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ROTHAMSTED RESEARCH

Report for 1948

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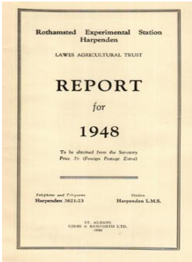
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Entomology Department

C. B. Williams

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ENTOMOLOGY DEPARTMENT

By C. B. Williams

During this period we have lost Dr. A. C. Evans who has gone to the Overseas Food Corporation in East Africa and Mr. W. J. Mc.L. Guild who took up an appointment at the University of Edinburgh. In addition Mr. S. N. Banerjee has returned to India after having been awarded the degree of Ph.D. at London University. Dr. F. Raw was appointed in August 1948 to replace Dr. A. C. Evans, and in May 1948 Mr. L. R. Taylor was appointed as an assistant Experimental Officer. Dr. H. F. Barnes represented the Experimental Station at the 9th International Congress of Entomology in Stockholm in August 1948.

Insect Ecology

Dr. Williams has continued his work on insect migration, on the relation of insects to weather conditions, and on the relative abundance of insects in wild populations.

During 1948 there was very little insect movement into this country from abroad, after very widespread immigration in 1947. There were no extended movements of *P. gamma* or of the Cabbage-White Butterfly (*P. brassicæ*), and damage done by these two pests was negligible. Records of insect migration continued to come in from all parts of the world.

During 1948 three light traps were in use continuously, including two that were working in 1947 and one new one in the garden at Rothamsted Lodge. The latter has turned out to be a very good location and large numbers of insects have been captured. The work on analysis of the relation of catches to weather conditions is proceeding.

The Lepidoptera in the light trap are being used also for the study of the structure of mixed insect populations, and the relative abundance of species. We now have one trap (A) with 7 years' catches (4 before the war and 3 since)—and three other traps for 3, 2 and 1 year, making a total of 13 trap years. The total number of Lepidoptera identified is about 60,000 belonging to 320 species. The frequency distribution, which follows closely to the logarithmic series is small samples, shows more indication of fitting to a log-normal distribution in large samples.

Many of the mathematical properties of the frequency distribution of insect species have been shown to apply to the distribution of plants.

Gall Midges

Dr. Barnes reports that this long-term study of the incidence of the two wheat blossom midges on Broadbalk was carried out for the twenty-second successive year. The predicted fall in total numbers of larvæ of both species continued as shown by the figures 33,491, 21,693 and 15,417 larvæ per 500 ears for the years 1946, 1947 and 1948. The corresponding grain infestations were 26·6%, 15·4% and 14·7%. When the two species involved are considered separately, it is seen that *C. tritici* numbers fell for the second successive year, while those of *S. mosellana* increased considerably.

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This increase was sufficient almost to maintain the percentage infestation by both species in spite of there being considerably more grain available for attack (per 500 ears) than in 1947. It should be remembered that *S. mosellana* larvæ are almost solitary whereas those of *C. tritici* are gregarious. It is thought that in 1949 or 1950 the numbers of these two midges will be at their lowest for the cycle and thereafter a rise in numbers will take place.

The year 1948 was a better year for the emergence of *S. mosellana* in the insectary than was 1947. More midges emerged from samples of larvæ collected in 1939, 1940, 1944, 1945 and 1946 than emerged from these samples in 1947; for example, twice as many emerged in 1948 from the 1945 samples and more than six times as many from the 1946 samples as in 1947. The emergences from the 1939 samples showed that under these conditions *S. mosellana* larvæ can stay nine winters after leaving the wheat ears before emerging as midges.

Dr. Barnes was successful in finding the larvæ of what must be the true *Contarinia nasturtii* Kieffer, popularly called the Swede Midge, infesting the flowers of one of its original wild host plants, *Rorippa amphibia*, at Bedford. He was successful in rearing the midges both from these flowers and similar ones obtained in Holland. He is attempting to build up a stock of these midges in order to try to establish whether the true *C. nasturtii* will, besides infesting the blossom buds of wild *Rorippa* and *Nasturtium* spp., cause leaf damage, (e.g. 'many-necked' and 'crumple-leaf' condition of swedes) on *Brassica* spp. It has been generally accepted in England that *C. nasturtii* does leaf damage to *Brassica*, but continental authorities maintain that a distinct species is involved. This problem was discussed thoroughly with the Dutch authorities during a visit to Holland in April, and with Danish and Swedish authorities during Dr. Barnes' visit to Denmark and Sweden in August. It is to be hoped that Dr. Barnes will soon be able to settle this point and also the further one concerning the possibility of the midge involved in the leaf damage being also responsible for *Brassica* flower damage.

