be delayed; it is necessary to harrow just when rye started to sprout.

Due to the fact that rye ripens earlier than wheat, the harvesting of rye with combiners is facilitated, because the combiners are not busy with wheat harvesting. With the harvesting by simple machines, rye threshing is done also before all other cereals, as soon as the grain hardens. The binding of rye should be carried out immediately afterwards.

On collective farms rye is often threshed without it being piled into a haystack; it is brought in sheaves directly to the threshing machine.

W h e a t

Wheat is the principal cereal.

The socialist reconstruction of agriculture introduced into wheat production great changes. Wheat is now being sown in great amounts in such regions where it was not sown before. The Soviet scientists and stakhanovites of agriculture worked out new measures for soil tilling and new fertilizers under wheat. Selectioners had produced new varieties of wheat which are able to resist unfavorable conditions of the climate. The sowing fields and wheat crops increased, new regions for producing spring wheat in non black soil were formed.

The wheat spike differs by following characteristics; upon the elbow-stalk are located alternately compressed small spikes; in each small spike are two-three grains, with high yields the number of grains in the small spike amounts to four-five. A spike has from thirteen to eighteen ears. The weight of the grain in one spike with high yielding could surpass two gr., and the length of the spike reaches sometimes ten cm. and even more. The wheat spike could be awned and unawned.

Drawing: Appearance of spikes of wheat:
a - grain, b - first roots, c - stem shoot, d - side shoots from bud knot, e - the knot where the spikes appear; f - secondary roots, g - main stem, h - side shoots

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Wheat can be a winter one and a spring one. With spring sowing (without vernalization) the winter wheat does not yield any spikes, spring wheat usually dies with fall sowing.

Winter wheat. Almost a half of the entire winter wheat is sown in the Ukraine. Large fields in Northern Caucasus, in Alma-Atinsk and in other Southern oblast's of Kazakhstan are used for wheat crops. The highest yields of winter wheat are obtained in Krasnodarsk krai, in Vinnitsk and Kiev oblast's. The hero of Socialist Labor, V.M. Romanchenko, obtained in 1946 a yield of winter wheat - 35 centners from one hectar upon a lot of 18 hectars.

The February plenum of the Central Committee of VKP(b) pointed out the necessity of "establishing in 1949 the pre-war level of winter wheat production in the Ukrainian SSR, Krasnodarsk Stavropol' krai, Rostov, Crimean, Voronezh, Kursk oblast's and Moldavian SSR, of improving the yielding capacity, by increasing the sowing of winter wheat in collective farms of these regions in the fall of 1947 by 1500 thousand hectars, in comparison with the harvesting lot of 1946, and bring it up to 7.2 million hectars, including Ukrainian SSR up to 4.4 million hectars, and in 1948 up to 8.3 million hectar, including Ukrainian SSR up to 4.8 million hectar.

Of providing a considerable improvement in yielding capacity and an increase of total harvest in other regions, where winter wheat has been produced, especially in the regions of the Volgariver, Tadzhik SSR, Southern oblast's of Kazakh SSR, in Kirgizian and Azerbaidzhan SSR."

The most widely spread variety of winter wheat is still the awned wheat "ukrainka" with a large grain of perfect quality. Now a series of more valuable varieties have been produced which would be able to replace "ukrainka". For the drought regions of Southern USSR "krymka" is most suited on account of its high drought resistance. The varieties of Odessa Institue - "Odessa 3" and "Odessa 12" proved to be very good.

Among new varieties, we should mention "krasnodarka" which is rust resistant and "novoukrainka" in Northern Caucasus, "Ul'ianovka" in Central Volga region, "liutestsens 17" and "eritrosperum 5", which yielded the highest crops in the Ukraine.

In Chkalov oblast' we sow "Ul'ianovka" and "gostianum 237".

The most important task in the production of winter wheat is the protection of the plants against winter-spring death. Winter wheat suffers during the winter-spring period from the following reasons:

1) from freezing which takes place during severe winters with little snow, or in spring, when the ground had already thawn and the wheat starts to revive after winter dying away;

2) from stewing and soaking, when a great amount of snow had fallen upon thawn ground, and from accumulation of water in the spring;

3) from protrusion, i.e. damage of roots by exposing the knot of spike formation; roots are exposed when the soil sinks or when an ice crust is formed;

4) from fungi disease of snow mold when the plant suffocates and rots.

In order to control the loss of winter-spring wheat, it is necessary to sow first of all, winter resistant varieties. "Ukrainka", for instance, winters poorly in Eastern regions of the Union and is here replaced by Saratov wheat, for instance "gostianum 237" and "liutestsens 1060/10".

On Lower Volga is possible to protect winter wheat from rarifying, and sometimes from death by snow blocking. Therefore, in the South-East wheat is sown along slot fallow land-between strips of unharvested corn or sunflowers. Snow blocking is carried out with snow shaft or with snow mass or with standing sunflower stems.

Almost everywhere winter wheat is sown along clean black fallow land - in early spring. When sowing after sunflower or after corn, winter wheat yields good crops only in Kuban' and partly in the Ukraine. Fallow land upon which winter wheat will be sown in fall should be kept perfectly clean. Already in preceding all such fallow land has to be plown at full depth (25 cm); in spring and in summer it should not become covered with weeds. The pre-sowing tilling under winter wheat should be more thorough than that under rye. Often the application of many "korpusnik" without banks is useful.

Dung is usually placed mainly under winter wheat, as most valuable crop which is best responsive to it.

Additional feedings increase greatly the yield of winter wheat. The feedings are added in fall, before the appearance of spikes and in spring, immediately after the thawing of the snow, before harrowing, and also before the plants produce tubiflorae. As feeding are used mineral and local fertilizers: dung juice, bird excrement, ashes.

Winter wheat is sown in individual parts of USSR at various time; farther North, the earlier. In Crimea, for instance, winter wheat should be sown at the end of September, in individual regions of the Ukraine - between the first and twenty fifth of September, in Moscow oblast' - around August 25, and in Chkalov oblast' - between 10 and 20 of August. If we sow wheat in the South too early, then in fall it grows too fast and in winter it will stew, especially during snowy winters. It is dangerous to sow wheat early on account of Hesson fly which puts its eggs upon the sprouts of winter wheat. During flight of the Hessen fly there should be no sprouts yet.

In the South wheat is sown at the rate of 120-130 kg. per hectar, and in the North 150-160 kg. per hectar, in Chkalov oblast' 100-120 kg. per hectar.

Winter wheat is sown by row sowing machines at the depth of approximately 5-7 cm. It is advisable for the sowing of winter wheat to use combined sowing machines which sow simultaneously both the seeds and the mineral fertilizers. Winter wheat should be weeded twice in order to free it from weeds and from rye contamination. Rye should be weeded out far before the appearance of spikes. Wheat blooms almost immediately after the appearance of spikes and soon finish its blooming. Wheat is ready for harvesting with simple machines during its waxy ripening.

Spring wheat. Spring wheat occupies in USSR the first place among all crops as far as the lot of sowings is concerned and surpasses in lots the sowings of winter rye. Before the war spring wheat occupied huge lots - 25 million hectars. Several million hectars are sown by hard spring wheat which is sown in various parts of the steppe belt: from Omsk and Chkalov in the East and up to Kuban' in the South; in the West it occupies a part of Dnepropetrovsk and Khar'kov oblast's.

In recent time, spring wheat occupied huge lots in non black belt, particularly in the regions where it was not sown before. Thus, spring wheat occupied a firm place in Ivanovsk and Kalinin oblast's. Spring wheat is spread also in the Northern parts of black soil zone - in Kursk, Tambovsk, and Voronezh oblast's, Siberia, Kazakhstan, the entire Volga region are basic regions for spring wheat. Soviet scientists strive by new methods of agrotechnic to achieve the moment when there would be no limit for the spreading of spring wheat.

Two varieties of spring wheat are sown in our country: hard one and soft one. The hard wheat yields grains of highest value. The grain of soft and hard wheat is easily differentiated. The grain of soft wheat is more round, more floury. The grain of hard wheat is more elongated, transparent in profile, so called, glass-like.

Before, in those localities, where spring wheat was sown even for a long time, the yields were low: only 5-6 centners per hectar. At experimental stations only the yields reached 13-14 centners. The hero of Socialist Labor, V.D. Bukhol, (Khalturin collective farm in Chkalov oblast') obtained in 1947- 30.5 centners per hectar of spring wheat upon a lot of 39 hectars. But this is not the limit. In our country, the progressive workers of agriculture obtained yields, unknown in the world, of 80 and even 100 centners per hectar. Efremov and Efremovites (Chumanov, Popenko and thousands of others) achieved outstanding yields, applying to spring wheat the combination of a series of basic measures.

Efremovites applied snow blocking widely. They also improved the plant's utilization of light, applying a cross sowing, i.e. a sowing in two directions. With such sowing, upon each square meter is possible to distribute a larger amount of plants, providing a full development of each of them. Efremovites who worked in Altai krai came to the conclusion that soft spring wheat should be sown between 600 and 700 grains upon one square meter, and hard ones - between 500 and 600 grains (in drought regions less grains should be sown per hectar, for instance - 400). The Efremovites introduced a deep sowing of wheat seeds. Such sowing enables the harrowing of the fields before the sprouting of the crops. Harrowing is practiced also along sprouts. During the growth of wheat two-three additional feedings with dung juice, or with ashes are given to the crops.

The February plenum of Central Committee of VKP(b) decided "to distribute spring wheat in the first place along the layers and along the turning layers of virgin and waste land, along clean fallow land, replown in fall and along newly plown land".

In Siberia, Kazakhstan and in Several other drought regions spring wheat is sown on fallow land, and the lots of fallow lands intended for spring wheat are now widened. In majority of other regions winter wheat is sown along fallow land. Spring wheat yields best after grasses (mixture of cereal and legumes). Spring wheat yields best crops after potatoes, corn and cereal-legumes, but only if the legume crops were cleaned thoroughly of weeds. It is good to sow spring wheat along melon fields: melons, cantalope and squash.

As soon as the field is cleaned in fall from crops which were sown before spring wheat, it has to be loosened and then plown by plows with coulters at the depth of 20-22 cm. Spring wheat increases the yield considerably by sowing along a deep and early plowing.

The dung should be introduced in fall either under preceding crops or directly under spring wheat. If dung is introduced in humid regions during spring, then it should be well stewed. It is advisable to introduce ashes under wheat in spring. Along sprouts and before the appearance of spikes, feeding is introduced in liquid form, if possible: dung juice, superphosphate is dissolved with water, and with this content is poured over spring wheat. Bird excrement is also advisable.

In spring an early harrowing is carried out along the fields, intended for spring wheat. It decreases the evaporation of water in the soil and causes sprouting of weeds which, afterwards, after 3-4 days, are destroyed with pre-sowing tilling.

The sowings of spring wheat often rarify, because it suffers greatly from drought, dry winds, weeds, Swedish fly, rust. The Swedish fly harms largely the late sowings of spring wheat. A very early sowing which is carried out in a short time protects spring wheat against Swedish fly and rust.

Progressive farms in drought regions devote great efforts in controlling drought. In irrigated regions at least three floodings are carried out; in non irrigated regions snow blocking and checking thaw waters are applied.

It is important to sow wheat by seed varieties. Best selection varieties of spring wheat not only yield higher grain crops, but they are not infested by fungi diseases and resist drought better. In those localities, where the summer is short, we must select such varieties which ripen earlier and therefore avoid fall frosts.

The following varieties are of greatest significance in USSR:

1) "liutestsens 62", a variety of Saratov station, produced from "poltavka", - white spike wheat, awnless, with a red grain;

2) "mil'turum 321" - red spike, awnless, red grain: this variety was produced in Siberia;

3) "sarrubra" - awnless wheat with a perfect grain, highly drought resistant;

4) "tsezium 111" - owned, red grain, with perfect flour and backing qualities, but is easily infested by loose smut (Ustilago tritici);

5) "eritrosperum 841" - owned, white spike, red grain; ripens quickly and is drought resistant in highest degree, but it is hard for threshing.

In Chkalov oblast' - liutestsens 62" and the promising "liutestsens 53/12" and "liutestsens B-35" are important.

Among hard wheat which are valuable for the production of higher qualities of flour, for the production of macaroons and for pastries, the following varieties are well spread:

1) "melianopus 69" - white grain, white spike, with black awns;

2) "gordeiform 10" - white grain, red spike, with red awns, and in Chkalov oblast' - gordeiform 189" and "melianopus 69".

Hard wheat was previously sown mainly along virgin soil. With the introduction of crop rotations with perennial grasses the significance of hard wheat should increase.

Of great significance for spring wheat is vernalization, because wheat which has been vernalized ripens by three-four days earlier than the non vernalized. Due to the fact that vernalized spring wheat spikes and blooms earlier, it avoids drought which in many drought regions begins usually at the time when spring wheat blooms and when the grain's ripening occurs. In the North the vernalized wheat escapes early fall frosts.

Spring wheat suffers especially from contamination. It has to be weeded out at least twice. The weeding has to be carried out before the formation of tubes, because after the formation of tubes wheat could be trumpled upon easily.

Spring wheat bushes easily, and the secondary stems in its yield do not play any important role.

The period of vegetation, i.e. the time between sowing and ripening, varies with individual varieties of spring wheat. At the average, it amounts to sprouts 85-95 days. Between sprouting and the beginning of spiking are 16 days, spiking lasts 12-15 days. Between the beginning of appearance of spikes and the beginning of full spiking are 40 days. After spiking, similar to that with winter wheat, blooming occurs immediately. Between blooming and ripening are 25 days. These terms depend upon the varieties, temperature, soil moisture, and upon fertilization.

Spring wheat is easy and convenient to harvest with combiners, since it is lodging more seldom than winter wheat. Hard wheat suffers less from crumbling than the soft one. It ripens somewhat later. Therefore the production of soft and hard wheat in a collective farm alleviates the strain of harvesting.

BARLEY

Barley is the basic raw material for beer industry; it is also good forage for pigs, and in Southern regions it partly replaces oats for horses. The largest barley fields in our country are in the Ukraine and in Northern Caucasus. Much of barley is sown also in White Russia and in Northern oblast's.

Barley differs from rye and wheat by the construction of its spike. The spike of barley consists of small spikes which are situated upon the curvature of the stalk, not one by one, like with wheat or with rye, but by three on each side. The ears are situated one above another lengthwise rows. Each ear has one blossom. The exterior film of the blossom usually carries a long awn. The grains grow together with the films from which they are not freed even in threshing. Only with the so-called bare barley, the grain falls out, free of films.

Drawing: Many rows barley "pallidum 45" (left); two rows barley "prokopius 143"

Barley plants are of many-rows and of two-rows. With many-rows barley, all three ears, situated upon one protrusion of the stalk yield grain. With the two-rows barley, the side rows are sterile. They differ by a larger grain.

There are spring and winter barley. Unlike rye, the spring barley is sown in larger quantities than the winter one.

Barley stands low temperature better than oat. In the North, where late in spring occur severe frosts, with barley sprouts, the upper parts of the leaves are affected, but the plant itself lives and grows perfectly. Winter rye does not resist the severe Northern winter, and spring wheat does not ripen there, therefore oat is here the basic supply cereal. Barley, especially the many-row one, ripens before spring wheat.

There are many varieties of barley, and various varieties serve different purposes. Forage barley (many-rows) is the most drought resistant and ripens fast. It is rich with albumen and is the most valuable forage, mainly in pig production. It is sown in the South of USSR. In the Western part of USSR grows beer productive barley (two rows) which is in many regions more yielding than the many-rows barley. Many rows barley breaks easily and slips out, therefore it is replaced in many places by the two-rows barley. The grain of two rows barley contains less albumen and more starch, therefore it is of higher value in preparing beer. Bare barley are used for the preparation of barley cereal. In Northern regions the provision barley is sown (many-rows).

Among individual barley varieties the following two-rows barley are widely spread:

1) "viner" - white spike, variety with large grain significant in beer production; this variety is produced at the Viatka (kirovsk) station;

2) "ganna", variety of Chekh selection;

3) "evropeum 353/133".

In Chkalov oblast' is sown "prekotsius 143", promising "nutans 187" and "donetsk 591".

Among many-rows barley, let us mention "pallidum 32" and "pallidum 45" produced at Krasnokutsk station of Saratov oblast', and "grushevskii" - old Ukrainian variety.

Winter barley dies easily, therefore it is produced only in the regions of mild winters, mainly in the Caucasus, and also in Crimea.

Winter barley represents an interest, because it is more yielding than spring barley and is more useful for beer production. Besides, winter barley is weed resistant; winter barley is harvested early, even before rye, which makes barley a perfect predecessor for winter crops: after the harvesting of winter barley, the fields could be brought into the same condition as early fallow land.

Winter barley could be sown somewhat later than winter wheat.

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O A T

According to sowing fields, oat occupies in our country the third place. It yields only spring wheat and rye in the sowing lots. The lot under oat in USSR before the war amounted to approximately 18 million hectars.

Cultivated oats are branched (simple), with branched panicles, and single crested, with one side panicle. Single crested oats suffer less from crumbling, but ripen later and are sown in only few regions.

The ears in oats are two-three colors. The blossom films are close to the grain, but do not grow in it, as they grow in barley. The first (low) grains, among the two-three grains of each ear, possess better seed qualities and are of higher yield. In preparing seeds for sowing in grain cleaning machines, the first and the second grain could be divided. The sowing with the second grains yields almost the same crops as the sowing of the mixture of the first and the second grains. But on fields, sown only with first grains, an increased yield is obtained.

Oats differ also in the color of bloom films. There are white oats, yellow and black ones. The most widely spread oat species are branchy oats, with white and yellow coloring. Black oats are spread in a small amount. They yield good crops upon marshes.

Of oat varieties the most spread in our country are the Swedish varieties: white grain "victory" and yellow grain "golden rain", as well as varieties produced upon Verkhniachesk selection station (Ukraine), - "verkhniachesk 53" and "soviet".

Drawing: Types of oat grains: 1 - Swedish, 2 - needle like, 3- leitenitskii, 4- shatilovskii

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At the Timiriazev agricultural academy was produced the variety "Moskovskii A - 315".

