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an annual report (ten pages, English) of a Polish research project entitled, "Studies in the Development of Improved Strains of Parasites of Forest Insects" which is being conducted at the College of Agriculture at Poznan under the direction of Dr Alfred Szmidt. The period covered is 1 Jan - 31 Dec 62. CONFIDENTIAL 7

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STUDIES IN THE DEVELOPMENT OF IMPROVED
STRAINS OF PARASITES OF FOREST
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Report period: from January 1.1962 to December 31.1962.

annual report no. 2.

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S U M M A R Y

In the annual report No. 1 the general problems and the attempts to receive improved strains of various parasitic insects undertaken in past were discussed.

Such possibilities are studied in the reported period in case of Hahloboginus fuscipennis Zett. and Dirhionus albopunctatus Ratz., two parasitic hymenopterans attacking several forest insect pests.

As regards D. fuscipennis the studies on the level of biotic activity of several pure lines, that had been collected in different areas, have been completed. These studies showed that there is distinct differentiation of biotic activity in different strains and that the most effective appeared to be the strains Nos.: VI, IX, XI, and without promise strains Nos.: V and VII.

It should be emphasized that especially the fecundity of pure lines inbred for 10 to 14 generations decreased very distinctly. The crossing of several pure strains of D. fuscipennis was continued.

As regards D. albopunctatus the studies on longevity of the pure strains were completed. In this respect the most effective appeared to be the strains Nos.: II and VIII. Until the present day the numbers of females of this parasite tested on biotic activity increased to 1500 and the general numbers of progeny obtained from these females increased to 70.000.

The general practical conclusions are:

1. it is possible to obtain any required number of both studied species of parasites at any date.
2. the rearing of pure strains inbred for a long time is not acceptable.
3. probably by crossing of lines with the positive features it would be possible to receive a strain with ideal features for use in biological control.

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Detailed ReportIntroduction.

In the period from 3.III. to 31.XII.1962 special interest was given to the D.fuscipennis. The work on second species D.albeannulatus was in beginning stage because the collecting of this parasite was possible in winter 1961-1962.

Studies made on pure lines of D.fuscipennis in the reported period showed that there is distinct differentiation of biotic activity in different strains.

It was found that the progeny of all crossed strains of both parasites is fertile.

The preliminary investigations on D.fuscipennis showed that vitality of progeny of crossed lines increased in F_1 and F_2 .

As regards D.albeannulatus in several experiments it was found that this parasite had natural and unnatural insect hosts. As a basis for studies on biotic activity of this parasite the average quantitative relation between females and males, average fecundity of females, length of development of one generation, have been studied.

Experimental procedures.

The several thousands cocoons of Diprion spp. Gilpinia spp. and pupae of Panolis flammea Schiff. were collected in different areas as in the previous periods.

The host-pupae were dissected in order to find the new pure strains of D.albeannulatus because during hibernation /1961-62 / some studied pure strains of this parasite became exterminated.

Host - cocoons and host - pupae were segregated and then used for rearing of parasites, according to the same methods as in the past year.

The same concerned the criterions and methods of rearing D.fuscipennis and D.albeannulatus, at the studies on biotic activity of separate pure and crossed strains of both species of these parasites.

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Results

In the reported period the characteristics of forest-biotops were made in which the separate pure strains of *D. albopunctatus* and *D. fuscipennis* were collected. These characteristics made according to the rules applied in the forest studies concerned the following data: type of forest localities, quality of soil, age of stand, composition of stands, bottom etc.

As regards *D. fuscipennis* the studies on pure lines of this parasite have been completed. The biotic activity of separate pure strains is shown in the Table 1. The number of specimens tested in each of 11 strains was: 1000 of females on longevity, 500 of females and 1500 of cocoons on average number of parasitized thin-walled cocoons by 1 female, 600 of females and 600 of thick-walled cocoons on percentage of parasitization, 500 of females on searching capacity and 500 of females on fecundity. The premissing value of each strain was characterized by a sum of points of all five studied features /Table 1/. The lowest number of points was assigned for the life longevity of females /11 points for the first place, 10 points for the second, etc./ the highest number of points for the average fecundity of females /15 points for the first place, 14 for the second, etc./. Such analysis of premissing value showed that most valuable strains are: VI, IX, XI and with low value are: V, VIII, X, VII.

In the preliminary studies on pure lines of this parasite the decrease of activity of pure lines inbred for about 4-5 generations was not observed. Therefore now the comparing of the average fecundity of 200 females from the generation 1 to 4 and of 200 females from the generations 10 to 14 showed that the fecundity of pure lines inbred for a long time decreased very distinctly /Table 2/.

During the reported period the crossing of several pure strains of *D. fuscipennis* was continued. The biotic activity of progeny received as results of cross-mating of various pure lines was studied. For example until the present day the number of females tested on longevity increased: strains I x III to 820, I x IX to 629, I x VI to 581, II x IX to 831 and strains III x to 809.