Immunity and preference trials showed that the gall midge *Wachtliella ericina* F. Loew will only attack *Erica carnea* and its varieties and will not attack other species of ornamental heathers.

Dr. Barnes's investigations on the activities of garden slugs continued in Bedford during the year.

Vol. III of *Gall Midges of Economic Importance*, that concerned with the gall midges of Fruit was published on March 31st, 1948, while Vol. IV that dealing with the gall midges of Ornamental Plants and Shrubs was issued on January 10th, 1949.

Dr. Barnes visited entomological research and advisory centres in Holland during a visit during April 1948 and officially attended the VIIIth Entomological Conference in Stockholm in August. He read a paper on the necessity for biological investigations in the identification of gall midges at this Congress. He also spent an afternoon at the headquarters of the plant pathological service at Lyngby, Denmark, on his way to Stockholm and a day at the south Swedish substation at Lund on his way back. These visits are of material help to his investigations and he was able to make or renew several important contacts with many entomologists.

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Aphis Fabae AND INSECT DRIFT

Dr. Johnson reports as follows:—

Work at Cardington

Identification of the aphids caught during the season of 1947 is now complete, and work is being done on the analysis of the factors affecting their distribution at various altitudes.

In 1948 the procedure adopted at Cardington was changed, and instead of long continuous periods of flying, the day was split up into two-hourly periods in order to see to what extent population changes occur in the atmosphere during the course of a day and night.

It has been found that, broadly speaking, the population of the upper air does not reach any considerable density until towards the middle of the day, and that towards the evening this density diminishes, so that very little aphid activity exists during the night and early morning. This rhythm extends up to all heights we have so far investigated, viz. to 2,000 feet.

The activity of aphids at crop level

The activity of aphids at crop level, which is at the source of supply of aphids to the upper atmosphere, has also been investigated, and it has been found that there is a similar diurnal rhythm during the course of the day, with practically no aphid activity during the hours of darkness. The effect of climatic factors on this diurnal activity and nocturnal inactivity was also investigated during 1948, and is now in process of being worked out statistically.

The effect of wind direction on the pattern of infestation of black aphids on the bean crop

In the spring of 1948 the migration from the winter hosts to the bean crop of *Aphis fabæ* was followed in three ways:—

(a) By watching the rate of departure from the winter host
(b) By watching the rate of infestation of a small pilot bean crop by winged migrants
(c) By means of traps around the main bean crop.

In this way the peak migration periods were determined and wind directions were taken over the same period.

On two subsequent occasions, some weeks after this migration, the pattern of infestation around the edge of the bean crop on Great Field was made. This showed that during the first third of the primary migration, when the wind was in the north, an excess of aphids was found along the margin exposed to the wind. Later on, when the wind changed to the east, this resulted in a greater density of infestation becoming evident finally along the opposite margin. On the whole however, the wind was mainly from the north east, and it was on the north-east margin that the greatest infestation occurred. Infestation on the south-west margin, away from the wind, was very slight.

The effect of infestation of fabae *on the bean crop*

A small crop of beans was planted in the Lodge garden and alternate bean plants were kept free from Aphis by handpicking. Subsequently the crop was harvested, stem heights measured, weights and numbers of beans determined—with the object of assessing quantitatively the effect of an infestation on the output

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of the crop. This work is still being pursued, but it can be said at the moment that the infested crop produced over 6½ lb. while the uninfested crop produced 14 lb., a difference of approximately 53 per cent. It may be mentioned that the infestation was but moderate and did not destroy any plant.

The development of suction traps

A comparison of the performance of suction traps, sticky traps, and nets has been made, and it has been found that both nets and sticky traps are so greatly influenced by the wind, particularly at speeds under 5 m.p.h., that large errors are likely with these traps.

A special type of suction trap has been devised, which segregates the catch according to 24 periods during the day and the night. It is hoped that by the use of these traps a more accurate picture of populations and activity changes will be possible than has hitherto been the case with the recognised methods of sticky traps and nets.

The fact that suction traps are independent of wind speed over the range of wind speeds 0–6 m.p.h. is very significant, in view of the fact that it is at these wind speeds that most aphid flight takes place.

Translation

The translation of a large key to aphid genera and species by the Russian entomologist, A. Mordvilko, is being made in collaboration with Dr. E. Judenko.