In comparison with barley, oat is a crop of a more mild and humid climate. In dry regions it suffers from drought and therfore is replaced by barley. Oat ripens later, and therefore it does not reach as far North as barley. The basic zone of oat sowings includes the following oblast's: Kursk, Orel, Tambov, Voronezh, Tula, Riazan', Penza, Gor'kii, Sverdlovsk.

According to its ability for high yields, oat occupies the first place among various cereals. The best yields of oats in collective farms reached up to 60 centners from hectar in 1937.

Oat yields change drastically, depending upon the crop which it succeeds. A great amount of oat is sown mainly after rye. Oat yields well after potatoes, sugar beets and flax, and especially after legumes, mainly after beans.

Oat requires a deep fall plowing. If oat is sown after potatoes or sugar beets, then a deep lowing is necessary, carried out under those crops. Besides, the field has to be loosened after the harvesting of potatoes; and after the harvesting of sugar beets, the field has to be plown in fall. If oat is sown after winter cereals, then the soil has to be plown shallow between the rows of shocks, when the winter crops are still in shocks, and afterwards has to be plown.

In spring, in the majority of regions, especially with lack of moisture, cultivation is sufficient. Only upon heavy soils, in non-black regions, plowing is done under oat.

Oat reacts well to nitrogen fertilizers.

Oat seeds, before sowing, should be poisoned with formalin, because oat is easily infested by smut.

Oat is not so sensitive to late sowing, as spring wheat, but nevertheless its sowing should be completed within ten days, counting from the start of sowing.

Only in Siberia, later oat sowings, at the end of May, yield better.

Oat does not resist deep covering. In the central belt, it is best to sow oats at the depth of 2-3 cm. and only in a drought belt - at the depth of 5 cm.

In the most important oat regions, oat is sown by 1.5 centners per hectar.

Oat suffers less from weeds than does wheat, but one weeding is always imperative for it.

The ripening of oat begins with the upper ears of the panicle.

The harvesting of oats with the combiner is very successful. The combine harvesting is also important for oat because in shocks oat becomes yellow and molds easily.

Besides oat, there are some species of wild oat. The most widely spread among those species is "ovsiug" which is a most harmful contaminator of fields. The most safe measure in controlling "ovsiug" is the fall shelling.

C O R N

Corn is of great significance: various products are produced from corn, it yields high crops, and, finally, corn is a good predecessor for other plants in crop rotations.

Up to recent time, corn was produced only in the South. The basic regions for corn production were Northern Caucasus, Grusiia, Southern Ukraine, as well as Moldavian SSR. Now corn spreads farther North and to the East. It is sown in Stalingrad, Saratov, Voronezh, Kursk, Kuibyshev, Chkalov oblast's, at Bashkirian ASSR and at the Altai krai. If corn is intended to be utilized as a vegetable before complete ripening, it could be produced even farther North.

The February Plenum of CK VKP(b) decided: "to extend during the year 1947 the lot of corn sowing in collective farms of USSR by 280 thousand hectars more that would reach 2260 thousand hectars, and during 1948 to extend it up to 2700 thousand hectars, thus increasing considerably the yielding capacity of corn."

Corn differs from other cereals by the inflorescence; male inflorescence (panicle) is located on the top, the female inflorescence (cob) - is located high upon the stem. Cobs are situated upon short leggs in the bosom of leaves and are covered with several jackets.

The corn stem is able to reach tremendous heights. The fast ripening varieties are low, late varieties are high.

There are many varieties of corn, and they are produced for various purposes.

Drawing: corn cobs: 1 - siliceous, 2 - starchy, 3- tooth-like, 4 - sugary, 5 - cracking

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The most important groups of varieties:

1. siliceous corn, rich with albumen, - forage corn
2. tooth-like, which contains more starch than the siliceous one, forage corn, starch-molasses and alcohol-distillary
3. starchy - alcohol-distillary
4. sugar, which contains more albumen and sugar - for table usage
5. cracking, the richest with albumen, - for flour

The most widely spread in our country are the groups of varieties: siliceous with a smooth glass-like grain, and tooth-like with a starchy, pressed in grain. Among the siliceous corn are those which ripen early.

To valuable siliceous varieties belong "besenchukskaia" and "bessarabskaia", and among the American varieties - North Dakota", and in Chkalov oblast' - "kichkasskaia local", "ashchebutakskaiai local".

Among the tooth-like varieties are spread "broun-konti dnepropetrovskii" with yellow grain, "minnesota-13-ekstra", "sterling" (white grain, with a very big cylindric cob) and others.

As far as yield is concerned, corn differs from other cereals. The hero of Socialist Labor, M. E. Ozernoi, obtained in 1946 a corn yield of 136 centners from hectar upon a lot of 4 hectars. Corn resists drought quite well, but not during the time of blooming which takes place at the end of the second month of its life. Dry wind may interfere at that time with pollination and decrease the harvest.

Corn is usually sown after cereals. Corn is a good predecessor for spring wheat, especially in drought regions; it is even better than sunflowers. Therefore, the introduction of corn into crop rotation improves grain wheat farming.

With a thorough care for corn, the tilling of the between-rows, the soil after corn has more moisture than after other cereals. Besides, corn does not fall and does not contaminate the field with fallen grain.

Corn is sown on fallow land, before winter crops, as well. With the help of rare rows of corn, a so called curtain fallow land is formed (this is discussed in the chapter on soil tillage).

The dung fertilization increases considerably the yield of corn.

Corn requires deep plowing - up to 25-30 cm. It is necessary to till the land in spring, or to go through the soil with a ploughshare without dumps (terraces). The tilling should be done twice: the first time-early, after harrowing, the second time before sowing.

The cobs are thoroughly selected for sowing. They are threshed immediately before sowing. The upper parts of every cub are removed so that the grain of the tops are not used for sowing.

Corn is sown quite late, because its seeds grow only under the temperature not lower than 10 degrees; those which are sown into cold ground rot easily. The usual depth of covering the corn seeds should be 8-10 cm.

The width of between-rows for low varieties is supposed to be 60-70 cm.; for high varieties - 80-90 cm.

The sowing norm is 30 kg. per hectar; with a tractor sowing it increases and amounts to 45-50 kg. per hectar.

Besides the compact sowing, corn, like sunflower, is sown by nest sowing. The sowing machines, which are especially adapted for corn, produce not a compact row, but nests. Between the nests remain unsown areas of 25-40 cm., and in the nest (nugget) remain two-three plants. This measure is convenient because it facilitates the mechanized care for corn. Upon such sowing, the tractor cultivator is able to work not only along the rows, catching several rows at the same time, but across the rows as well.

In spring, as soon as the corn sprouts, it is harrowed across the rows, and then it is dug upon compact row sowings, so that weak plants would not be left within the rows, and so that plants could grow at equal distances from each other. Corn requires a good care: the best grain harvests are obtained with three plowings and three hoeings.

A considerable increase of corn yield could be achieved by means of artificial pollination, according to the suggestion of the laureat of Stalin prize, agronomist Musiiko. In 1940, for instance, artificial pre-pollination in the collective farms of Odessa oblast' increased the yield more than by four centners; thereby to receive grain of improved seed qualities, the infestation of corn by vesicular smut decreases considerably. The artificial pollination of corn was applied on a wide scale before the Great National War, and in the post-war years, in 1946 and 1947, in the oblast's of the Ukraine was carried out yearly upon a field of about half a million hectars.

An additional pre-pollination (the best is a double one) of corn is carried out with the help of bouquets which are made of corn cobs freshly cut. Shaking ensures the preparation of seeds which passed through hybridisation completely (hybrid seeds).

Numerous experiments indicate that inter-variety crossing which has been carried out, for instance, between such raioned varieties, like "broun-konti" and "grushevskaia" or "minnesota" and "grushevskaia", provides a considerable increase of yields: up to three-four centners per hectar. A mass shifting to hybrid seeds is indicated by the decree of the February Plenum.

In his report at the Plenum of CK VKP(b), Andreev, A. A., indicated that agronomic institutions often underestimate spreading of corn production into new regions, especially its introduction into non-sugar beet collective farms of the central-black soil belt, wood-steppe Ukraine, and in the Southern regions of Siberia.

BUCKWHEAT

According to the degree of the February Plenum of CK VKP(b), the lot of buckwheat sowing in collective farms in 1947 should be increased by 420 hectars and should be brought up to 1.5 million hectars, and in 1948 up to 1.7 million hectars. Buckwheat does not reach far South, nor East in European part of USSR, because it suffers there from drought during blooming. Buckwheat reaches far in the North. Buckwheat is sensitive to light frosts, but it ripens early. The Southern boundary for buckwheat could be considered Vinnitsa-Voronezh-Penza-Kazan'.

The pollination of buckwheat is done mainly by insects. The blossoms of buckwheat are carrying honey and therefore are visited greatly by bees; these insects assist in its pollination. It is advisable to bring beehives upon buckwheat fields before its blooming.

Variety sowings of buckwheat are still very little spread here. The sowing with local seeds predominates. Of selecionary varieties are well evaluated:

"bogatyr'" which has been produced at Shatilov station (Orlov oblast'), and "bol'shevik" which was produced at Bogoroditsk experimental field (Kursk oblast').

From sowing up to buckwheat ripening pass 60-70 days.

In the non-black soil belt, buckwheat could be sown as the first plant along newly plown land. Buckwheat is a good predecessor for various plants. In some wet regions, for instance, upon the right shore of the Dnepr, buckwheat is sown before rye upon fallow land.

In Southern regions, buckwheat could be sown as a second plant, especially after rye, since rye ripens here and is harvested early. Secondary plant is called a plant which is sown after the harvesting of the basic plant and which ripens and is harvested the same fall.

The yield of buckwheat reacts well to ash and phosphor-potassium fertilization. Phosphor flour (powder) is good for buckwheat yield.

The fall plowing increases considerably buckwheat yields. In spring, before sowing, two tillings are advisable, since buckwheat is sown later than all spring grains and the field would easily cover by weeds after sowing.

Buckwheat should be sown by wide-rows sowings with 25-30 cm. between the rows. The norm of sowing, with a regular row sowing, is 80-90 kg. per hectar, and with a wide-row sowing, 60-70 kg. per hectar. Buckwheat is sown at the depth up to 5 cm. In a dry soil, the seeds of buckwheat could be placed even deeper.

Buckwheat sprouts develop very fast, cover the ground with a full green carpet and easily overcome weeds. With the wide row sowing, the buckwheat plowing is very important. An additional pre-pollination increase considerably the harvest of buckwheat.

Buckwheat harvesting is carried out when the majority of grain ripen.

It is impossible to expect full ripening, because buckwheat fall easily. The application of the combiner decreases considerably the grain loss during buckwheat harvesting.

M I L L E T

Millet is a plant of Eastern Europe and Asia. In Western Europe it is almost non-existant. Millet does not reach far in the North.

Large lots under millet in USSR are located in Kazakhstan, much of millet is sown in the Ukraine, in Saratov, Stalingrad, Chkalov, Voronezh, and Tambov oblast's.

Millet varieties differ by the construction of the panicle: 1)branchy millet has a panicle which is evenly extended into all directions: 2)panicle of lump millet, with short branches is more tight and as if close together: 3)with the wilted millet, the panicle is bent into one side.

The millet grain is of various colors: yellow, red, white gray, black, violet. The color depends upon the coloring of the blossom films. In our country are especially spread yellow and red varieties.

Drawing: Millet panicles: on the left - "saratovskoe 853"; on the right - "veselopodolianskoe 367".

Of earliest ripening are the varieties of branchy millet with a violet coloring of the spike film, stems and of the leaves.

Of individual millet varieties most widely spread are "saratovskoe 853" "veselo-podolienskoe 24/273", "red toidemskoe", in Chkalov oblast" "veselo-podolianskoe 367", admissible - "orenburg red", lump millet and wilted and promising variety "dolinskoe 86".-

Millet is famous for its resistance to drought. It consumes little water and therefore it is a most valuable plant in dry regions. Millet, if it is exposed to drought, dies in the ground and supports itself upon the bud stub. But if late rains will fall which would not be used by other cereals, then millet starts growing fast, forms new roots and stems and yields good crops.

With best stakhanovites, millet yields reached 65 centners from hectar, and the best millet producer of the Union, Bersiev in Aktiubinsk oblast', obtained, during watering, 175 and even 200 centner of grain from hectar.

Millet is very sensitive to the purity of the field and suffers from contamination. It yields best after grasses - after clover and lucern-cereal grass rotation, but yields high also after legumes, sugar beets, potatoes. Millet is a good predecessor for many cereals, especially after a good care. If millet stands too long, it falls greatly and next year it will yield fallen grains.

The millet yield increases considerably from the introduction of phosphor fertilizers.

Before sowing, millet should be poisoned with formalin, otherwise it suffers from smut.

The field which is plown before sowing of millet should be tilled twice by a cultivator, and in more moist regions - it should be plown. In case of millet sowing after spring plowing, it is necessary to do some shelling of the field (preplowing loosening), in order to preserve moisture and to promote the sprouting of the weeds.

It is best to sow millet by wide-row method. The wide-row sowing enables the loosening of the soil between rows and facilitates weeding. Millet suffers considerably from contamination. The between rows could be varied, but the highest yield in the central belt is obtained with the sowing in between-rows of 27-30 cm.; in Chkalov oblast', with a wide row, one strip sowing, are accepted between rows of 45 cm.

With a wide row sowing of millet, the usual amount is 12-15 kg. per hectar; with a regular row sowing - 15-18 kg. per hectar. It is not advisable to place the millet seeds deep. It is placed usually 2-3 cm. deep, in very dry weather - 4-5 cm. After sowing, it is advisable to roll the millet field often. Millet is considered a plant of late sowing, nevertheless, delayed (July) millet sowings are dangerous; millet might not reach ripeness and might be considerably infested by moth.

Two weedings for millet are obligatory; two plowings are necessary between the rows. The first weeding should be done as soon as possible.

Millet ripens unevenly and it ripens poorly in sheafs. The harvesting with the combiner removes the difficulties in drying millet in sheafs.

Of late, in various regions of USSR millet has been damaged heavily by mosquitoes. Its larvas winter in unharvested millet panicles. Therefore, each panicle should be collected, and millet plown land should be plown in fall.

Harvesting cereals with combiners and the control of losses.

In order to carry out the harvest successfully, it is necessary first of all to decide upon the time of harvest and to carry it out in the shortest time possible. Comrade Stalin indicated; "Harvesting is a season matter and it does not like to wait. If we harvest early, we win; if we delay within the harvest - we lose".

In harvesting wheat, for instance, we should not expect a full hardening of grain; harvest could start with half dry grain, during wax ripeness, whereby it is not necessary to worry about the green coloring which is still kept upon the spike films.

Harvesting with combiners decreases many times the consumption of labor: it eliminates binding and stowing of sheafs into shocks, their stacking, transport and a special threshing. At the same time, the harvesting with a combiner reduces the grain loss: all grain losses which are connected with binding and storing cereals in sheafs are excluded; the loss in grain from being unthreshed, loss of grain in hay or in weeding could amount to a zero.

In the evening, the unmown cereals grow moist even in the steppe regions of USSR. Therefore, during a night harvest with the combiner, it is necessary to tighten the deck of the roller in order to achieve a full grain threshing.

The greatest losses are obtained, because a part of the sheafs are not caught by the combiner and remains in the field. There are especially many lost spikes when the cereals are cut high. Therefore, it is necessary to apply a low cut. Besides, the pilot at the wheel should change quickly the height of the cut, counting the degree of cereal lodging and even the wind direction.

The presence of uncut spikes and of spikes of short, cut without straw, leads to great losses. Such spikes are not collected by horse rake: the uncut spikes are threshed by them, the short spikes jump through between the rake teeth, even if they are plaited by a wire.

Pioneer teams and school children could show good assistance to collective farms in the harvesting of spikes.

Horse rakes should pass along the field immediately after the combiners, and the rakings should be brought to the malt floor and be threshed.

We should keep in mind that ten spikes left behind by the machine upon each square meter, means a loss of at least one centner of grain per hectar: the grain of each spike rarely weighs less than one gram. Therefore, a thorough control of the harvesting quality is necessary. For such a control a constant registration of losses is obligatory. For this purpose, behind the combiner, after its last operation, lots of one square meter are separated in the field, and the number of spikes lost on each square meter are counted.

A quick registration of the losses enables the combiner to regulate the machine and thus decrease the amount of losses.

With a close observation, the harvesting of all cereals with combiners could be carried out entirely without any losses. Therefore, it is most important to extend the harvest with the combiner upon those plants which are still harvested by simple machines. It is very important to apply combiners upon the harvest not only of grains and of sunflower, but of mustard, rape, partly corn, buckwheat, seeds of lucern and of clover as well.

2. GRAIN LEGUME PLANTS

The plants which belong to this group of cereals are called the papilionaceous family.

All grain legumes contain many albumens. Lupine contains twice or three times as many albumen as cereals. Not only the grain of grain legumes is rich with albumen, but even their straw, which fact increases their forage significance. If the straw of heavy stem legumes, for instance, beans, is used as cattle litter, then the dung is richer with nitrogen than when the litter is made of rye straw.

After grain legumes, the yield of all cereals increases. The grain legumes possess the ability of absorbing the nitrogen from the air and to accumulate that nitrogen in the roots with the assistance of small roots - swellings on the roots in which bacteria are found which absorb the nitorgen from the air. In this respect, however, the grain legumes are behind perennial legume grasses - clover, lucerne.

Grain legumes could be divided into four groups:

1) To food grain legumes belong beans, kidney beans, lentils and chick-peas;

2) to technical legumes which are used for preparation of food products and oil, belong soy beans and peanuts;

3) of forage value are vika and horse beans;

4) legumes which are for both grain and hay;

To legumes belong also lupine which is produced mainly for green fertilizer. The seeds of regular lupine are not used as forage for cattle, because they contain a bitter poisonous substance (alcaloid). Only in recent time was produced a lupine without alcaloid which is very rich with albumen and yields perfect forage.