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Strain Number	Average longevity of females /in days/	Average number of parasitized thin-walled cocoons by 1 female	Parasitization of thick-walled cocoons %	Searching capacity %	Average fecundity of 1 female /in points/	The remaining value of strains
I	7,59	1,20	41,69	36,11	44,03	44
II	6,04	1,29	45,36	47,95	45,05	47
III	7,17	0,86	42,86	55,56	32,77	39
IV	6,97	1,16	46,65	40,15	39,29	44
V	6,80	1,07	35,79	30,88	41,06	30
VI	6,49	1,28	43,70	37,31	48,77	48
VII	6,73	1,06	35,23	33,82	38,56	26
VIII	6,42	1,18	28,45	39,26	46,53	30
IX	6,46	1,29	40,94	40,58	47,90	48
X	6,44	1,13	40,09	32,85	44,29	30
XI	6,66	1,23	54,11	63,42	40,75	50

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Table 2.

Number of strain	Fecundity of 200 females		Remarks
	Generation I to 4	Generation IO to I4	
I	11.115	5784	
II	11.268	6479	
III	8.683	4658	
IV	8.571	6457	
V	10.053	5821	
VI	11.288	7958	
VII	9.592	5569	
VIII	10.844	7313	
IX	13.050	5541	

However because of insufficient number of repetitions it is too early to indicate crossing of which pure lines will give the most prominent progeny.

As regards D. albannulatus during the reported period of our investigations studies on longevity and fecundity of pure lines were made.

The 1000 of females tested on longevity in each of the strain showed that there are the distinct differences between the average longevity of one female in separate pure lines. / Table 3 /

Table 3

Number of strain	Average longevity of one female (in days)	Remarks
I	5,73	
II	7,30	
III	5,43	
IV	5,25	
VI	5,21	
VIII	7,13	
IX	6,12	

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Until the present day the numbers of females tested on fecundity and numbers of progeny obtained from these females are shown in the. /Table 4/

Table 4.

Number of strain	Number of females tested	Number of progeny	Remarks
I	200	10.985	
II	200	12.352	
III	200	11.658	
IV	200	8.293	
VI	200	7.344	
VIII	250	12.432	
IX	250	11.888	

Because of insufficient number on females tested on fecundity and other criterions, it is difficult to say now which strains belong to the most effective ones.

The preliminary investigations on cross-breeding of different strains of D. albannulatus showed that the progeny is fertile.

Discussion

Although the studies made up to day on D. fuscipennis and D. albannulatus are not complete it seems that some of results are of important value for development of improved strains of these parasites.

It may be emphasized that the various strains from various areas differ significantly in biotic activity and only the effective ones can be recommended for biological control.

Besides, the activity of pure lines inbred for more than 10 generations decreased very distinctly. Although the crossing of pure lines inbred for a long time showed that biotic activity of their progeny has increased, whether this phenomenon will disappear after some generations, will be found in the future investigations based on the comparing of activity of crossed lines and pure lines.

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Only by further selection and crossing of best positive lines it will be possible to obtain the improved strains .
 Some difficulties have been stated during the studies on D. albopunctatus. Namely during the hibernation of the larval-stages of this parasite some of pure lines become exterminated. Therefore it is necessary to collect some new strains in the field and to begin the new investigations on them.
 The special experiments to explain the conditions of hibernation of D. albopunctatus were established.

Another difficulty in our investigations is connected with the lack of sufficient number of pupae and cocoons of host insects which didnot appear in mass number in Poland during reported period.

C o n c l u s i o n s

Based on the studies made on some points on biology and ecology of D. fuscipennis and D. albopunctatus the methods of mass rearing of these parasites were worked out. Only the conditions of positive hibernation of D. albopunctatus are to be explained .

The completed investigations on pure strains of D. fuscipennis have shown the distinct differentiation in activity various lines. The most effective lines of this parasite are strains Nos. VI , IX, XI and they may be recommended for use in biological control of sawflies.
 Apart of that the studies on pure lines that inbreeding for about 4-6 generations did not cause any decrease of biotic activity. However after 10-14 generations the activity of these lines , especially the fecundity of females , decreased very distinctly.

The crossing of several pure lines of both parasites was continued. The studies on progeny of cross-mated strains of D. fuscipennis has indicated that it is possible to increase the biotic activity of parasite by this method. This last conclusion must be, however, verified by additional experiments.

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~~PLANNED FUTURE work~~

The plan for the next year of our investigations includes completing and starting of the following problems :

- 1/ Completing of studies on biotic activity of pure lines of D. albannulatus in order to find what strains are most effective.
- 2/ Completing of crossing of most active strains of D. fuscipennis. Starting to cross the most active strains of D. albannulatus. It must be also cleared by laboratory rearing of few generations of parasite whether such positive features will be inherited or shall disappear as effect of heterozy.
- 3/ Obtaining in laboratory rearing of several thousands of parasites that will be used for preliminary introduction and checking of efficacy under natural conditions.
- 4/ Collecting of few thousands of host-pupae and host-ecceens for further laboratory rearing of both parasites.

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