

BRITISH COLUMBIA ENTOMOLOGICAL SOCIETY.

PROCEEDINGS, 1920.

THE ONION-MAGGOT.

BY R. C. TREHERNE, ENTOMOLOGIST IN CHARGE FOR B.C. DOMINION
DEPARTMENT OF AGRICULTURE, AND M. H. RUHMAN,
ASSISTANT PROVINCIAL ENTOMOLOGIST.



A GREAT deal of conflicting evidence is before us on the control of this injurious insect. Even now after one year's concentrated study of this insect at Vernon in the "Dry Belt," where it is yearly assuming greater importance, and after two years' observations on its general activities and habits in that district, we are unable to claim to have devised a scheme for control which completely satisfies us. Our investigations have led us along definite channels which may result in something definite after a while.

In glancing over the literature on this insect we find the following suggestions for its control:—

"Liberal amounts of tobacco-dust." (O'Kane.)

"Clean up and burn refuse after harvest." (Sanborn, Oklahoma.)

"Rotation of crop, destroy infested plants, and apply carbolic-acid emulsion to soil." (Conradi, South Carolina.)

"Destroy refuse, wild mustards, and cruciferous weeds; rotate crops; fertilizers; frequent surface cultivation; tobacco-dust and sulphur in drill-rows with seed; hellebore; and slaked lime as a dust to the soil. (Lovett, Oregon.)

"Cultural control measures and use of trap-crops with deterrents of sand and kerosene, carbolized lime, charcoal, hellebore, tobacco-dust, and dry lime." (Britton, Connecticut.)

"Control by repellents and fertilizers; take up infested bulbs and destroy." (Pettit, Michigan.)

These suggestions for control are representative of the remedial measures adopted for this fly until about the year 1913. During 1913, 1914, and 1915 the poisoned-bait method for control was devised and used extensively in Eastern United States. Eastern Canada has also used this new method with great success. In brief, the recommendation called for the use of 5 grammes of sodium arsenite dissolved in $\frac{1}{2}$ pint of molasses and water. This mixture was applied to the fields of onions as soon as the onions were up in about two applications a week until the latter part of June. It was either whisked out of a bucket across or in the rows of onions or it was sprayed in coarse drops from a hand-sprayer. The object

to be attained was briefly to induce the female flies to feed upon the poisoned liquid from the drops that fell either on the soil, or on the onion foliage, or on the foliage of weeds and grass growing alongside the fields. In this way the flies would be killed and the first generation of maggots would be prevented. Later on, owing to the labour involved in this operation of spraying, ordinary pie-dishes were used at the rate of from twenty to forty to the acre, with a quantity of the same poisoned liquid in each dish. At the present time it is my understanding, although there are few published records of the work, that both the spray method and the pie-dish method are employed by onion-growers in Eastern Canada and Eastern United States.

In order to test the efficacy of the treatment in British Columbia, steps were taken in 1918 and in 1919 to run a series of experiments. Since the summer of 1914 the annual losses suffered by onion-growers through the work of the onion-maggot have been gradually increasing in severity. In the spring of 1918 several growers evinced the desire to take steps to effect control. Unfortunately, the Entomological Branch, at this time, were unable to undertake any definite control measures or to study the life-history owing to pressure of other work. The growers were advised on the method of using the sodium-arsenite and molasses bait. The pie-dish method of using the bait was suggested, for the reason that it was felt that the spreading of the bait in coarse drops of spray would not suit our conditions in the Okanagan.

Accordingly, two fairly large onion-growers set out twenty pie-dishes to the acre, using the bait consisting of $\frac{1}{4}$ oz. of sodium arsenite and $\frac{1}{4}$ pint of molasses to a gallon of water, and starting them going about the end of April. These pie-dishes were maintained during May and until June 14th, after which time they were allowed to dry for a month, being renewed for a few weeks in July. On June 14th, at the suggestion of these growers, an examination of the onion plantations was made, and advice was further requested as to how to save the plantation which was severely injured by maggots. Examination revealed the fact that the onions were heavily infested despite the use of the baits over the period mentioned. The growers had made an honest endeavour to retain moisture in the pie-dishes, but it was a difficult matter owing to the rapid evaporation. Dishes filled at noon were found to be absolutely dry by 3 o'clock in the afternoon. Fresh water at the rate of $1\frac{1}{2}$ pints to each dish was added daily, and once a week a fresh solution of bait was made up and poured into the dishes. Close examination of the fields on June 14th showed that very few unhatched eggs were present and that few flies were in evidence flying over the plantations. The onions had been thinned in May by hand, but despite this fact it was evident that a heavy loss from the maggot was to be anticipated. Judging from the conditions, it would appear that the point of heaviest infestation had been reached; it was therefore suggested that the crop be rethinned and that all infested onions be pulled up and burnt. One grower with 8 acres of onions arranged in two blocks, 5 and 3 acres each,

separated by 100 yards of an alfalfa-field, objected to the process of rethinning owing to the increased cost. He was prevailed upon, however, to do the rethinning on 5 acres, leaving the remaining 3 acres untouched. The results of this work were most surprising. The rethinned 5 acres yielded a crop at the end of the year of 25 tons to the acre, while the untouched 3 acres produced a total of 900 lb.