Drawing: Beans of various grain legumes: 1-beans, 2-lentils, 3-chick pe., 4-kidney beans, 5-vetch, 6-horse beans, 7-vetchling 8-soy beans, 9-lupine.

BEANS

As one of the most important grain legumes should be considered beans.

The largest lots under beans are located in Tartar ASSR, then in Chelisbinsk and Kuibyshev oblast's, in Bashkirian ASSR and in the Ukraine (mainly in Kamenets-Podol'sk and Vinnits oblast's).

Beans produce high yields. The best stakhanovites obtained a yield of beans of 40 centners per hectar.

Among bean varieties the following are widely spread in our country: small grain variety "kapital" and large grain variety "victorii".

Beans are not too demanding, as far as climate is concerned, and is not too sensitive fo autumn frosts therefore it spreads far to the North. In the

South, beans don't yield high crops on account of a great number of pests. It suffers especially from bean weevil (Bruchidae pisorum, or Mylabridae pisorum) (brukhus).

In the soil, beans are quite demanding. It yields best in black soil. In loamy soil, with a surplus of moisture, beans are uncomfortable.

Beans should be sown after potatoes and root fruits. After beans, the yield of oats increases considerably. The influence of legumes, especially that of beans, is not limited to the plant which is sown immediately after it. Beans influence the yield of plants which are sown a year after them, and even two years afterwards.

Beans yield a great increase in the crops by introducing phosphates and potassium salt.

The tilling of beans begins by shelling the soil and by fall deep plowing; in spring, tilling is sufficient.

It is possible to sow beans early, because it is not too sensitive to fall first frosts. Large grain beans are sown approximately 220 kg. per hectar, the small grain beans - approximately 150 kg. per hectar. A wide row sowing with a between rows space of 27-30 cm. improves the bean yield and increases the size of its seeds. In order to avoid the lodging of beans, oats are mixed with it.

Two weedings are necessary for beans.

Beans are easily harvested with hay mowers. It should not be kept long upon the rollers, because it splits, loses many grains or rots. It is best to thresh beans on the field, without storing it into stacks, and before it dries completely. Beans which are very dry, splits easily in threshing.

Of other most important grain legumes, we should mention lentiles and vetch.

L E N T I L E S

Lentiles, unlike beans, is a low plant with feathery leaves and white blossoms. The varieties are divided into two main groups: plate lentiles and small seed lentiles.

Lentiles do not lodge, in threshing they do not split, therefore their harvesting passes considerably easier than bean harvesting. According to drought resistance, it surpasses beans and it yields better crops in the South-East. The basic regions of this plant are: the neighboring regions of Penza, Tambov and Saratov oblast's.

V E T C H

Spring vetch has violet blossoms, grey or white seeds. It is produced for hay and for seeds. The best variety is "l'govskaia" vetch. Vetch is usually sown in the mixture with oats.

Vetch-oat mixture for hay is a valuable plant for occupied fallow land. Vetch should be sown and harvested early, and the field under vetch should be plown immediately after its harvesting.

Vetch for green forage which is sown in forage grass rotation at collective and state farms is of special significance for the provision of dairy cattle by green forage. Vetch yields well under crops which are down at various time during the entire spring. It is a valuable plant for artificial forage.

Vetch production for seeds is important not only for the provision of seeds for forage sowings, but for direct cattle forage as well; in this case, vetch seeds are threshed.

3. SPINNING PLANTS

Various plant families belong to spinning plants. Some of them yield material for the production of yarn as bast fibers (flax, hemp), others are in the form of long fibers which form leaflets upon seeds (cotton). Spinning plants are simultaneously oil plants, since they are rich with oil. Among the spinning plants the following are most important: flax, hemp, cotton. In May, 1948, the Soviet of Ministers of USSR took special decision on measures in reinstatement and developemnt of flax-and hemp production.

FLAX

Flax is produced mainly for the fibers which are obtained from the stems of this plant. Flax fibers are bast fascicles situated along the stem. In the production of flax stems (moistening), these fascicles are separated from the tissues which surround them with which they are glowed together. After moistening, the fascicles are broken and pulled.

The quality of the material which is obtained from flax fibers, their firmness and thinness depend upon the characteristics of bast fascicles: they must be long, even, thin, but solid. For that purpose is needed a longer and the least branchy stem. The thinness of the fibers depends upon the harvesting time. With early harvesting, when flax still blooms, the fibers are very thin and supple, but they are very few.

Flax is produced as an oil plant as well. Flax oil is used in food, but it is mainly used for the production of colors and paints.

There are three directions in flax production.

Sometimes, only fibers which are the thinnest and the most solid are highly evaluated, therefore the harvesting is done during blooming, and no seeds are secured.

In other instances, when flax is produced for the sake of seeds, it is harvested in full ripeness; fibers are used very little, because they are coarse and short.

In the USSR predominates a double utilization of flax, for fiber and for seeds.

In the USSR flax is the most important spinning plant. The lot under flax in our country amounted before the war to 2 million hectars.

The spinning flax, or long flax, is produced mainly in Northern and Western oblast's. The largest lots are occupied by it in Smolensk and Kalinin oblast's and in Belorussia, then in Kirovsk, Iaroslavl's, Leningrad oblast's. In recent time long fiber flax moved into Siberia.

Among the varieties of spinning flax which are most extended, we should mention new Soviet varieties: "victor", "spinner", "textile worker". These varieties suffer slightly from rust infestation and yield higher seed crops. Of the varieties, large lots are occupied by "806/3" and "823/3", produced at the Timiriazev Agricultural Academy.

Drawing: Flax: 1 - "dolgunek", 2 - "kudriash"

Oil flax is produced in the South and in South-East, in such regions where the spinning flax suffers from heat and drought in the Ukraine, in Northern Caucaus, in Volga region and in the republics of Central Asia. A well produced variety in Chkalov oblast' is the oil flax variety "VIR 1650".

Weather peculiarities influence flax greatly; mainly flax fiber production and quality. Flax requires even weather, a wet summer with regular water fall. The development of flax plant is completed in 85-90 days.

In recent years, the stakhanovites flax producers obtained huge harvests of flax-fibers. The stakhanovite Baranovskaia in Zhitomir oblast' harvested 20.5 centners of flax fiber from hectar. Seed yields for spinning flax reached 10-12 centners per hectar. In the South, in flax crops for seeds stakhanovites obtained 25 centner of flax seeds from hectar.

Flax requires a fertile and moist soil, free from weeds. It should not be sown at the same place. During a second sowing, flax is easily infested by fungi diseases and often yields poor crops.

The largest flax yields are obtained during the sowing after perennial grasses, after clover with timofeevka. In order to improve the yield of flax, the February Plenum of CK VKP(b) resolved "...to extend the sowing of perennial grasses, providing the collective farms of flax producing regions for 1950 with flax sowings after a layer of perennial grasses". Clover enriches the soil with nitrogen: clover-cereal mixture leaves a soil with a good construction and clean from weeds. When flax is sown after clover, the best yield is obtained from potatoes, oats and even spring wheat.

It is not necessary to introduce dung under flax, because dung produces a more coarse and uneven fiber.

Immediately after sowing, the field which is sown by flax should be covered with a thin layer (one and half cm.) of turf. Such protection (it is called mulching) prevents the harm done to flax by flax flees, eliminates the formation of a crust after rain, provides a more regular soil temperature and promotes high yield. Flax yield is increased considerably by the introduction of potassium fertilizers. Nitrate-potassium feedings have a good effect upon flax.

The deepening of the flowing under flax improves considerably its yield. The application of coulters is most important. Before the sowing, it is useful to till the soil with disk cultivators.

The sowing in the first days of May not only provides high yield, but better fiber quality as well.

It is necessary to sow fiber flax quite densely, the sowing norm should be 160-180 kg. per hectar. The between rows are narrow, 9 cm., or even less. Flax is placed shallow, not deeper than 2 - 2.5 cm. The first month flax grows slowly, but during the second month of its life, approximately between June 15 to July 15, it grows fast.

The most important measure for cultivation is weeding. Flax should be weeded at least three times, it has to be done early, before the start of speedy growth.

The harvesting measure depends upon the fact whether flax is produced for fiber or for seeds. If flax is produced for seeds, then it is mown, because the stem is of minor value. When flax is produced for fiber, then it is harvested by pulling it out with the roots. This work is often carried out by hand, but in recent years we use in our country flax pullers with success. The seeds are removed by flax threshers or the entire tops are combed with special machines.

The flax stems are moistened and spread, in order to separate the fibers from the woody part.

HEMP

Hemp is a dioecious plant: its male and female blossoms are located not upon one plant, but upon various plants.

The male hemp plant is called "poskon'ia", or "zamashka". Poskon' has a thinner stem and forms on the top a large raceme which is similar to a panicle. The fiber of the male plant is thinner and it ripens earlier, in the middle of the summer. The female plant is called "materka" or plain hemp. "Materka" develops slower, it yields ripe seeds only in fall.

At the beginning of their growth, the male plants slightly differ from the female plants, but already after one and a half months the male plants outgrow the female plants and there appear in them signs of forming racemes.

The fiber of the male hemp plant ("poskonia") which is thinner and more supple is used for the production of linen. Thin fiber could be obtained from female hemp, only when it is harvested during blooming. With a delayed harvest, the fiber is more coarse.

We produce hemp simultaneously for the production of fibers and of seeds. The short fibers obtained by the production of "poskonia" (flossing), and the fibers of the female plants are used for the production of coarse linen (cloth) - for sacks, tarpaulin, canvas for fire hose, binder twine, cords ropes etc. Flossings of coarse fibers (hemp fiber) are applied for calking.

The hemp seeds produce oil. Fresh hemp oil tastes very well and is of a pleasant odor, but it is spoiled before the oil of sunflower. Hemp oil is used for the production of paint, drying oil and of soap.

Hemp oil cake, after the squeezing of the oil, is an excellent forage for cattle. Oil cake is given to the animals in a ground form or it is strewn upon cut and moistened rye straw.

The principal regions of hemp production are situated in the central belt of USSR, South of the principal regions of flax-"dolgunets": in Chernigov, Orel, Kursk oblast's, as well as in Penza oblast', but it is also sown in Chkalov oblast'.

We produce two hemp species: central Russian and Southern hemp. The Southern hemp is of higher yield and yields more fiber, but it yields seeds not in all hemp producing regions. In the regions of the central belt, Southern hemp is sown upon "zelenets", e.i. it is harvested not completely, after it begins to break out into blossom. During the harvesting of "zelenets", the fiber is better and thinner. Under good conditions of production, the central Russian species yields 8-10 centners of fibers and 12-15 centners of seeds per hectar, and the Southern 14-15 centners of fibers. Stakhanovites-hemp growers harvest up to 25 centners of fibers per hectar.

The vegetative period of hemp is longer than with flax and amounts to 100-110 days. Hemp grows fast, much faster than flax. Already 10 days after sowing, it reaches 35 cm. height. Since hemp requires much moisture in the soil, it yields best upon special lots - upon hemp fields which were fertilized with a great amount of dung. For field sowing, hemp requires very fertile land, a great amount of fertilizers, mainly of dung, and excellent tilling. Besides hemp fields, hemp yields good crops upon river inundations and upon dried swamps.

Drawing: The upper part of hemp plant; 1 - male, 2 - female

The plowing under hemp must be very deep, thorough and should be done in fall. Besides dung, which is carried out and covered by plowing also in fall, under hemp are introduced nitrate, potassium and phosphor fertilizers.

The best predecessors of hemp are clover of two-year utilization, lucerne and forage sugar beets. Hemp leaves the field in a perfect condition. Due to its height and wide leaves, hemp supresses weeds.

Hemp is not afraid of early autumn frosts, but a continuous cold weather affects it badly. Hemp is sown after the end of sowing of early spring cereals, but its sowing should not be delayed. The seeds should be tested for sprouting before they are sown, because sprouting ability could deteriorate in winter.

Hemp is sown quite densely: 120-130 kg. per hectar. Hemp is able to endure a deep covering, but better results are obtained with the covering of 3-4 cm.

The fast growth of hemp facilitates the weeding. Southern hemp which is sown in wide between-rows should be plown.

With a double utilization (for fiber and for seeds), hemp is harvested in two procedures. First, during blooming, "poskon'" is harvested which yields only fibers. In a sowing, the male and female hemp are equal in their amount. In order to avoid the scutching of hemp, paths are formed along it ("lekha"). Female plants torn out upon those paths, are placed together with the male hemp, because by that time they are not coarse yet, and their fibers are almost similar to that of male hemp fiber. The harvesting of male fiber is one by hands at the end of July, the harvesting of the female hemp is done one and a half months later. The female hemp is harvested by hands or by mowing machines, then its tops are cut or they are combed with special machines and the seed is threshed.

In recent time simultaneously a ripening hemp has been produced. Its male plant begins to dry only at the time of seed maturing. This faciliatates the harvesting of hemp with machines.

The hemp stems are moistened, then they go into scutching and breaking machines.

4. OIL-BEARING PLANTS

The seeds of all oil plants are rich with oil and with albumen. Therefore, during the centrifuging of oil, the remained oil cake is a highly valuable forage for cattle. Oil which are obtained from the seeds of oil plants are used for various purposes. Some are used in food, others for greasing machines, some for paint and dry oil production. The sowings of oil plants (flax-"kudriash" which was mentioned above, sunflower, mustard, "ryzhik" etc.) are of great significance in the national economy of USSR. In May, 1946, the Soviet of Ministers of USSR issued a decree concerning the restoration of sowing lots, improvement of the yielding capacity and the increase of total harvest of oil plants in collective farms. According to the decree of the February Plenum of CK VFP(b), it is necessary: "to provide, starting with 1947, the sowings of oil plants along plowed land, to improve the quality of pre-sowing tilling of the soil and of the crops; upon wide rows of sowings of oil plants (sunflower, sesame, poppy, safflower, peanuts) at least three tillings between-rows should be carried out with one weeding within the rows.

SUNFLOWER is one of the most high stem plants. High oil varieties reach two meters. The stem of cultivated plants is not branched. The raceme - calathide - includes a great amount of blossoms of two types. The marginal tongue blossoms are sterile; they have large bright petals, the basic bloom mass (a few hundreds on a calathide) form tubular blossoms.

A crossing pollination of the sunflower is taking place mainly by insects.

Sunflower varieties are divided into: gnawing and oil-bearing. The gnawing sunflowers possess a larger and longer, less full, ovule. The ovules of oil varieties are smaller, short and swolen, more full, with less heavy coating, therefore they yield less husk.

Drawing: Sunflower achene: 1-gnawing, 2-oil, 3-average "mezheumka" achene (on the left - the entire achene, on the right - cross section).

The sunflower stems contain a great amount of potassium, therefore the ashes from the stems are valuable potassium fertilizers.

Due to well developed roots, sunflower is able to endure drought with less losses, nevertheless, upon moist soil, upon low land and upon watered lots, the sunflower yields are much higher. The oil sunflower is more drought resistant. The period of sunflower vegetation is long: it is sown at the end of April, and is harvested only in August-September.

The principal regions of sunflower production are: Saratov, Voronezh, Rostov, Krasnodarsk, Stavropol' krai. Of late, sunflower plant is extending West and East. Early sunflower varieties ripen in the Ural and the Southern regions of Siberia. Near Moscow, sunflower is produced only for silage, but with vernalization it could be produced even there.

Good care, loosening of between-rows, fertilization, thorough tilling, combine harvesting - all this improved considerably the sunflower yield. Already in 1937, many collective farms harvested 20-25 centner per hectar. The best collective farms of "USSR"(Ukrainian?) harvested the best crops - 40 centners per hectar.

Sunflowers are not too requiring as to their predecessors. The best yield is obtained from sunflowers which are sown upon fields after winter wheat and after grain legumes. In Southern oblast's, after sunflowers are often sown rye and winter wheat. In central zone after sunflowers is advisable to sown oat and barley. It is necessary, nevertheless, to protect the plants, sown after sunflowers, against contamination by fallen plants, by an early harvesting and a deep plowing with coulters. It is not advisable to sow sunflowers upon the same lots frequently, because it would be impossible to eliminate the danger of its contamination by virus disease (Orobanche). Sunflower should occupy only one field in correct crop rotation.

Sunflowers extract from the soil a great amount of potassium, therefore ashes should be introduced under it, as well as phosphate-potassium fertilizers which increase the oil producing ability. Best results are obtained when phosphate is introduced into the rows during the fertilization of sunflowers. This measure decreases the consumption of the fertilizers by three-four times. The introduction of dung under sunflower is also expedient.

The sowing of sunflower should be done early, simultaneously with early spring cereals, especially since sunflowers are not sensitive to morning early frost. An early sowing is important for sunflowers because its seeds which possess a thick film and an olive nucleus requires a great amount of moisture and swell slowly and because the sunflower requires approximately 120 days from its sprouting to maturing. In many regions sunflowers are successfully sown for the winter, so that the seeds would not sprout before winter would come.

The sunflower seeds are sown 12-15 kg. per hectar. The distance between rows is 50-60 cm., in Kuban' 70 cm., and the distance from one plant to another, in the row itself, is 25-30 cm. Within 12-15 days after the appearance of sprouts, the sunflower should be weeded out, and in the between-rows a plowing should be done which is to be repeated later. By means of tractor weeding hooks, the cultivation across the rows is very successful.

Artificial pre-pollination suggested by the laureat of Stalin prize, Musiiko, yields best results with sunflowers. In 1937, the removal of unpollinated achenes, in the centre of the calathide was successfully tested at Timiriazev

Academy. Very high crops of sunflowers, 35 and 37 centners per hectar, were obtained by the prize winner Koz'mina (now laborant at Timiriazev Academy) at Gremiachensk raion of Voronezh oblast'. Comrade Koz'mina also applied artificial pre--pollination. An increase of yield, which is achieved by artificial pollination, is possible to consider at least two centners per hectar.

Artificial pre-pollination is carried out upon sunflower field by means of uniting two blooming calathides or by direct transfer of the pollens with a piece of cloth (also with a rabbit skin).

