

The potato and tomato leaf-looping caterpillars (*Plusia chalcites*) does a considerable amount of damage to potato and tomato crops and numbers of these were collected and used in the comparative poisoning tests between acid lead arsenate, basic lead arsenate, and calcium arsenate. These caterpillars can be bred very easily in the laboratory in large numbers and will be the main insects used during the winter in the arsenate tests.

The arsenates will be tested out in the laboratory in the early spring against larvæ of the codlin-moth. It was hoped to do this sooner, but the larvæ which have been collected show no signs of pupating yet.

The effects of the different arsenates on the white butterfly (*Pieris rapæ*) will also be closely studied in the winter months. Arrangements are in hand for breeding up sufficient numbers of these insects for the tests. One of the great difficulties in applying sprays to Brassicas is to get them to stick and spread evenly. A special study is to be made of this.

Up to the present time no outstanding differences can be detected in the effects of the three commercial arsenates, but the evidence is not yet sufficient to be conclusive.

Experiments have been carried out in the field on the effects spreading and sticking powers of the three types of arsenates on the fruit and foliage of orchard-trees. Calcium arsenate by itself appears to damage fruit and foliage severely and the effects of adding lime and ferrous sulphate to the spray have been studied. The great virtue of calcium arsenate is that it is cheaper than any of the other arsenates.

All the arsenate experiments are being carried out in conjunction with field tests conducted by the Orchard Instructor at the Plant Research Station and in conjunction with chemical work being conducted at the Dominion Laboratory in Wellington.

RED MITE.

The life-history of the red mite has been completed. A study of material from the orchard-growing areas of New Zealand has shown that there are two mites hitherto included in the category "red mite." These are *Paratetranychus pilosus* and *Bryobia pratiosa*. Of these the former is by far the more important, and causes most of the damage ascribed to red mite. The distribution and hosts of *Paratetranychus pilosus* have been studied. The life-cycle from the hatching of the egg to the adult occupies ten to fourteen days. Overwintering eggs are laid as early as February and the bulk of winter egg-laying is over in a comparatively short time.

The main points studied in this life-history have been: (1) Life-cycle of female; (2) life-cycle of male; (3) numbers of eggs laid by one individual; (4) length of life of adults; (5) summer and winter eggs; (6) incubation period of eggs; (7) habits of adults; (8) methods of spread; (9) Natural enemies; (10) distribution and hosts.

A detailed account of the red mite in New Zealand will be prepared as soon as the identification of the natural enemies is received from the Imperial Institute of Entomology in London.

GRASS-GRUB.

The season's work with the "Orach" plant which was claimed to be very attractive to the grass-grub beetle has shown that it is useless from the control point of view. Further experiments are being conducted with the arsenate-of-lead treatment on turf against the larvæ of the grass-grub. It seems reasonable to suppose that $\frac{1}{2}$ in. of arsenate-poisoned turf will be sufficient to kill the grass-grub instead of 2 in. to 3 in. as hitherto used in these experiments. This new set of experiments will mean the broadcasting by suitable means of about 5 lb. of acid arsenate of lead powder per 1,000 square feet of existing turf. Experiments on grass-grub control are also being conducted in conjunction with the greens research scheme of the Golfing Association.

CODLIN MOTH.

During the 1931-32 season a study of the seasonal history of the codlin moth mainly by the use of bait traps was made. It has been debated for a long time as to whether an arsenate spray is necessary at the calyx stage. The general impression is that in most seasons it is unnecessary, but that there are seasons in which it should be applied. Up to the present the orchardist has had no reliable means of deciding whether he should spray at the calyx stage. The use of an attractive bait, however, such as fermenting molasses makes it possible to do this. Sixteen bait traps containing molasses and yeast have been distributed over four fairly widely separated and previously neglected orchards in Palmerston North and records were made every four days of the insects caught. Counts of fruit sprayed at the calyx stage only, others unsprayed during the season, and others sprayed regularly except at the calyx stage, have shown that calyx-infection is very small. Unfortunately, the bait-pans were not put out until towards the end of November, so that there is no evidence from this source as to the prevalence of the moth at the calyx stage. By the end of February there was very little moth about, and this is in accordance with observations made in the field. It should be possible to rely on these baits to indicate the prevalence of the codlin moth, and if spraying is done within ten days of the appearance of the first moth then doubt as to whether the calyx spray should be applied or not would be dispelled. Information is also obtained as to how late in the season spraying should be continued. It is considered that the bait traps are useless from the point of view of lessening the number of moths, but, on the other hand, their use as indicators when to spray would be very useful to the orchardist.

BOTANY SECTION.

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1. ROUTINE WORK.

(a) *Identification of Specimens and Advice thereon.*—In my previous report I mentioned that this work had steadily increased since I assumed office. This year also very full advantage has been taken of the facilities offered by the section. There has been a very pleasing improvement in the quality of the specimens sent in, favouring accurate and prompt identification. It is evident that field officers of the Department of Agriculture are taking a lively interest in the weed flora of their districts. Apart from these and officers of other Government Departments, many farmers and other private individuals have sent in specimens. A pleasing feature has been the increased advantage taken by commercial firms of this service. A considerable number of specimens of indigenous plants have been sent in, indicating an increasing interest in our flora.

Under the inspiration of its President, the New Zealand Junior Red Cross instituted a "Grassland knowledge" competition. Widespread interest was taken, and entries were received from all parts of the Dominion. The collections were named and judged and returned to the competitors. The considerable amount