At the close of the year the statement was made in our annual report that results from the use of the poisoned bait had been unsatisfactory, but that the bait was still believed to be satisfactory. It seemed essentially necessary, however, to conduct a close study of the life-history of the fly in order to correlate its habits with the use of the bait. The onion-growers, further, were very anxious to obtain more information leading towards control; hence it was decided to include the study of this fly in the outline of experiments for 1919.

In 1919 an extensive experiment with the use of sodium-arsenite and molasses bait ($\frac{1}{4}$ oz. to $\frac{1}{4}$ pint) was carried on at Vernon. Specially constructed cans were made, filled with water, which allowed a certain quantity of water to filter down on to felt pads arranged in trays. The felt pads, having been soaked in the bait and a few ounces of the poisoned liquid poured over them, retained their moisture for four to ten days under all temperatures. Twenty of such bait-cans were placed to the acre between the rows of onions and $2\frac{1}{2}$ acres in an 8-acre field in all were treated in this experiment. The bait-cans were set on May 14th, five days before any eggs were laid in the field, and they were maintained continuously until the end of June, and again during the first two weeks in August.

Samples of the poisoned liquid were taken two or three times a week from the trays and fed to flies. The adults were observed to be in distress within five minutes of actual feeding and were completely stupefied in thirty minutes, and this condition prevailed throughout, despite frequent dilutions from rain and from the water in the reservoirs above the felt pads. Flies left to their own devices in the laboratory in the presence of drops of poisoned bait gave a 100-per-cent. mortality in less than twenty-four hours. Circular fly-traps arranged in the field, each baited with different essential oils and mixtures, undoubtedly showed that molasses was the most suitable substance to attract the flies. Despite these two favourable circumstances, we are unable to claim that the poisoned-bait method is a satisfactory control under such field conditions as prevailed at Vernon, B.C., in 1919. Oviposition took place on seedling onions and on volunteer onions (from the crop of the previous year) in such numbers that it was impossible to state that the poison bait had any effect in checking oviposition. In several instances volunteer onions gave as many as 500 eggs to the plant during May and June.

The influence of a suitable type of volunteer onions as a trap-crop for the first generation presents a phase of onion-maggot control that must be regarded very highly. In the 8-acre experiment of 1919 a number of sections of onion-seedling rows were examined daily for oviposition, and it may be stated that there was no material difference in oviposition in the

baited area or in the non-baited area. Further, there was no indication that the maggot attack was more severe in any one part of the field over any other.

The first male flies appeared in the field on May 10th; the first females a few days later. The height of the oviposition period was not passed until June 6th. Eggs were laid in the field on May 19th, and continually from this date until August. The length of the larval period varied from sixteen to twenty-nine days and the pupal period from fourteen to twenty-six days. The earliest pupa formed was found on June 14th. Second-generation adults appeared on July 7th. The first generation of flies extended over a period between May 10th and July 7th; the second generation until August 23rd, after which time third-generation flies might be expected. Two generations occur and doubtless a third, but the life-history notes on the last generation have not been obtained with accuracy. A great many notes have been obtained on the habits of the fly and particular attention has been paid to temperatures and weather conditions.

OBSERVATIONS ON THE CONTROL OF THE ONION-MAGGOT (*HYLEMYIA ANTIGUA*).

BY M. H. RUHMAN.

Onions have been extensively grown in British Columbia for a number of years, particularly in the Okanagan Valley. In the year 1914 growers began to complain that cutworms were destroying their young plants. On investigation it was found that the onion-maggot was present and responsible for most of the trouble. This was most evident in small kitchen-gardens, the large commercial plantings not suffering sufficiently to attract attention. The few short gaps that did occur in the rows of onions were attributed to faulty seeding or cutworms. In the year 1915 growers began to get alarmed, as extensive injury was being done by the onion-maggot. The recommendations for control—i.e., the removal of infested plants in the middle of June and their destruction by boiling or burning, and the destruction after harvest of onion-tops and undersized onions, usually left on the field to be ploughed under—did not appeal to them and comparatively little was done to control the pest. The onion-maggot has now become so serious a menace that control measures must be undertaken or the growing of onions commercially must soon be discontinued.

The adult of the onion-maggot is a fly somewhat resembling the common house-fly, a little smaller and more slender, but with proportionally larger wings, and is grey in colour. The life-history of the fly in British Columbia is not well known; the insect passes the winter in the pupal stage in the ground and occasionally in stored onions, in which they may have pupated. The adult fly emerges in the spring; the earliest Canadian record is of an adult captured in the third week in May at Ottawa (1). The number of eggs laid at one deposition may vary from