It is dangerous to delay with harvesting, because sunflowers fall heavily. Now the sunflower harvesting is done mainly with combines, especially since the rest of the cereals are harvested at this moment and the combines are vacant. The combine harvesting of sunflower is especially important, because the storing of unthreshed sunflower is complicated. Previously, before the combine harvesting was introduced, the sunflower tops were cut by hand and they were placed upon the stems left after cutting for drying. With such method of drying, the sunflower tops often were exposed to rain, were nibbled out by birds, rotted. The drying of the tops upon the fields, near the threshing machine or in a room, required extensive lot and delayed the threshing.

Among other oil-bearing plants, we should mention mustard, camelino (false flax) rape, castor plant.

Rape, principally winter plant, is produced mainly at the part of the Ukraine which is located on the right bank of the Dnepr. Farther East rape winters poorly. Rape is sown in August-September with between rows of 35-45 cm. It ripens very early and therefore it is a good predecessor for winter wheat.

Mustard, unlike rape, is produced in the South-East, mainly in Stalingrad oblast'. There are several varieties of mustard, but we produce mainly "sareptskaia" mustard which has noduler pods and purely black or reddish-black seeds. Mustard seeds are small, they are sown 10-15 kg. per hecter. Mustard grows fast, but its sprouts suffer considerably from ground flees.

Cameline, the earliest plant among oil-bearing plants, is of the greatest significance in those raions in which sunflowers do not ripen (mainly in Siberia). Cameline was also successfully sown upon winter crops which were rarified in individual spots. Cameline is sown, like mustard, early, before the sowing of other spring plants. Cameline ripens at the same time with the winter crops, falls less than other oil-bearing plants and is easily separated from the grain of rye or of wheat, therefore it is easily harvested along with winter cereals.

Castor plant is a Southern plant; it is sown mainly in Kuban' and even there it ripens late. Castor plant differs by great power. Castor plant is, produced with wide between rows (90 cm.). The width of the between-rows often reaches 100 cm., but in farther Northern regions, it is better to limit the width by 70 cm. The castor plant fruits break easily with the majority of varieties, therefore the removing of seeds is done upon malt floor with a self-thresher.

5. POTATOES

Besides being used as food, potatoes are valuable material in technical production - starch, molassis and alcohol distillary. For cattle forage, not only potatoes are used, but waste (malt grains, vegetable pulp) from alcohol distillary and starch factories as well. Rinsing waters from starch factories are used for fertilization of meadows and gardens. Potatoes have a good influence upon the yield of succeeding plants; the tilling of the field under potatoes, carried out at a considerable depth, plowing and hilling promote the loosening of the soil and its cleaning of weeds.

The potato stem has underground shoots upon whose branching tubers are formed. The potato tubers represent an underground stem formation which could be called a thickened end of the underground shoot. The potato eyes are foliated underdeveloped leaves in whose axils are buds. Usually there are three buds in an eye.

With the sprouting of potatoes, the central bud sprouts first; it is the most developed of the three located in the eye. If this bud is damaged, then the side buds begin to sprout. The sprouting begins with the younger and more viable buds which are located in the upper part of the tuber. The shoots, after reaching the soil surface, turn green and develop leaves. A part of the shoots which are in the ground yield six-eight horizontal shoots which thicken at the end and form new tubers. These horizontal sprouts, in turn, branch and at the end of the branchings yield more tubers.

Potato tubers contain a great deal of starch; in more starchy varieties, the starch percentage reaches 25.

Of great significance is the wide utilization of the tops of productive potatoes as planting material. The tops are the most valuable part of the tubers as far as seed is concerned. On small lots, for instance, in individual gardens and at suburban collective farms is recommended to produce potatoes by planting the eyes or the tubers. Such production is most economical for the planting material and provides an early yield of new potatoes. With a dense planting, it is expedient to carry out a summer sprouting and thus obtain two potato harvests during the year. In potato planting the cutting of tubers is often applied, but with the regular density, the cut plantings decrease frequently the yield. In order to obtain full yields by planting cut potatoes, a dense planting in furrows should be applied, and the average tubers (50-80 gr.) should be cut into four parts, and the larger ones into more parts.

There are many potato varieties. They are divided into table potatoes, forage, production, universal.

The table potatoes are used for food; they must taste well, cook well, but should not fall apart during cooking. Forage varieties are used as cattle forage; they should be of high yielding capacity and should contain more albumen. The productive varieties are used at starch and distillary factories; for this purpose highly starchy varieties are needed. Universal potatoes are called those which are suitable for several purposes.

Let us discuss individual varieties which are most important in our country. Among table varieties the following are highly evaluated: "early rose", "epicure", "apron". Among the universal varieties the most widely spread is "lorkh" (of Soviet selection), "berlikhingen"; among the production -the late ripening starchy "vol'tman". In Chkalov oblast', besides these varieties, "smyslovskii", of average ripening.

In connection with the fact that the German invaders imported into our country potatoes which are affected with potato canker - a very dangerous tuber disease - most important are the varieties which are resistant to canker and which should grow in Western regions of the Union; for instance, "Iubel'".

In the USSR, potatoes occupy tremendous lots. A great amount of potatoes is produced in Western and North-Western oblast's. In Belorussia, Smolensk, Moscow, Ivanov, Leningrad oblast's. Then follow the Ukraine, Northern parts of Kursk and Voronezh oblast's, Penza oblast' and Western parts of Kuibyshev and Gor'kii oblast's. In recent years stakhanovites obtained very high potato crops. The best teams harvested 1000-1200 and more centners from hectar (Kartavaia and Iutkina).

Potatoes are not too particular about the climate. Some varieties are produced far in the North. Other varieties, on the contrary, are more suitable for Southern regions. At the present time, potatoes are grown in the Far East as well. In the Kol'sk peninsula, in Kirovsk, 300 centners per hectar was harvested. The highest potato yields were obtained in Poltava and Kiev oblast's.

It is good to plant potatoes after wheat, rye and legumes. After potatoes, the most valuable cereals should be sown, because potatoes leave the field loose and clean; often after potatoes, spring wheat is sown; but other plants also increase their yield, if sown after potatoes. Therefore, it is very important to introduce potatoes into field crop rotations.

Potatoes require loose soil and deep plowing. In summer, after the harvest of the preceeding plants, the field should be shelled and plown as soon as possible. In spring, the field should be replown again. Only in the drought belt, upon black soil, the cultivation could be limited to slight replowing. In non-black soil belt, a third plowing is done during planting. Dung should be introduced under potatoes in fall; in spring it is advisable to introduce dung upon the furrows or under the tubers. This measure reduces considerably the consumption of dung. Potatoes increase considerably in yield by introducing phosphate-potassium fertilizers and ashes before planting and after sprouting.

Potatoes should be planted into heated ground, when the temperature of the soil, at the depth of 10 cm. reaches 7-8 degrees, but planting should not be delayed.

In the South, during a spring planting, potatoes yield poor crops of bad tubers, thus potatoes degenerate. This degeneration is eliminated by summer plantings. During summer plantings, potatoes produce tubers not in the hot weather, but in fall, and yields a planting material of good value.

Large tubers (not less than 80 gr.) or parts of large tubers should be used for planting. Potatoes are often planted behind the plow. The plow produces deep furrows, then the tubers are placed not at the bottom of the furrow, but on its side. Whole tubers are placed at the distance of 35-40 cm from each other. A half of the furrows remains without potatoes, therefore the plows should work in pairs. The planting with double parts plows is convenient. The planting is facilitated by planting machines - potato--planters. The between rows should be 60 cm. wide.

Before sprouting and after sprouting, potatoes should be harrowed. The pilling and the replowing of potatoes between the rows should begin early, before the full development of the haulm. Pilling should be done several times, usually at least three times.

In humid regions, the pilling is the basic measure for potato cultivation. It promotes the formation of new, underground stems and of new tubers; it also covers the weeds between the bushes with soil. Pilling causes the drying of the soil, therefore in dry regions pilling is not done.

Within the rows between the potato plants, a weeding is obligatory with hand hoes.

Potatoes are harvested by plows or by potato diggers. After the plowing, a harrowing of the potato field is done and all the tubers, discovered by the harrow, are collected. Then a replowing is carried out and a repeated harrowing. The harvested potato should not be left in the field - tubers are easily hit by morning frost.

Potatoes are usually kept in basements or in "burts", trenches. A groove is dug at the depth of one meter and at the length of 10-12 meter. The width of the groove should not surpass one meter, but at the top it extends up to one and a half meter. The dried out potatoes are placed into the groove, is covered with dry straw and with soil, best of all with two rotating layers of straw and soil.

6. SUGAR BEETS

Sugar beets are two-year plants, like other tuber plants. In the first year tuber yields only a thickened tuber: that is the main purpose of the production. In the first year only the rosette of the leaves near the roots develops. In the second year, the plant yields stems with blossoms and fruits. The fruits, when they ripen, grow together, and these junctions (knots) are the seeds of sugar beets.

The root of sugar beets is white and contains a great amount of sugar (up to 20 percent), for the sake of which sugar beet is produced. Valuable waste of sugar production ("zhom" (press), molasses) are used as forage for cattle. Sugar leaves are used as forage in its fresh form, and they are also used for the preparation of silage.

Drawing: The tuber of sugar beet: A - heat, b - neck, c - the real tuber

The basic mass of sugar beet crops is distributed in USSR, in the Ukraine and in the central oblast's of RSFSR. The new regions of sugar beet sowing are Kirgiziia, Kazakhstan, Gruzziia, where sugar beets are produced upon irrigated fields, and also the Volga shores, Western Siberia and the Far East. During last war, sugar beets were highly developed in Uzbek SSR. Sugar beets are produced now in large quantities in non-black soil belt.

Before the revolution, the yields of sugar beets were low. At the average of 130 centner per hectar. In recent years, the stakhanovite movement is striving for high yields of sugar beets. M.S. Demchenko started this great task. The hero of Socialist Labor, A. A. Parmuzina, obtained in 1946 a yield of sugar beets of 1044 centners per hectar upon a lot of 2 hectars.

In striving for the increase of sugar beet yield, it is necessary that one hectar would yield 110-120 thousand plants, that the weight of each root would be high and that the sugar content of the tuber would not decrease. Stakhanovites achieved 120 thousand tubers per hectar, and the weight of each tuber up to one kg. and more. In 1938, according to the yield of sugar beets and to the amount of sugar obtained, our country occupied the first place in the world.

For high crops, not only an excellent mechanized tilling, good fertilization are necessary, but a thorough care as well.

In the middle of summer, sugar starts to accumulate in the tubers. In order that the accumulation of sugar would go successfully, a sufficient amount of sun days in August and in September is necessary. Sugar beets yield rich crops only with abundant rainfall or with irrigation.

The soil for sugar beets should be well tilled, fertile. Sugar beets are plants of black-soil primarily.

Usually, sugar beets are planted in crop rotation after winter crops, with the introduction of dung under the winter crops or under sugar beets. After sugar beets almost all spring cereals yield well. Spring cereals - barley, millet, oat - yield good crops, when sown after sugar beets.

The February Plenum of CK VKP (b) resolved: "To complete in 1949 the introduction and restoration of correct crop rotations in all collective farms which produce sugar beets with the application of grass rotations of legumes and cereals of perennial grasses, to distribute from 1947-1948 the sowing of sugar beets only along deep plowing of plown land. This plowing should be carried out with a preliminary and early shelling of stubble land."

If sugar beets follow spring crops, then the field should be shelled during harvesting. It is necessary to plow in fall deeper under sugar beets than under potatoes. Best yields are obtained upon black soil during plowing with coulters at the depth of 30-36 cm. Already in fall are introduced mineral fertilizers under deep plowing. For the winter the plown land is left unharrowed for the accumulation of moisture.

In winter, in regions of sugar beet belt with little snow, snow blocking is carried out. In spring, the field has to be harrowed twice as soon as it is possible to go into the field with harrows. A few days afterwards, the field is tilled with a cultivator.

Sugar beets should be sown early together with early grain cereals, without stretching the sowing time, so that the seeds would not be left in a dried out layer.

It is the best to sow sugar beets with a combined sowing machine. Along with the seeds, is advisable to introduce mineral fertilizers into the rows. The sugar beet sprouts are feeble, delicate, therefore, the seeds should not be placed deep. It is most advisable to place the seeds at the depth of 2-3 cm. Only during a dry spring, is it permissible to increase the depth up to 4 cm. The between rows are usually 45 cm wide which facilitates the care by tractor machines. About 27-30-35 kg. of sugar beets are sown upon one hectar.

As soon as the sugar beet sprouts appear - "the rows glitter", then the first hoeing is done - "sharovka". With a good density of sprouts, the second hoeing is done with tractor cultivators across the rows (bouqueting).

Immediately afterwards, the sugar beets are broken through, i. e. the useless plants are removed. It is important to know that sugar beets are sown by balls. Each ball contains several seeds, therefore, each ball yields several sprouts. Of these sprouts only one should be preserved - the best one. The plants are left, during breaking, at a distance of 15-18 cm. from each other. During that process a second hoeing is done. The third hoeing is done, during the inspection. During inspection, the plants preserved by mistake, or new sprouts are removed. Between inspection and the closing of leaves, the field should be hoen at least two times more.

Before the closing of leaves, sugar beets receive special feeding. The first feeding is often done by orgainic fertilizers (bird dung, manure juice). In later feedings, mineral fertilizers are introduced in liquid form. Then the leaves close, i.e. the space between the rows of the sugar beets close entirely. But in August the between rows open again, because the lower leaves dry out and fall down. After the opening of the rows, late, fall plowings are carried out. Two of such plowings are advisable.

It is most advisable to harvest the sugar beet plants with tractor sugar-beet elevator (hoist). After the sugar beet elevator passes the field, the tubers dug out from the rows are placed into piles and are cleaned of the leaves and buds. In order to decrease the loss of tuber tissues, the cleaning is done not by plain cut, but by scraping off the buds at a tiny depth (cleaning at a cone). In recent years, a new valuable method of sugar beet cleaning, preserving the buds, was introduced for factories (the method of Iarmoshenko). Even during short preservations in field piles, sugar beets should be covered with earth. Sugar beets are taken from the field directly to the sugar factory and are placed into over-ground large special rooms "kagat". For seeds, the selected tubers are kept in narrow trenches and early spring are planted approximately 22 thousand upon each hectar.

7. FORAGE ROOT FRUITS

The principal plant among forage root-fruits is the forage sugar beet. The forage sugar beet differs from the regular sugar beet. The tuber of forage sugar beet is much larger than that of the regular sugar beet. It is, with most varieties, painted into yellow or red color. Usually, a great part of this sugar beet grows over the ground surface.

Stakhanovite yields of forage sugar beets reached in our country 1300, 1800, and even 2000 centner per hectar.

During sowing of forage sugar beets, the distance between the plants are allowed more than with sugar beets. Those distances are 25-30 cm., and the between rows - 50-60 cm. It is necessary to pay attention that there would be upon one hectar at least 75-80 thousand plants.

The care for forage sugar beets is almost like that for the sugar beets. The harvesting is easier, because forage sugar beets, partly situated over the ground, are easily pulled out by hands.

The leaves of forage sugar beets yield excellent silage, like the sugar beets do.

During the years, a method has been worked out of digging forage sugar beets in two times.

This method enables additional summer sugar beet crops.

Of other forage root-fruits should be mentioned turnips (forage turnip). This plant is important because it permits two crops (plown sowings). During two months of its life turnip yields a tuber of full value.

Some varieties of turnips, especially of yellow content, are not inferior to turnip as far as their taste is concerned, as to their yielding capacity they surpass it considerably.

8. PERENNIAL GRASSES

The production of legume-cereal grass mixtures in field and forage crop rotations is one of the bases of grass standing agricultural system which has been worked out by academic Williams.

CLOVER

Clover is the most important forage grass. This perennial legume plant belongs to the family of pansies (Viola tricolor). Several species of clover are produced: red, white and Swedish, but most important in our country is red clover.

The importance of clover in agriculture is great. Clover yields first class hay, enriches the soil with nitrogen and improves the soil structure. The best results are obtained when clover is sown mixed with loose-bush cereals.

Clover is a plant of a moderate climate. It penetrates far into the North. In the South clover is replaced by lucerne and esparsette which are more drought resistant.

The crops of clover hay reach upon stakhanovite lots up to 100 centners per hectar.

Clover is very important in flax crop rotations. After clover-cereals, flax yields are high.

It is necessary to fertilize clover and the fields under it with phosphate-potassium fertilizers.

Drawing: The structure of red clover stem 1 - Northern (late ripening) and 2 - Southern (fast ripening). The figures indicate individual internodes, the Southern has more than the Northern one.

Clover is sown in Moscow and neighboring oblast's with winter crops: in spring a flax or disc sowing machine is passing over winter cereals. Among the winter crops, clover is sown along with oat; but it is best in the sowing of winter wheat. The first year clover grows under the protection of a covering plant and develops mainly a leaf rosette. Only during the second year of its life, hay is harvested.

Clover seeds are very small, therefore they are sown not more than 14-16 kg. per hectar.

Northern and Southern varieties of red clover are known. The Northern clover, which ripen later, blossom and ripen later, grow poor and are of poor foliage, but are more frost resistant. They are often called single-mown because they are mown only once.

The Southern varieties of clover are richer with albumen, are more drought resistant, but are less frost resistant; they are often called double mown.

The best clovers in our country are: "permskii", "ciatskii", "iaroslavskii", "tul'skii", and of the Southern: "kurskii", "podol'skii".

It is advisable to sow clover mixed with cereal perennial grasses; it is sown the most with timofeevka. Legume-cereal mixture improves the soil structure considerably.

Clover should not be left over three years, because hay harvest drops greatly. In the second year clover should be fed, harrowed, and sometimes weeded out.

Clover is pollinated by bumble bees and bees. The proximity of hives increases the yield of clover seeds. In order to increase the harvest of clover seeds and of other honey bearing grasses, it is advisable to carry out the hives upon the grass field during the blooming of the grasses.

Clover hay is harvested with sickles. A specially constructed combine is suited for the harvesting of seed clover. It is necessary to care for the least loss of clover seeds. The mowing of clover for hay is best at the very beginning of blooming.

L U C E R N

Lucern is a perennial legume plant which also belongs to the pansies family. Lucern yields hay of better quality than clover. It grows faster than the other grasses. In the regions irrigated agriculture, lucern yields 5-6 mowings. Besides of enriching the soil with nitrogen, lucern protects the soil from salting and is the inreplaceable predecessor for cotton. Lucern differs by its high drought resistance. This is explained by the powerful development of its roots.

In the regions of irrigated agriculture and the regions of abundant rain fall, blue lucern is sown. In the open steppes of South-East of best yield is the yellow lucern mixed with cereal grasses, mostly with "zhitniak". In the more Northern regions of lucern, "zhitniak" is replaced by American quack grass (Agropyron repens), and with rye grass. Lucern is successfully produced in various regions of USSR, in gardens, "levada" and hemp fields - upon rich land with near standing ground water.

Several groups of lucern varieties are known: central Asiatic, Ukrainian, French, Hybrid. Among the central Asian varieties, lucern is differentiated into: slowly developing, for instance, Khivin, and fast developing, for instance, Arabian. The hybrid lucern, as "grimm Zaikevich" is widely spread in our country.

Soviet selectioners produced new valuable varieties of lucern, among them the variety of Poltava station and others. In Chkalov oblast' is produced local "brodskaia", and besides, are raioned "ladak" and "krasnokutskaia 4009".

It is important to fertilize lucern with phosphate-potassium fertilizers and also with bacterial fertilizer - nitrogen.

The ground for lucern sowing should be clean from weeds. Deep plowing is most important.

Lucern seeds are small, and the bush is strong; therefore, for sowing are used 12-18 kg. per hectar, and in drought regions still less. The seeds are placed 2 cm. deep. During the sowing of lucern for seeds, it is sown 6-8 kg. per hectar.

Lucern develops fast already during the first year, therefore an uncovered sowing is applied successfully, especially during the cultivation with irrigation and during sowing upon low localities. In Southern oblast's, summer sowings of lucern are carried out with success. Lucern yields best results during sowing in mixture with loose bushy cereals: in drought belt with "zhitniak", during irrigation with rye grass or "ezh".

Drawing: Legumes and blossoms of lucern: 1 - structure of legumes of blue lucern, 2 - blooming raceme of blue and blue hybrid lucern, 3 - the structure of legumes of yellow lucern, 4 - blooming raceme of yellow lucern.

E S P A R S E T T E

The third place among perennial legumes is occupied by esparsette. Esparsette has feathery leaves, pink bloom raceme. It blossoms early (before clover), but many varieties grow slowly. Since esparsette blooms and is harvested early, it is most convenient to sow winter wheat after it, but esparsette mixtures of two year utilization are perfect predecessors for spring wheat. Esparsette resists drought and winters with little snow better than does clover.

Esparsette utilizes well phosphorus which is contained in the soil and does not require phosphate fertilizers. Esparsette yields well upon loamy soil. Good results are obtained from esparsette in the mixture with ovsiug and French rye grass.

The most important regions of esparsette are Rostov and Voronezh, the Eastern regions of the Ukraine.

T I M O F E E V K A

Timofevka is a perennial grass. Among cereal grasses, timofeevka is the most important and most widely spread.

Timofeevka does not require much from the soil, but it resists poorly dry soil and high temperature.

Timofeevka is usually sown mixed with clover. Hay yield reaches 70 centner per hectar. As a perennial grass, timofeevka does not yield any mowing during the first year; it yields the best crops in the third year. The depth of the seed location is small - 1-2 cm.

Under a clean sowing, 8-12 kg. of seeds per hectar are sown, mixed with clover - 5-7 kg. per hectar. In a mixed sowing, clover would surpass timofeevka in the first and second year, but in the third year clover is more rare, timofeevka excells. In order to accelerate the development of timofeevka, it is useful to add it to rye in fall.

Z H I T N I A K

Zhitniak is a perennial grass, very drought resistant and also resistant to salty soil. Zhitniak is introduced under plant at Valui experimental station. It is sown mixed with lucern. After zhitniak, spring wheat (hard) yields well. The best varieties for Chkalov oblast' are Brodskie - narrow mown 60 and wide mown.

Zhitniak should be sown shallow - one cm. deep. Even in the depth of 3 cm. it does not yield full sprouts. Nevertheless, with a shallow sowing, zhitniak suffers in spring from drought, therefore it is better to sow it in fall with rye.

The first year, zhitniak develops very slowly, therefore it should be sown under cover. Mixed with lucern, in short terms (2-3 years) it yields a grass cover of superb quality.

9. S I L A G E P L A N T S

As silage various plants are sown. Their yields are used as valuable forage produced by silage. Silage is a method of preserving forage in fresh form.

The most important silage plants are in our country sunflowers (gnawing varieties) and corn. For the purpose of silage, these plants are sown very dense, with more narrow between-rows and are harvested before ripening.

As a silage plant, "sorgo", forage cabbage, which yields good silage, are used. An excellent silage plant is ground pear, whose tubers are used for food and forage.

10. TOBACCO

In the USSR are produced two forms of tobacco - yellow tobacco and inferior tobacco (makhorka). From tobacco leaves are produced material of various strength, whereby makhorka is the strongest (it contains more nicotine).

Yellow tobacco requires a great amount of heat for full ripening of its leaves. They are produced by planting, but even after planting the sprouts in the ground, three-four months are necessary for a period without frost. Due to this peculiarity, yellow tobacco is produced mainly in Southern regions of the Soviet Union - in Crimea, Moldaviia, Kuban', Zakavkaz'e, Central Asia.

Makhorka does not require too much heat; it is produced in many oblast's of the USSR, including central and even Northern oblast's. Makhorka is sown largely in Penz, Tambov, Voronezh, Chernigov oblast's, in Mordov ASSR. Makhroka yields good crops upon black soil with high fertility and requires a great deal of dung fertilization.

Tobacco, when there is a surplus of fertilizers, yields a too large and a coarse leaf rich with nicotine; the best tobacco leaves, according to their quality are produced upon rich, cartilaginous soil.

Tobacco and makhorka are produced by planting of sprouts which grow in nurseries and in conservatories. The February Plenum of CK VKP(b) indicated the necessity of organizing nursery farms...in all collective farms which produce tobacco, according to the full requirements for the production of sprouts for early planting tobacco and makhorka. The planting in the field should be carried out with sprout-planting machines.

The between rows for tobacco and makhorka are 60-70 cm. with the distance between plants of 18-25 cm.

Among various measures, besides of loosening and weeding, are applied cutting of the side shoots and the removal of raceme. Additional feedings are most important.

Harvesting (breaking of leaves) is done several processes. The breaking is done by layers, starting with the first.

In order to increase tobacco yield, of great importance are regular grass rotations with perennial grasses. The best place for tobacco in crop rotation is by turning the grass layers. Makhorka yields well by sowing along the layer of perennial grasses.

11. K O K - S A G Y Z

Kok-sagyz (rubber bearing dandelion) is the most important plant of all rubber bearing plants that are produced in the USSR. Kok-sagyz was discovered in 1931 in the mountains of Kazakhstan. Kok-sagyz is a perennial plant. Rubber settles in its roots.

The basic measures in producing kok-sagyz consist of the following. For kok-sagyz are selected highly fertile lots, hemp fields, dried swamps, lots under cabbage or under makhorka. Kok-sagyz is sown either in late fall (winter sowing), or early spring. For spring sowing, a preliminary seed preparation is necessary - the influence of low temperature as in vernalization. Kok-sagyz should be sown with between rows not over 36 cm. Good results are obtained by a manual sowing in nests. With nest sowing, the harvest is simpler, because the digging out of a group of roots requires less labor, and the consumption of seeds decreases.

The most important measure of cultivating the crops is, along with weeding and hoeing, the removal of dandelions which don't bear rubber. Best seeds are produced in the second year of the plant's life.

Academic Lysenko suggested the production of kok-sagyz by grafting. According to this method is carried out the planting of pieces of roots prepared early spring. By shifting to this method, the painstaking seed production of kok-sagyz is no more necessary.

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END OF BOOK

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Selection of sugar beets as to their resistanse to fungi diseases. (In Russian) Sveklovodstvo. 1:787-794
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In the system of measures in controlling sugar beet diseases, the production of resistant varieties should be of great importance, first, because a direct control of diseases is not very effective; second, because carrying out several measures in controlling diseases requires great consumption of deficit materials and power (for instance, numerous spraying of Bordeaux mixture in controlling cercospore). Therefore, the scientific thought is striving for a long time to find sugar beet varieties which would be resistant to diseases. But very little has been done in this direction. Only in relatively recent time, the problem of producing disease resistant varieties of sugar beets was given great attention both abroad and in USSR. As a result, a series of work on the basis of selection of immunity, as well as the methods of selection of resistant varieties has been carried out. In this respect, the attention of the explorers is concentrated upon important diseases which cause tremendous losses: black leg (Dorcadion), cercosporose and mound rot.

BLACK LEG. The first attempt of studying the problem of resistance of various sugar beet varieties to black leg was made by Trzhebinskii(115) who used to test the seeds of different origin and discovered a great differentiation in the infestation of those varieties by black leg. Of course, the varied infestation of the varieties of different origin could be explained by a possible different infestation of the seeds which was not taken into consideration in Trzhebinskii's experiments.

The fact that the infestation of the seeds might affect the development of the black leg in sowings has been discussed abroad. This relationship was also proven by the experiments of V. P. Murav'ev(76).

Thorough research in sugar beet infestation by black leg was carried out by S. D. Grushevoi(25). The study of black leg infestation of sugar beets was carried out with varieties of selecting collective varieties under natural conditions of field experiments. The data of the carried out experiments indicated that variety groups of various stations reacted differently to black leg, preserving this quality for a number of years. Based upon such data, the author arrives at the conclusion that the selection of varieties resistant to black leg will yield good results, by observing equal conditions both in the development of sprouts under experiment and in producing plantings for seeds.

Some of the conclusions are not too promising, based upon the analysis of materials of collective variety experiments for a number of years; these experiments indicate that the infestation of sugar beet varieties by black leg is not related, or related in unimportant degree, to their variety differentiations. At these conclusions arrived N. V. Broiakovskii who, during three years (1929-1931), was observing the development of black leg in collective and inter-station variety experiments. He explains this phenomenon by the fact that the existing varieties are obtained as a result of only a utilitarian selection without the registration of the infestation by black leg. Broiakovskii arrives at the correct conclusion, that the selection of resistant varieties is possible under the condition that the selection for the quality of resistability to black leg would follow the regular utilitarian selection upon all stages of selection process, starting with the selection of resistable ancestors.

The first steps in this direction were made in our country by S. V. Gudvilo who worked out a method for selection, under laboratory conditions, of sugar beet varieties with a high power in active growth. Taking into consideration the fact, that the resistance to black leg depends greatly upon the growth energy of the first stages in the development of sugar beet plant, the application of this method should yield, during selection, sugar beet varieties which are resistant to black leg.

In recent time, L. S. Sliva, aiming to connect the selection for resistance with the selection process for utilitarian qualities(105) worked out at the Mironov station a method of testing the resistance to black leg under the conditions of laboratory provocative experiments, exposing the seeds, before sowing, to the infestation of clean crops of one of the basic causes of black leg, Phoma Betae. The posterity is tested as to its resistability to black leg, whereby among the posterity would be possible to produce individual resistant plants which would become the ancestors of the resistant breed.

L. S. Sliva discovered a drastic differentiation of the tested material. The method, worked out by this author, enables to begin the selection for the resistance to black leg from ancestors and to continue with posterity.

Thus, the work of Gudvil and Sliva discovered the selection as to resistance to black leg which enables the selection of the ancestors, according to the growth energy and to the resistance to microorganisms, evaluating later their posterity in comparative crops and, working in this way, creating varieties resistant to black leg.

We should mention here the interesting work of Shteglik who had already in 1913-1917 (Dobrovitsa, Bohemia) produced, by way of selection, black leg resistent varieties, and who also observed upon hybrid material and inzucht-lines the inherited quality of black leg resistance. His five-year research, as a result of which he studied the behavior of F_1, F_2, F_3, indicated quite clearly that the resistance to black leg is a recessive symptom.

This circumstance, if it will be confirmed, should, beyond doubt, facilitate the selection of constant, resistant varieties.

CERCOSPORE. Another disease which is of great importance for the selection of resistant sugar beet varieties is Cercospora beticola Sacc.

Concerning the possibility of producing resistant varieties to cercospore, contradictory indications exist in our literature.

It has been observed for a long time that cercospore infests forage and food beet varieties more than sugar beets.

In recent years, in connection with the outburst of the epiphyte of cercosporose in Southern countries of Western Europe, in USA, and especially in our country, the problem of producing immune varieties to cercospore has been given greater attention.

Schmidt(220) determined, that cercospore is able to infest not only all sugar beet varieties, but other species and families as well; thus, he succeeded in infesting nettle, goosefoot and other plants with cerosporose. Considering such "multipoison", it seems hopeless to create immune varieties against cercospore. The results obtained by Schmidt were confirmed by the data of the American explorer, Edgar F. Vestal(234) who also, like Schmidt, carried out infestations of various sugar beet species and found that they all are able to be infested by cercospore. As to other plants he succeeded in infesting cercospore into 27 species, which belong to 12 various families, remote from each other, as far as system is concerned; thus, for instance, cercospore affected Amaranthus retroflexus, Lactuca Sativa, Plantago major and Laceolata, Soja max., Polygonum species and others.

In the light of these factors, the failure of West European selectioners to find sugar beet varieties which are resistant to cercospore is quite clear.

The report of E. W. Brandes(143) at the international congress of sugar producers in Brusselle, in 1933, informed everyone concerning the control of cercosporose in USA during recent years both, by chemical measures(spraying and pollination of the plantations with fungicides) and by producing resistant sugar-beet varieties (Kuns' works).

The work in producing relatively resistant varieties is carried out in a series of points. Attention is called to the selection of resistant ancestors for crossing and especially for the utilization of insucht-lines resistable to cercospores. By means of crossing resistant ancestors and insucht-lines constant and relatively immune varieties were obtained which will be utilized soon in production. In selection for immunity to cercospore, experimental crops are artificially infested by cercospore.

The development of infection upon experimental crops is caused by moistening the lot with artificial rain.

The work of Soviet explorers which has been developed since 1925 discovered definite approaches to the problem of producing sugar beet varieties immune to cercospore. As a result of this research, concrete selection schemes for immunity were outlined which provide planned work according to this system of selection materials, along all the stages of selectionary process aiming to produce varieties which combine the immunity to cercospore and high productivity.

In observing the infestation of various selection materials of sugar beets upon comparative lots of Mironov station during the year of greatest outbreak of cercospore (1925), V. P. Muraviev(76) arrived at the conclusion that, although all varieties were highly affected by the disease, nevertheless, with a very close registration, some relative differences in the degree of infestation of individual varieties could be disclosed. Observing in various years the behavior of the same varieties, Muraviev noticed a definite tendency of the more immune varieties of preserving its relative immunity to cercospore, in comparison with other varieties which were more affected; therefore he assumes that the work in selection of immune varieties might yield favorable results.

Numerous research (1925-1933) on the problem of selection for immunity to cercospore was carried out at the Belotserkov' station(127). The basic results of these explorations are as follows: although cercosporose is able to infest all sugar beet species, including wild ones, yet the infestation degree of various species differ. Wild species, like Beta maritima L. Beta trygina Waldst. et Kit. are infested less than the cultivated ones. Among the species of cultivated beets, forage and food beets are more infested than sugar beets. Among sugar beet varieties most immune has been for a number of years B. Plantagenifolia. Thus, although an absolute immunity does not exist, nevertheless relative differences in infestation are obvious and these factors are a good basis for the selection for immunity. In carrying out the study of selectionary material at various stages of selectionary process, we determined that among the ancestors exist the greatest difference in infestation, in their "klon", the posterity from inzucht and first generative posterity. In the succeeding generative posterities, the differences smooth out, due to the splitting of materials and cross pollination, as a result of which productive varieties of various stations differ slightly in relation to cercosporose.

As a result of our experiments, we approach the elucidation of the causes of the existence of relative immunity of sugar beets to cercospore. We determined that the leaves of various stages, upon the same plant are infested by cercosporose at various degrees. Old leaves, which completed their growth, are infested by the fungus greatly, the younger leaves are more immune, and the leaves of the young growing rosette are absolutely immune. This is evident from the following data obtained in vegetative experiment with artificial infestation of leaves of various stages (table 61).

Table 61

The artificial infestation of sugar beet leaves by cercosporose

The order of leaves upon the plants starting with the youngest....................	1	2	3	4	5	6	7	8	9	10	11	12	13
The amount of cercospora spots upon one leaf at the 16-th day after artificial infestation..	0	0	0	1	2	21	110	252	380	490	520	290	220

Consequently, the infestation of the plant is determined by the correlation between the size of the growing rosette and the leaves which completed their development. This correlation could be different with various varieties. Especially, the most immune to cercospora of B. plantagenifolia is the large rosette.

Considerable work in producing sugar beet varieties which are immune to cercosporose has been carried out since 1933 at the Ivanov station by N. V. Broizkovskii (12,13) who concentrated his attention upon inzucht material of T. F. Grin'ko, as well as upon hybrid material. Broinkovskii rates a considerable amount in variations of relative immunity to cercosporose along inzucht-lines and hybrids, in comparison to few variations of immunity in productive varieties obtained without any outlined registration of resistance symptoms to cercosporose. This is illustrated by the following data(1934).

Table 62

Fluctuations in immunity to cercosporose among various sugar beet materials

Material under experiment	Average infestation (in percentage to the standard)	Amount of variation (in percentage of the standard)	Variation coefficient
Sugar beet varieties of collective variety experiment..................	99,2	97-107	2,51
Inzucht-line................	101,5	77-105	7,28
Hybrid inzucht-line.........	98,5	67-125	7,08

A considerable variation is noticed in posterities from crossing individual ancestors in F_2 and F_3, which is indicated in the following table.

Table 63

Cercosporose disease (in percentage to Uladov standard)

Posterity	Sum of variations	Average percent of infestation	Amount of variations	Variation coefficient
F_1 from crossing in 1933..	23	96,6±1,15	85-110	5,72
F_2 from crossing in 1931..	151	100,1±0,47	80-120	7,36
F_3 from crossing in 1929..	626	98,0±0,26	65-125	6,73

These data indicate that hybrid posterity and inzucht lines are safe basic material for selection and for creation of varieties immune to cercosporose.

Based upon all these studies, VNIS(75) worked out in 1935 schemes for selection stations of Main Sugar in selection work along with the general selection process in the direction of producing varieties which combine immunity to cercospore with high productivity.

This scheme is presented as follows:

In the selection nursery, against the background of natural infestation, or upon individual specially infested lots, the selection of ancestry, immune to cercosporose, is carried out by registering the productivity symptoms. Here, in connection with the combination of useful symptoms within the selected material, pedigrees and superelites are selected. With further selection work, the immunity of the declining posterity of the selected pedigree and in generative posterity of the groups is examined. These groups are produced through isolation from other plantings, at the stage of planting. Then, based upon the complex study of the material, a repetitive selection of immune varieties is carried out and the rejection of infested plants or of entire posterity. If by direct selection it would be impossible to obtain immediately such varieties which combine high immunity to cercosporose with other utilitarian qualities, then crossings (regular or saturated) of highly immune varieties disregarding their productivity, are carried out with highly productive varieties. In this case, the selection of varieties which combine useful characteristics is done in the posteriies in F_2 and F_3. Along the line of synthetic selection for immunity, immune inzucht lines are utilized for crossing, and mixture of seeds of immune inzucht-lines is done; later on, is carried out the selection of highly productive combinations.

In special experiments, by studying the immunity to cercospore, when its sufficient development under natural conditions is not provided, an artificial infestation, by means of spraying the plants with water containing fungus spres, is applied. The infestation could also be carried out by means of dusting the lots for infestation with last year's dry haulm, infested by corcospore.

MOUND ROT. The testing of the existing productive varieties of sugar beets under the condition of "burt" storage indicates the presence of comparatively small and fluctuating differences between them, as far as the infestation of mound is concerned (collective experiments of Broiakovskii, Sliva, Gorshcharuk (10, 21) and others). This is explained by the fact that up to recent time, selection stations did not carry out special selection for the immunity to mound rot.

In recent years (1933-1934), considerable progress has been made in selection of sugar beets, immune to mound rot. We worked out a microbiological method to determine the immunity of sugar beet plants to this disease (128, 1929).

This method is as follows:

In cups of Koch or Petri, is produced the fungus of the basic disease of mound rot, Botrytis cinerea Pers upon sugar beet agar or gelatin, or upon vegetable pulp from distilled sugar beet tubers, in such a manner that the mycelium of the fungus would spread upon the entire bottom of the cup covered by nutritious substrate. Afterwards, cuts of tubers which are tested for their immunity to mound rot are placed into cups. The cuts for testing are done in a special way, so that the part of the top with the eyes and the part of the tuber's neck would be included.

The sugar beet cuts are placed into the mound rot fungus, under the temperature of 25°, are infested by the fungus after 4-6 days and rot. Then the degree of rotting of individual cuts is determined in percent or according to five grade scale.

The degree of rotting of individual cuts and the degree of the rotting of all cuts from the root group which represent the posterity under experiment - serve as the index of the relative infestation by mound rot of the ancestor plant or of the posterity.

The study by the microbiological method of the relative infestation by mound rot of selection material at various stages of selectionary process indicated, that with mound rot, like with cercospore, the greatest differences are observed among the ancestors. These differences are great also with collection materials which include the table, forage and sugar beets; these differences occur less with productive sugar beets obtained without the study of their immunity to mound rot.

The variation of the relative infestation by mound rot with various material could be illustrated by the following data of Belotserkovsk selection station.

Table 64

Infestation by mount rot

The name of the material under experiment	Infestation (in percentage of basic deviations)
Individual tubers of the variety of Veselopodoliansk station No. 10	40-100
Individual tubers of the variety of Verkhniachesk station No. 88	20-100
Individual tubers of variety of Belotserkovsk station No.39.	20-100
Collectionary materials of forage, table and sugar beets (posterity)	20-82
Various types of beets, forage, table and sugar varieties (production varieties)	54-99
Inzucht-races of Belotserkovsk station	42-72

Using the microbiological method, Broiakovskii carried out the evaluation of the posterity of insucht at the Ivanovsk station and discovered important differences between insucht-races in their relation to mound rot, which opens definite prospects in obtaining immune varieties the insucht method. By using corresponding insucht-lines and the products of their crossings, the same author discovered upon insucht-material that the data of microbiological evaluation of the immunity to mound rot correspond the behavior of varieties when they are preserved under natural conditions (in storage rooms); this indicates the fitness of the given method at the selection as to the immunity to mound rot (11).

The peculiarities in the biology of the causes of mound rot indicate that in respect to mound rot, like in the case of cercosporose, we may count upon the production of relatively immune races of sugar beets, but not absolutely immune. In selection for immunity to mound rot the same scheme could be applied as in selection for immunity to cercosporose.

The experiments which were carried out at the Belotserkovsk selection station in respect to the hereditary symptom of immunity to mound rot indicate, that single group selection yields some increase in the immunity to mound rot in the generative posterity of sugar beets by 13.5 percent, and double selection - up to 25 percent; in the posterity of individual species, the effect of the selection is even higher.

Thus, the described microbiological method, being, basically, the first provocative method, possibly justifies itself fully and therefore should be widely introduced into productive selection.

Mosaic and other diseases of sugar beets. The problems of selection of sugar beets as to the immunity to other diseases, among which some are very dangerous (for instance, mosaic false mildew, rust, "rizoctonia" etc.), are studied comparatively little. Thus, in respect to the mosaic in literature, there are no indications about immune varieties, despite the fact that on the problems of controlling mosaic many scientists worked both abroad and in our country. The same should be indicated in respect to rust and false mildew. It is necessary to mention here the successful work which has been carried out in USA in producing varieties immune to curly top - a disease which we did not disclose as yet; this work yielded good results.

As to mildew Erysiphae communis which has been discovered in our country by V. P. Murav'ev upon sugar beets, differences in immunity with various varieties of sugar beets were observed.

It is necessary to develop further the studies on the immunity of sugar beet varieties to all diseases, in order to find and utilize not only an absolute immunity, but a relative one. Even in such cases, when the disease infestation of most varied material will be the same, it is necessary, for the selection, to utilize all the differences in the plant's reaction to the disease.

The availability of a great differentiation in the productive varieties, as to their immunity to black leg, cercosporose, mound rot, necessitates the regular utilization in the very next future of phytopathological methods of selection, in order to produce new immune varieties. These new varieties will provide a considerable progress in the yield of sugar beets even if the losses which are caused by the main diseases of sugar beets will be eliminated only partly.

END OF ARTICLE

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Sempolovskii. L. L.
Breeding sugar beet at the Uladovo-Lulinetzky Beet-Breeding Station for immunity against fungus diseases. Naucnye Zapiski Sakharnoi Promyslennosti (Sci.Trans.Sug.Ind.)1938 Nos. 12:47-53 65.9 K54A

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The Soviet sugar industry requires the production of such sugar beet varieties for collective and state farms which are characterized by small losses of saccharose - the basic carbohydrate of sugar beet tuber - during a prolonged storage. Thus, the new breeding of sugar beets should produce varieties not only, as it was up to now, with the basic utilitarian symptoms of high yielding capacity and saccharinity, but with characteristics, according to the conditions of prolonged production(150-200 days).

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Uladovo-Liulinetsk selection station, from the very beginning of selection work, carried out a control for high yield of sugar from hectar and for sound sugar beets, always protecting the produced sugar beet varieties against various fungous and bacterial diseases. Parallel to the improvement of sugar beet quality, the selectioners should, along with the phytopathologists, pay attention to the plant's hygiene. Positive results of this long and responsible work are indicated by the research of the phytopathological section of Belotserkov' selection station. Experiments on the immunity to fungous diseases, carried out by the phytopathologist Shevchenko with varieties of the state collective research for a number of years, indicated, that the varieties of Uladov-Liulinetsk station occupy regularly the first places in respect to the immunity to fungous diseases, keep their sugar firmly and yield few losses in storage rooms.

In our article we would like to describe briefly those measures which we applied and will apply in this control for a sound sugar beet which will guarantee the highest production of sugar from one lot unit.

For variety production of sugar beets, the quantity and quality of the seeds are of primary importance. These seeds should be obtained from pedigree and superelite, which depend to some degree upon the condition and rational storing of elite seedlings, since the resistance of the sugar beet to the microorganisms is higher upon the plantation than during storage in "kagat". The selectioner should, from the very beginning of the sugar beet selection until the end of the vegetative period of the mother sugar beet of the second year - from seed to seed -, pay attention to his precious material, so that the harvested seeds would be absolutely sound and normal.

In the sugar beet tubers we have various seeds - heavy and light ones. The heavier the seed, the stronger the plant, the better is its yield and the saccharinity of the tuber. In order to obtain heavy seeds which would produce good sprouts and sugar beets, the station uses elite seeds for sowing the selection fields through three mm sieves. According to the station's experiment, the fraction of seeds from 3 to 3.5 mm has the highest percentage of heavy seeds, and with this fraction we sow the selection fields. These seeds undergo disinfestation with formalin solution. By this measure we remove the bacteria and the fungi which are in the tubers.

Many years of experiments with vernalization of sugar beet seeds at the stations convinced us that this measure of seed production influences favorably the growth and the development of the sugar beet, accelerating the appearance of sprouts (stimulation for seed sprouting), decreasing the black leg infestation, improving the sugar beet yield, in comparison with control, and decreasing the amount of harmful nitrogen in sugar beets. In recent years, the station vernalizes all seeds of selection fields for 6-8 days. It is clear, that the selection field should meet the highest requirements in respect to the chemical and physiological soil characteristic.

The reaction of the field soil should be normal, not too acid or caustic, because the acid soil reaction might cause the black leg disease, and the caustic might cause the rot of the center's leaf. The best reaction of the soil is the one in the boundaries of 7-7.5 pH.

The maximal, stakhnaovite sugar yield from one hectar depends, to a considerable degree, upon a regular crop rotation and regular chemization. As a selection field, the station should have an even piece of land with a good macro-relief. It should have the best insulation which promotes a full ripening of the sugar beets. A ripe sugar beet is better preserved in storage. The amount of nourishing substances should be regulated in such a manner that there would be no lack of phosphoric acid in its relation to nitrogen and potassium oxide. Newest experiments indicate also the great importance of microelements in the living processes of sugar beets. The application of fox-tail grass as fertilizers (boro-super phosphate) protects the sugar beet against the rotting of the center; manganese etc., increase the saccharinity of the sugar beets, iodine stimulates the assimilation of nitrogen. These problems require even a more thorough work in the future.

The selection field which is plown in fall at the depth of at least 25-27 cm., tilled thoroughly by "garden measures", in early spring with a train, harrow, cultivator and rollers, is sown with elite seeds in short time in order to preserve the necessary moisture for speedy sprouts. Upon the quality and the tempo of the sowing depends, mainly, the condition of the young sugar beet and the final yield.

T o the most dangerous diseases of young sugar beet plants belongs black leg; we must provide the plants, at the very sowing, with such conditions of growth and development so that they would be less damaged by the disease. The main cause for the black leg consists in insufficient soil aeration, due to which the plant is unable to develop normally and loses the immunity to various diseases caused by microorganisms. All those measures which cause the increase of the growth power, as, for instance, the best soil structure, loaming, sufficient amount of nourishing substances, portect the plant against this disease of sugar beet sprouts ("child disease - diphtheria of sugar beets"). Upon highly cultivated soil, black leg damages rarely, but upon untilled soil it causes great losses, because many plants perish, and those which survive yield more or less low crops.

The sowing upon selection fields should be carried out in such a manner so that it would produce strong, even and, mainly, fast sprouts. The shorter is the interval from the sowing to the appearance of sprouts over the soil surface, the less there will be of black leg. Therefore, the sowing should be carried out not too deep (2-4 cm) and as early as possible, in order to utilize winter moisture. Immediately after sowing, the roller is applied for firmness of the soil near the tubers, and then a light harrowing is applied, in order to prevent water evaporation. In order to accelerate the process of seed sprouting and the early shooting, it is possible to mix elite seed with a small amount of speedy sprouting of seeds of other plants (vernalized barley seeds). These plants sprout fast and indicate rows, which fact assists in the first loosening of the soil ("sharovka"), in the acceleration of the sugar beet sprouts and, thus, to shorten a dangerous critical period, when the sprouts did not yet appear over the soil. During the succeeding work - testing and registering - we select the young plants and we leave only those plants which indicate a strong, even growth and a sound development - physiologically the strongest organisms.

For the facilitation of this important, from point of view of selection and phytopathology, work, the station follows the growth energy of the sprouts from the very beginning of the sowing every ten days and registers these strong plants with pickets, in order to form a special group which is refined separately in sugar beet laboratories. In further care at the selection plantations, we have to pay attention to the circumstance, so that the sugar beet tubers had sufficient aeration. It is clear, that the control of the crust is of most importance during the entire vegetative period.

Tremendous achievements of stakhanovites in the increase of sugar beet yields indicated descriptively how important is the expedient loosening for the growth of sugar beets.

A systematic and sufficiently deep loosening of the between rows (up to 20 cm) at the end of vegetation is a prophilactic measure against sugar beet diseases. The final loosening should be carried out carefully so that the root system would not be damaged (for this purpose, a chisel clutch should be used).

The work of the phytopathologist and of the selectioner are closely interrelated, it should go parallel, and it is hard to tell where ends the work of the selectioner and where starts the work of the phytopathologist.

The main rejection by the phytopathologist should be done before the harvest - according to the leaves, and after digging - along the roots. We shall dwell briefly upon these two measures. The haulm is the nature's laboratory for obtaining sugar. It should be the object of study of both the selectioner and phytopathologist. Upon selection fields the phytopathologist carefully rejects those diseased plants whose haulm is infested by various microroganisms. To these microorganisms belong, in the first place, peronospora, phomos (zonal spottiness), uredinoz, etc. The infested haulm has to be silaged, because in silage all the spores (nucleus) of the infesting microorganisms are destroyed. During the digging, it is necessary to observe the correct cutting of the haulm; it should be carried out very carefully with a sharp knife, leaving the leaf petiole in the center of the top at the depth of 2-3 cm. at the periphery - 1.5 cm.

Before we store the selected sugar beets, we must take all the neccessary measures for its protection, in order to eliminate the rotting of the plantings. A thorough rejection of tubers increases the plantings' immunity to diseases and increases the yield of seeds from one tuber. Before storing, the selected sugar beets are rejected again, according to the conditon of the tubers. The plantings upon which phomoz is observed, rhizoctonia, bacteriosis etc. are rejected and only sound tubers are left.

The selected sugar beet is a living organism in storage as well; in winter (6 months) it passes the period of "winter sleep," during which its life functions drop to a minimum. During this sleep, the tuber breathes, whereby the saccharose which accumulates in it transforms, to some degree, into carbonic acid and into dissolved non-sugars. The intensity of breathing or the loss of sugar depend upon the environment - temperature, moisture of the environment and individual conditions - individuality, enzymes, unripeness and traumatism (wounded). The living processes of the elite tuber in which occurs the chemical transformation under the influence of enzymes, does not depend at all upon the degree of the tuber's saccharinity. During these processes of most importance is the amount of the active albumen of the protoplasm, consequently, the individuality of the variety and its ripeness. Thus, the selectioner should keep its material entirely sound, ripe and unwounded.

The rating of the quality of the material from selectionary fields is now done between January and the end of March, whereby in selection laboratory are rated: the weight of the tuber, the percentage of sugar, dry substances, harmful nitrogen, ash content, invert sugar, etc. After the classification of planting tubers, the sugar beets go again into storage. Thus, we have two stages of storage: the first - from digging up to laboratory refinery and the second - from laboratory refinery to planting. Previously, the sugar beet tubers underwent selection refinery in fall, because the refinery upon the plant occurs, principally, in fall, and then definite figures are obtained on saccharose which during the winter transforms, partly, into non-sugar. The newest experiments indicated, nevertheless, that the best method is the winter selection, because specimens which are selected with high polarization in winter, lose sugar more regularly and are characterized by long storing ability.

The selectioner is thus faced with the problem - to keep the specimens of sugar beets which are of better storing ability, taking into consideration that at this moment we are able to find those tubers which contain little of invert sugar. This is of great significance for the technological process at the factory where the invert sugar decreases the production of sugar from one unit of refined sugar beet.

During selection work with sugar beets, we must place the roots into storing rooms and keep them in such a manner that, up to the moment of their research in the sugar laboratory, they would have the equal conditions of the environment in respect to temperature and to moisture (the first stage of storing). The temperature may fluctuate within the boundaries of 2° to 6°. Such conditions we produce for the selected tubers in well prepared storing rooms or in special cellars, where the temperature and the moisture is regulated. Carefully selected, completely sound plantings are placed in the cellars into tempered humid sand; under such conditions the seedlings don't dry out and are preserved perfectly. For the control of temperature in such cellars two termometers are necessary, downstairs and upstairs, and for the observation of moisture, hydrometers are required. Due to the fact, that such cellars are very expensive, variety producing stations are usually storing their mother material in storing rooms, where the tubers are placed horizontal or vertical in one layer.

In January, the plantings enter sugar beet laboratory and, after a specimen is taken in a shape of a candle, they are stored again, because the weather conditions are not fit for planting at that time. If we keep the seedlings under the conditions of not too cold temperature, then we must keep them in the cold, so that they would not sprout before the planting time.

Tuber plants manifest an intensive sprouting of buds in March and April, because their winter rest comes to its completion. The seedlings which possess more sugar at the moment of planting differ by their powerful and wild vegetation, form strong stems, yield larger and better tubers. Therefore, an early spring storage of tubers, after having drilled them with a drilling machine of the system "Keil Dolle", should be carried out in special cellars with a low temperature (approximately 0°).

Without a definite phytopathological control during the first and the second stage of storing the select sugar beets, we are unable to obtain even and sound plantings.

In order to determine the quality of the elite tubers in sugar beet laboratories, we drill out, with a specially constructed driller, the portion of the vegetable pulp, so called "candle", whereby every tuber has, consequently, "polarized holes". We indicated already, that the wounding of the plantings is the cause for their rotting and death, because a wounded tuber breathes heavier and loses more saccharose. Previously, these holes were disinfected with various fungicides: cupric, ferrous vitriol, calcium, etc. If, during the drilling, completely smooth candles are formed, then it is sufficient to wipe the holes until dry, because the plant is forming a protecting tissue all by itself. This tissue protects the plant against microorganisms. The less we drill the tuber (it is best to take out only one candle) and the farther from the buds we take the specimen, the better are the chances for a high yield of tubers from one plant. With a selected sugar beet the tails are not out in fall and are preserved until planting in spring.

Early spring, we again carefully reject suspicious and rotting tubers. This rejection causes an even and good condition of the planted plantation and ensures a high yield.

If a careful phytopathological rejection of tubers is not carried out, then the plantations and the groups of polarized sugar beets have often a great percentage of planting losses, due to the drying out of some part. This phenomenon which repeats from year to year is not given due attention, and hence a considerable amount of valuable elite seeds is lost, which comes to high expenditures for the government. The drying of the plantings occurs often in dry years upon soils which are insufficiently tilled (poor agrotechnic), and occurs, under such unfavorable conditions of climate and soil, in great masses. The main reason for the loss of plantings - tubers - is their rotting, which occurs, due to the infestation or to the wounding of the sugar beet. If we control during the vegetative period of the first year, if we protect the plantings against fungi diseases during dig-ging, storing, transportation and planting, then we do not have to fear this complicated disease.

After planting, the role of the phytopathologist upon the plantation consists of removing all abnormal and diseased specimens before blooming. These specimens could, during crossed pollination, influence harmfully the obtained seeds, since diseased tubers could not be healed in the field. It is obvious, that high agrotechnic (loosening of the soil, sufficient fertilization) is necessary for the soundness of the plantings. Before the harvesting, the phytopathologist examines again the condition of the plantings, severely rejecting all the defective specimens. After the dry seeds were threshed, they are let through 2.5 mm. sieves, in order to remove small seeds. Small seeds and dust should be carefully removed and destroyed, because they usually possess a great amount of the germs of the microorganisms. Under no circumstance should small grain be sown, because they usually possess a great amount of the germs of the microorganisms. Under no circumstance should small grain be sown, because it usually yields poor sprouts which die from black leg.

In our survey we tried to indicate those measures with the help of which we succeeded in obtaining sound sugar beet. For the future, the station strives to produce new varieties of sugar beets which would combine the symptoms of immunity to diseases, along with utilitarian qualities. This task is difficult and complicated, since up to now the problems of sugar beet diseases of mycological and bacterial character were not scrutinized sufficiently. Nevertheless, due to great losses which sugar beet industry suffers every year, due to the infestation by micro-organisms of expensive raw material, we are obliged to produce such raw material which could be preserved in storing rooms.

In order to achieve this aim, it is necessary:

1) to find the complete phytopathological characteristic of the selected material which is used for the production of immune sugar beet varieties;

2) taking into consideration the fact that, when the sugar beet varieties are used at the given stage, they are, to some degree, infested by mound rot, cercosporose and black leg, selection should first of all be directed towards the production of immune varieties;

3) the newly produced varieties should be let through a phytopathological

scrutiny, so that a complete exclusion of the infested species would be achieved. Therefore, it is necessary, at the first stage of selection work, to include into phytopathological refinery the entire material, beginning with the ancestors and with the selection of pairs for crossing. The phytopathological work should be carried out, in the first place, against the following most harmful diseases: 1) mound rot, 2) cercosporose, and 3) black leg.

AGAINST MOUND ROT: during the work, it is necessary to apply the microbiological method of Belotserkov' station (com. Shevchenko). Pedigree, superelites and elites - all go through the microbiological analysis. Pedigrees which are heavily infested, should be rejected, according to posterity, after the examination of their infestation. Among the superelites and elites, the heavily damaged tubers should be rejected. The immune tubers should be selected into a separate group and then examined again.

AGAINST CERCOSPOROSE: during the period of vegetation, it is necessary to carry out an individual rating upon the selection fields, in respect to the infestation by cercosporose, rejecting heavily damaged plants and electing the immune ones. Simultaneously, a sowing of the varieties for artificial infestation and the selection of the more resistant varieties is to be carried out, and the rejection of heavily infested as well (cercosporose).

AGAINST BLACK LEG: The production of a group of plants with sprouts of high power (Triebkraft).

Upon the plantations should be carefully observed the infestation of bushes of individual ancestors and posterities. Besides, we carry out an artificial infestation of plantings and of elite groups by cercosporose and reject the infested bushes before blooming.

As to the mosaic disease, the tubers should be planted far from the sugar beets of the first year, which yields positive results in respect to the protection against virus diseases which are carried, mainly, by various species of aphids and by other insects.

The sugar beet selection could ensure the best effect in the case, if it would be carried out in close contact with a phytopathologist. The best selection varieties in respect to utilitarian symptoms, but not immune against fungi diseases could not satisfy socialist industry at the present moment. The party and the government require from the selectioners-sugar beet producers that in order to increase the yield, they would produce in the third five-year plan, such varieties which would not only be qualitatively and quantitatively good raw material, but that the material would be kept in storage rooms for a long time; this would be possible only, when the varieties would be resistant against the infestation by fungi and bacterial microorganisms. For such qualified reconstruction of sugar beets, we must utilize the outstanding results of the academic T. D. Lysenko in respect to the transformation of the plants' nature.

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End of Article

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Tverskoi, D. L., and Bunina, A. M. Transl. 260 Sugar Beets
Ekologiia tserkosporosa sakharnoi svekly
i pravila primenenila khimicheskikh sredstv dlia
bor'by s nim[Ecology of sugar beet Cercospora
(C. beticola) and directions for the use of chemical
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Translated by R. Dembo

Cercospora occupies one of the first places among the diseases of sugar beets during vegetation, in repect to its harm and to the degree of its spreading. The spreading of cercospore is basically connected with the distribution of sugar beets. This disease is known in Western Europe, Japan, Korea, Manjuriia, in Northern and Southern America..

In USSR cercospora is spread everywhere. It infests sugar beets, starting with Belorussia up to the Far East, from Vologda oblast' to Beyond the Caucasus and the republics of Central Asia. The disease develops most in Krasnodarsk krai, in Ussurii oblast' and in some years at the South-Western Ukraine (Vinnits, Kamenets-Podol'sk Zhitomir and in other oblast's).

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Cercospora infests the leaves, upon which it develops small, light brown spots. With a considerable amount of spots, some of them unite, as a result of which the leaf blade becomes brown and dries out. The spottiness of the leaves reduces the general assimulating field of the plants and, in connection with this, decreases the accumulation of the organic substances by the plant, including sugar. In the experiment of VNIS (according to Murav'ev), comparing the sound sugar beets with the ones which are in some degree infested by cercospore (during an artificial infestation), the sugar losses were expressed in the following figures (table 1).

The sugar losses are especially noticeable during a great development of the disease which causes a premature death of leaves and the formation of new ones. According to the data of Pool and McKay (USA), the increased growth of new leaves, in replacing the dead ones, infested by cercospora, led to the succeeding change of saccharinity of sugar beet tubers (table 2).

As the table indicates, the mass formation of new leaves decreased the saccharinity of the tubers from 14.5 percent to 10.9 percent. As Schmidt indicates, during 1928, as a result of sugar beet infestation by cerspora, in Korea, the saccharinity of tubers from 16.6 percent in July decreased to 7.8 percent in September.

Along with the decrease of saccharinity and with the weight of the tubers, cercospora deteriorates also the technological characteristics of the tubers. The tubers of the diseased plants possess a decreased quality of juice, a harmful nitrogen accumulates in them and the preserving ability during storage decreases.

During certain years, the cercospora causes a serious loss in sugar beet production and sugar beet sugar industry of USSR. In 1934, cercospora caused a shortage of about two million centner of sugar, and in 1935 - over one million of centners (VNIS - Murav'ev).

The losses, caused by cercopsora, naturally, urged in USSR and abroad a great number of experimental work in the biology and ecology of the disease and the working out of measures for controlling it.

Despite a considerable toxicity of the applied fungicides (for instance, Bordeau solution), the chemical control of cercospora did not always produce high effectiveness. The greatest decrease of infestation and a considerable increase of sugar were observed, mainly during repetitive chemical treatment of 7 - 10 - 15 times during the summer. Along with this, there were cases, when a four, three or even one or two sprayings or two sprayings or pollinations produced the same results as a seven or ten times chemical treatment, and sometimes they excelled the latter (table 3).

A detailed analysis of this phonomenon enabled us to determine, that the flexible effectiveness of the chemical control is caused by an incorrect selection of timing and the frequency of the treatment of sugar beets with mordants. The timing and the frequency of sugar beet treatment with fungicides were often determined mechanically, without sufficient registration of the peculiarities in the development of the disease, i. e. the time of its appearance and the dynamics of growth.

The methods of chemical control of cercospora were not scientifically substantiated, the rules for the most effective application of fungicides were not worked out. Taking into consideration the indicated shortcomings, we included into the program of research the following three basic divisions:

1. The determination of the influence of climatic factors upon the development of the disease.

2. The working out of rules of the most effective application of chemical measures in controlling the disease and their testing, under conditions of production.

3. The fixing of the zone of cercopsora spreading, in connection with the ecological peculiarities of the disease.

The outlined work was carried out during 1937-1941, according to a single laboratory-field method, in collaboration with Vinnitsa, Khar'kov, Maritime experimental stations of VNIISP and Krasnodarsk support station.

THE INFLUENCE OF CLIMATIC FACTORS UPON THE DEVELOPMENT OF CERCOSPORA.

Temperature and moisture are basic elements which regulate the appearance and the development of the disease. We studied the influence of temperature and of moisture upon the preservation and the accumulation of the infection agent, upon the plant infestation and the manifestation of the disease and, finally, upon the dynamics of its development. For experimental treatment the following problems were considered.

1) the viability of the cause of cercospora - the fungus Cercospora beticola, 2) conditions for formation of spores, 3) conditions for the growth of spores, 4) condition for plant infestation and the length of the incubation period and 5) conditions of accumulation of infection and epiphytotic development of the disease.

THE VIABILITY OF THE FUNGUS

The resumption of the disease depends, to a considerable degree, upon the preservation of the fungus during the fall-winter period. After the harvesting of crops, the fungus remains upon the infested vegetative refuse in the form of conidia and in the form of resting mycelium - stroma. It was the task of research to elucidate, under which form and under which conditions, could the fungus be preserved until spring and infest the new crops.

Four experiments were carried out for the elucidation of the viability of conidia and of the resting form of the fungus - stroma.

The experiment of the elucidation of the viability of conidia was carried out, according to the following method.

The sugar beet leaves, infested by cercospora, with the film of spores, which were harvested in fall, were placed into dry and moist test tubes PY, which were left from fall (from 1/X until spring (1/IV) under natural conditions. The viability of spores were determined according to their growth every two months. Simultaneously, for comparison was determined the viability of spores from dry, infested leaves, preserved in herbarium. The viability of spores in this case was inspected after 6, 8 and 12 months.

The growth of the spores was carried out ten times in Van-Tigem rooms. During the experiment were registered the minimal and the maximal temperature of the air. The results of the experiment are given in table 4.

In the moist test tubes the condidia died 3 months after the first frosts 12°. Upon dry herbaceouss leaves the conidia preserved their ability for growth during eight months. Since the cases of preserving sugar beet leaves in a dry condition are rare in nature, we may assume, that practically conidia die during the fall-winter period and play no role in the resumption of the disease.

The experiment in determining the viability of stroma has been carried out under laboratory-field conditions at VNIISP in Moscow and at the Vinnits and Marital experimental stations.

Dry cercopsorose leaves, collected in fall after harvesting, were partly placed in a thin layer upon the surface of the soil, and partly placed in the soil in special metallic nets, at the depth of 5, 10 and 20 cm. In spring, when the air temperature reached 1 - 2°, we took from specimens of leaves the kept variations for the testing of the viability of the fungus. The specimens were carefully washed by running water and were placed into the moist room under good aeration. According to the appearance of new conidia upon the material under experiment and according to their virulence upon sugar beets, we judged the wintering of the fungus under various conditions.

The results of the experiment are indicated in table 5.

Thus, stroma winter freely upon vegetative waste and, under favorable conditions, produce conidia which infest sugar beets. In our experiments the fungus appeared to be viable and formed conidia both upon the leaves which were lying upon the surface of the soil and upon the soil at the depth of 5 and 10 cm, i. e. slightly covered with ground. The fungus stroma dies upon the leaves which are deep in the soil, where the vegetative tissues undergo a more complete disintegration.

The data obtained in the experiments coincide with the results of similar research carried out by Pool McKay (1926) and Stolge (1929). As a result of the experiments it became evident, that up to the new harvest, the fungus is preserved, mainly, in the form of a resting mycelium - stroma, but the conidia soon die and do not play any role in the resumption of the disease. Thus, the infested vegetative waste which are left after the harvest of sugar beets, are the basic source for the primary infection of the crops. This is also observed in nature. The disease manifests itself first of all upon the sugar beet crops after each sugar beet, as well as upon the lots which are close to old sugar beet fields, or to roads along which the haulm was transported. The obtained results have a great practical significance; the death of the fungus, at a great depth in the soil, indicate the expediency of a deep plowing of old sugar beet fields for the covering of vegetative waste in the soil, and the infestation of the crops in fall indicates the nucleus of infection which should be taken into consideration, when controlling the disease.

CONDITIONS FOR THE FORMATION OF CONIDIA

Cercospora is spread by spores - conidia which are formed upon the narrow, brown-olive colored conidia carriers which grow from the stroma of mycelium hidden in the tissues of the infested plant. The primary and the secondary infestation of plants depends upon the availability of spores in the air. Therefore, it was important to clarify the influence of temperature and of moisture upon the appearance of spores. The experimental research consisted of two basic experiments: 1) the influence of temperature and of moisture upon the spore formation of the fungus upon wintering vegetative waste and 2) the influence of meteorological factors upon the spore formation of the fungus upon the spots of summer infection of the leaves.

Under natural conditions, the spores are formed with most varied fluctuations of daily temperature and relative moisture of the air. Therefore, the effect of the basic climatic elements upon the formation of spores has been studied experimentally under different temperature and moisture in a thermostate and under field conditions.

Pieces of the infested leaf tissues, collected already in fall, were cleaned carefully from old spores by having been washed ten times, in water. The pieces of infested tissues cleaned from the spores upon a slide, were placed into moist chambers with a constant moisture of air of approximately 100 percent. The moist chambers were placed into a thermostate and were kept there under the temperature of 0°, ≠ 5°, ≠ 10°, ≠ 15°, ≠ 24°. The appearance of spores was determined by the inspection of pieces of tissues under the microscope every 3, 6, 24 and 48 hours. The results of the experiment are given in table 6.

The growth of stroma and the formation of spores started only at the temperature of 5°. With the increase of temperature, the energy of spore formation increases, and at the temperature of 15-24°, the spores appear already after 3-6 hours, while at 5°, only after 48 hours.

For the determination of the role of moisture in the formation of spores, the material under experiment (pieces of old infested leaves) was placed into moist chambers - with the moisture of the air of 70 percent, 80 percent, 90 percent, and 100 percent, regulated by the solution of sodium chloride. During the experiments, the moist chambers were left in the thermostate under constant temperature of 23-25°. The appearance of spores was recorded after the inspection of the tissue pieces after 12, 24 and 48 hours.

The results obtained in this experiment were given in table 7. According to the table, for the appearance of spores upon the wintering vegetative waste, a moisture is needed not lower than 80 percent. The maximal formation of spores was observed at the relative humidity of 90-100°; at this moisture and at the temperature of 24°C - the spores appeared after 12 hours.

Parallel with the laboratory experiments, observations were carried out upon infested vegetative waste of spore formation under natural conditions. In spring, after the snow had thawn, the infested tissues, freed from old spores, were placed upon the soil surface.

From the beginning of the experiments, we registered daily the temperature of the air (minimal and maximal), the relative humidity of the air and of water fall (rain or dew). The appearance of spores and the intensity of their formation were registered by daily inspections of specimens of diseased tissues under a microscope. During the microscopic analysis we recorded: the presence or the absence of spores, the presence of conidia carriers, and the amount of circles upon the conidia carriers - the places, where the fallen spores were attached. The experiment was carried out at VNIIZP, at Khar'kov and the Far East experimental stations. The results of this experiment are given in table 8.

Under the fluctuating meteorological factors, the spore formation begins, when the daily temperature of air increases up to 5° and higher and under the conditions, when there is rainfall, dew or fogs. An intensive spore formation occurs under the average daily temperature of 11° and higher, as well as under rain fall, dews or fogs. The observations under natural conditions coincide with the results obtained in laboratory experiments. As table 7 indicates, the spore formation, under constant temperature conditions, began only at 5°, a more intensive spore formation was observed at 10° and higher.

Observation over spore formation of summer infection was carried out upon sterile oily or necrotic spots, especially noticeable upon the sugar beet leaves in the field. As in the preceding experiment, the appearance of spores and the intensity of their formation were determined by daily microscopic examination of the diseased tissue. Besides, during the entire experiment, the temperature and the air humidity were observed and the water fall was recorded (table 9).

According to table 9, during the summer period, with the beginning of steady heat, the mass appearance of spores was determined by rain which caused the relative humidity of the air at least 80 percent. Under these conditions, the spores emerge after 24-48 hours. During dew (for three or more days) the spore formation stopped for five days and even longer.

Thus, the appearance of spores in spring upon the wintering vegetative waste depends upon both the temperature and the high relative humidity. The spores begin to emerge under the average daily temperature not lower than 5°. With the increase of temperature up to 10° and above, and with the presence of waterfall, the rate and the intensity of spore formation increase considerably. In summer, when the average daily temperature is sufficiently high, the basic factor which determines the appearance of spores is the relative humidity. For the primary appearance of spores, this humidity should not be less than 80 percent. With the increase of moisture up to 90% and higher, which occurs usually after rain, the spores are formed rapidly and in a great amount.

CONDITIONS OF SPORE SPROUTING

The spores, formed under specific external conditions, sprout and infest plants. The better are the conditions for more sprouting, the more intensive is the development of the disease. Therefore, the necessity arose to observe the dependency of spore sprouting upon temperature and relative humidity of the air.

When studying the influence of temperature upon the sprouting of spores, the following method was applied: spores were washed down with a small brush into water pipe from the sugar beet leaves. The suspension drops of the spores were transferred to the moist rooms - the Van-Tigem rings. Under these conditions, the spores in thermostate underwent the effect of various temperature from 0° up to 40° with intervals of 5°. For each variation were applied ten repetitions. After 24 hours, the moist compartments were taken out from the thermostate and were inspected under a microscope. Based upon the inspection of at least hundreds of spores, the average percentage of sprouted spores was determined. For the fixing of spore sprouting intensity under various temperature, the compartments were inspected every 12 hours; during this process was counted the amount of sprouts of each spore, and their length was measured by ocularmicrometer. The results are given in table 10.

According to the table, the critical temperatures for spore sprouting are betwen 0°, 5°, 30° and 35°, and the optimal - between 15° and 30°. The maximal spore sprouting and the longest sprouts occur at 25°.

The influence of moisture upon the spore sprouting was examined in the following way: dry spores on slides were placed into moist chambers with the air moisture of 70%, 80%, 90%, and 100%. The moist chambers were kept in a thermostate under constant temperature of 24°. The spore sprouting was determined by the inspection of slides under the microscope after 24 - 34 and 48 hours. The results of the observations given in table 11 indicated, that, under 100% of moisture, the spores sprouted after 24 hours, and under 90% moisture - after 34 hours.

In the atmosphere of 70 percent and 80 percent moisture, no spore sprouting was observed after 48 hours. It is important to notice, that under the atmosphere of increased moisture, the spores sprout somewhat slower, than in liquid moisture. Thus, under the temperature of 24-25° and 100 percent of relative humidity, spores sprouted after 24 hours, while in a water drop, under the same temperature - after 12 hours.

Based upon the examined material, we may insist, that in nature, the speediest spore sprouting occurs during warm weather with the minimal temperature at least of 15° and after rains or after abundant dew which causes the liquid moisture of high relative humidity of the air (90-100 percent) during one or two days.

CONDITIONS OF INFESTATION OF PLANTS AND THE LENGTH OF INCUBATION PERIODS OF THE DISEASE

The study of conditions of plant infestation and the determination of the length of the incubation periods are quite important for defining the time of the appearance of the first spots of the disease and the understanding of the dynamics of its development.

The first infestation of the plants is caused by spores which are formed upon the waste of infested leaves of preceding year. For the infestation is necessary, that the spores would germinate and their germinating pipes would penetrate into the plants' tissues. Research indicated, that the spore sprout under relative humidity not lower than 90 percent, the greatest sprouting speed occurs at the temperature between 15-30°.

In connection with that, we may assume, that the infestation of plants occurs during early summer hours, when the stoma are wide open, and after rains and dews which create in the zone of sugar beet leaves the necessary moisture for the sprouting of spores. Since the infection of plants is best provided in the morning, it is advisable to use the index of minimal temperature for the determination of possible infestations. If, after rains or dews, the minimal temperature is lower than 10°, then, despite the sufficient moistening of the leaves, the infestation is not able to occur. In nature, the optimal conditions for the infestation of sugar beets occur during warm days, under the minimal temperature not lower than 15°.

After the fungus penetrates into the interior tissues of the sugar beet leaf, oily or necrotic spots appear upon the infested spot, and then appears the fruit bearing body of the fungus. The period between the moment of infestation and the appearance of cercospora spots is called the incubation period, or the hidden period. For the development of the fungus in the plant tissue, the decisive moment is the temperature. In connection with this, the length of the incubation period depends upon the natural fluctuations of air temperature. Further research was dedicated to the study of this relationship.

Work was done according to the method of artifical infestation under field conditions at Vinnits, Khar'kov and Maritime experimental stations.

The plants under experiment were grown upon especially isolated lot in the field. In order to observe the influence of most varied temperature fluctuations during the summer upon the length of the incubation period, every three days artificial infestations of the plants were carried out. For every infestation were taken three plants, upon which were selected completely developed leaves, approximately of the same maturity.

The artificial infestation was carried out by suspension of spores, washed into water from the cercospora spots of the new infection. The spore suspension, in the fork of small drops, were placed upon fixed places (circled with Indian ink) of the upper or lower surface of the selected leaves. Twenty five infestations were made upon each plant. The infestation was done in the evening, before sunset. For the fixing of disease manifestation (the appearance of the oily or necrotic spot), the infested leaves were inspected in the morning. After the appearance of spore bearing body upon the spots, the inspection of leaves stoped. During the entire experiment, the meteorological factors were examined with a thermograph and hydrograph placed among the plants under experiment, at the height of the leaf zones. Along with that, dews and rains were recorded.

Experiments with artificial infestation of sugar beets under field conditions indicated, that the length of incubation periods during the period from May until August fluctuates from 6 to 29 days and more. Thus, the length of the incubation periods in the middle and the end of May amounted to 17-29 days, at the beginning of June, 18-29 days, in the middle of June, 15-21 days, at the end of June, 10-16 days, in July, 6-15 days, and in August, 6-13 days.

The shortest incubation periods occur in July and in August.

In the practice of phytopahtology, for the characteristic of the length of the incubation period, indexes of the average temperature during the incubation are often used. We also made similar comparisons. (table 12) It appeared, that the length of the incubation periods is not characterised by the average temperature (minimal, maximal and average) during the period of incubation.

A detailed study of the notes on the experiments indicated, that the relation between the length of the incubation period and the temperature is very complicated and is connected, mainly, with the fluctuating minimal temperature during the incubation period. During the analysis of numerical data, it became evident, that the closer are the daily fluctuations of temperature to the optimal temperature of the fungus development of (25°), the shorter is the length of the incubation period (6-8 days). Divergences from optimal temperature up to 10-31° increase the length of the incubation period up to 10-11 days. The length of incubation periods are drastically influenced by the temperature divergences lower than 10 and higher than 32°. Table 13 indicates, that one or two days of such unfavorable temperatures increase the length of the incubation period up to 14-19 days.

Thus, the average daily temperature which is composed of varied minimal and maximal temperature which affects the fungus, either positive or negative, does not characterize the length of the incubation period of cercospora. The average daily temperature epitomizes this disease only in the limits of vegetative period, when we say, that in May, due to a lower temperature , the length of the incubation period is longer, than, for instance, in July-August.

Therefore, when explaining the development of the disease, it is important to take into consideration the fluctuations of minimal and maximal temperature during the day; the closer this temperature is to the optimal development of the fungus (25°), the shorter is the incubation period, and, the greater is the amount of days with the temperature beyond 10-31°, the longer is the period. This regularity explains the development of cercospora in nature. Negative temperature during spring and early summer period checks the incubation period considerably, hence at that time could be observed a slow development of the disease. On the centrary, in July-August, the long optimal temperature for the development of the fungus (15-30°) shortens the time of the appearance of the disease, and with sufficient moisture, it promotes its mass development.

Conditions of accumulation of infection and epiphytotic development of the disease. The exposed ecological peculiarities of the fungus Cercospora beticola , its close relation to relatively high temperatures and its demand for liquid moisture, determine the growth and the development of the disease in nature. The infection depends upon the presence of spores in the air; therefore, the conditions of spore formation and their spreading indicate its accumulation in nature. The observations of spore formation during summer indicated, that the relative humidity of the air is the most important factor for the appearance of spores. The speed and the intensity of spore formation after the manifestation of the first symptoms of the disease - the cercospora spots - depends upon the relative humidity and upon rain fall and dews. Depending upon the distribution of days with rain-fall and with dews during the summer, the spore formation occurs after 1-3-12 days and more. The more frequent and more abundant are the rainfalls during the summer, the easier are the plants infested. A high relative humidity and rains cause the development of spores, as it is indicated in table 14.

The results of observations indicate the possibility of deduction and of the scattering of the spores only under a strong moistening and especially during rain with wind.

For the explanation of the conditions for the spreading of the disease in nature, were carried out special observations of its development during the summer, taking into consideration the meteorological factors. The work was carried out upon forty plants grown upon a lot, located near the nidus of the infection. Upon each plant were counted the sound and the diseased leaves. The mark of the infestation of leaves was determined according to the scale of Shevchenko. The results are given in table 16.

The table indicates, that in summer of 1937, the disease grew gradually and mildly, because in July was a small amount of rainfall. The absence of infection in July checked the development of the disease in August. Thus, the poor development of the disease was caused by the absence of the necessary optimal meteorological conditions. For a more intensive development of the disease, the meteogological factors should be optimal for a longer period. These conditions in the development of the disease could be seen upon the following phenograph of the cercospora at Krasnodarsk krai in 1932. (see phenograph No 1). As the phenograph indicates the optimal development of the disease was caused by the long period of the optimal temperature (during more than 60 days) in the limits of 15-30°, comparatively abundant rainfall in July-August (from 30-60 mm).

RULES FOR APPLICATION OF CHEMICAL MEASURES IN CONTROLLING CERCOSPORA AND THEIR TESTING UNDER CONDITIONS OF PRODUCTION

The study of the ecology of cercospora is the basis for the following rules in applying chemical measures of controlling the disease.

1. Chemical measures in controlling cercospora are the preventive measures and therefore their application could give a good effect only in the case, if they will be used before the leaves would be infested by the spores in masses. Before the treatment of the sugar beets with mordant is carried out, it is necessary to determine the time of their application which has to be based upon the familiarity with the conditions of the first appearance of the disease and of its further manifestations.

2. The sugar beet leaves are infested by cercospora under the minimal temperature of 10° and higher. It usually occurs at the beginning of June and quite often during the closing of the rows. At that time is important to start careful observations of sugar beet crops, since, with the start of warmer weather with the minimal temperature of 15° and higher, the first spots of cercospora will begin to appear upon the lower sugar beet leaves. The inspection of the sugar beets should begin with lots, located near the source of infection (old sugar beet fields, roads along which haulm was transported) or on low lands and near reservoirs. Under these conditions, the disease develops the fastest.

3. The first spots of cercospora appear usually in small amounts after the first infestation, but their presence in nature indicates the appearance of new sources of infection which, under favorable conditions, could cause the progress of the disease. The development of the disease in summer is caused, mainly, by rainfall. Therefore, if immediately after the appearance of the first spots of the disease, there will be rain, dew or fog, it is imperative to proceed with the treatment of sugar beets with fungicides.

The spreading of the disease comes from the source of infection, therefore the lots which are close to the old sugar beet fields and to the roads along which the haulm was transported should be treated with mordants first of all. During dry, hot weather, the spraying is not carried out and is postponed until the days with rainfall (rain, dew, fog) which promotes the development of the disease.

4. The second and the succeeding treatment of the sugar beet should be determined by three conditions: 1) presence of a permanent film of fungicides upon the leaves, 2) weather conditions and 3) phenology of sugar beet growth. Normally, the fungicide film remains upon the sugar beet leaves for two weeks. During this time may grow new parts of leaves which is not covered with the fungicide. Therefore, the succeeding spraying of sugar beets should be carried out after 10-12 days. In such instances the treatment of sugar beets with fungicides should be carried out only after rain, dew and fog which occured a day before. During dry, hot weather the spraying should stay for 15-20 and more days, i. e. before the conditions arrive which are favorable for a new outbreak of the disease.

5. As a general rule, after heavy rain which washes down the fungicides, the treatment of sugar beets with fungicides repeats immediately.

These rules of applying fungicides in controlling cercospora were verified under conditions of production - at Molotov collective farm, at Koransv MTS of Krasnodarsk krai.

The method of testing the rules. The experimental field of sugar beets was located at a distance of 200 meter from a sugar beet field of preceding year, which was infested by cercospora. One half of the field was treated with Bordeau solution, the other served as control field. The spraying was carried out with an attached sprayer "Vulkan". Starting with the second decade of June, as soon as the weather stabilized at the minimal temperature of 10° and above, observations were made of the appearance of the first spots of the disease. The first single spots of cercospora were discovered on June 27 upon the sugar beet field, near the road. The treatment was carried out on July 9. The second spraying was done during the period of dews and of fogs, 12 days after the first spraying, because the growing surface of the leaves was free from fungicide and was able to become infested. The third spraying was done 17 days after the drought which was followed by rainy days. The fourth spraying was done on the 11th day after the third, during the period of heavy rains, therefore its effectiveness is doubtful.

The registration of the development of the disease upon experimental and control fields was done before spraying and on the following day after every treatment with mordant upon 100 example plants, according to the method of S.A. Smirnov.

The results of the experiment. The results of the registration of the development of cercospora upon experimental and control fields of sugar beets, during the testing of the rules of applying chemical measures in controlling the disease are given in table 16.

According to the table, the four sprayings (really, three spraying), carried out without any delay, counting the meteorological factors, decreased the sugar beet infestation by 87 percent. The decrease degree of the infestation stays usually at the same level after every spraying (84-90 percent). This circumstance confirms the correctness of the timing for spraying.

A drastic decline in the development of cercospora upon a tilled field has been reflected also upon the sugar yield (table 17).

The increase of sugar yield was not significant, but this is explained by the relatively late appearance and slow development of the disease which was not manifested in the decline of the yield.

RAIONS OF CERCOSPORA SPREADING IN CONNECTION WITH ITS ECOLOGICAL PECULIARITIES

For the planning of chemical and of other measures in controlling cercospora, it is important to possess not only data on the spreading of the disease, but it is also important to know the zones of its greatest harm. The degree of the harm of cercospora is determined by the intensity of the development of the disease. In VNIISP was carried out treatment of the material on the spreading of the disease in the basic raions of sugar beet sowing (according to the observations points of VNIS for eight years) and the data of meteorological service were analysed. Comparing data of many years, according to the degrees of the development of the disease, with the meteorological data of many years, the following groups of raions, according to spreading and harm of cercosporese in USSR were determined.

1. Raions of the greatest harm of cercospora: Krasnodarsk krai. Ussurii oblast', Maritime krai and Khashur raion of Georgian SSR. These raions are epitomized by a long period (2-2 1/2 months) of temperature optimal for the development of the disease between 15-30° and of frequent waterfall which creates a lasting high relative humidity (see phenograph in drawing2). The climatic conditions cause almost yearly, the disease becomes epiphytic which causes great losses in yield. Years when the disease is not developed are extremely rare in these regions.

2. Raions of fluctuating conditions of cercospora development and

fluctuating economic harm: sugar beet regions of Ukrainian SSR and Southern part of Voronezh oblast'. In these regions (see phenograph in drawing 3) during the normal years, according to meteorological conditions, high humidity and temperature between 15-30° are short and are not stable. Therefore, cercospora is very slightly spread here, and the infestation of sugar beet by the disease is rarely observed in great quantity.

3. The raions of unfavorable conditions for the development of cercospora: Kirgiziia, Kazakhstan, Altai krai and new Northern and Eastern raions of sugar beet sowing. In connection with a low minimal temperature of with an extremely high maximal temperature, cercospora is not developed in these raions: its harm is insignificant.

SUMMARY

The results of the study of the ecology of cercospora, under laboratory and field conditions, enable us to arrive at the following conclusions:

1. The optimal temperature of the formation, sprouting of spores and of the development of the fungus lies in the limits of 20-30°.

2. Sprouting, formation of spores and their infestation of plants occur under a great relative humidity of the air (95-100%), or with the availability of liquid moisture (dew and rain).

3. The length of the incubation periods depends upon the fluctuation of the minimal and maximal temperature during twenty four hours and during the time of incubation. The closer are the fluctuations of minimal and maximal temperature to optimal temperature of the development of the fungus, the shorter is the incubation period. The shortest incubation periods of the disease are observed under the temperature fluctuations in the limits of 20-30°, which are possible in July-August.

4. The study of the dynamics of the development of the disease indicated, that the first spots of Cercospora appear in a limited amount, and the development of the infection occurs, mainly, at the expense of the secondary infection in July-August. Under the conditions of combining the optimal factors: temperature of 15-30° and of frequent rains which cause the formation of spore and their spreading, the outbreak of the disease are observed.

5. In connection with the dynamics of the development of cercospora in USSR and with the phenology of the sugar beet growth (early death of the first leaves and their intensive growth in July and in the first half of August), it is not necessary to spray the sugar beets for the control of the disease before the appearance of the first spots, the real source of infection. In controlling cercospora, 2-3 sprayings are sufficient which are carried out according to the development of the disease and according to meteorological factors. The first treatment of the sugar beets with mordants should be carried out after the appearance of single spots of the disease upon the lower leaves, and the second and the succeeding treatments 10-12 days after the first treatment. Both the first and the succeeding treatments of sugar beets with mordants are carried out after water fall. During dry, hot weather spraying should not be done.

6. The analysis of the sugar beet infestation by cercospora in sugar beet zones of the Union, by comparing their meteorological factors, enables to specify three groups of raions, according to the degree of their infestation by cercospora. To the first group of a constant and harmful development of the diseases belong: Krasnodarsk krai, Ussurii oblast' and Khashur raion of Georgian SSR. To the second group of raions - of unsteady and slightly

harmful significance of the disease - belong all the sugar beet sowing raions of Ukrainian SSR and the "Southern part of Voronezh oblast'. To the third group of raion - a slow development of the disease without any harmful significance - belong: Kirgizia, Kazakhstan, Altai krai and new Northern and Eastern raions of sugar beet sowings.

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