

CAMOUFLAGE

Advice on botanical aspects was given to the Army authorities. Experiments on fire-proofing manuka and other material yielded a method that gave very satisfactory results.

ENTOMOLOGY DIVISION, NELSON

Director: Dr. D. MILLER

DIAMOND-BACK MOTH (*PLUTELLA MACULIPENNIS*)

Completion of field surveys of cruciferous crops throughout the Manawatu, Rangitikei, Hawke's Bay, and Masterton areas in the North Island, and Marlborough, Kaikoura, North and South Canterbury, and as far south as the Taieri Plains in the South Island, show that, over the whole of the area covered, both species of parasites (*Angitia cerophaga* and *Diadromus collaris*) are well established and for the most part are exercising a very good control over the diamond-back moth.

Details of the survey have yet to be completed, but it can be said that the degree of control attained in the North Island has this year, at any rate, reached a high peak of efficiency. The survey in the South Island, however, while a good control of the moth is revealed, shows that the same degree of success has not yet been reached as in the North. The explanation of this difference at the present time is perhaps the fact that the parasite liberations commenced two years earlier in the North than they did in the South Island. With our present knowledge of the position, however, there does not appear to be any reason why control should not eventually reach the same degree of perfection in both Islands. This feature will be elucidated by the future annual surveys.

The above facts are in relation to farmers' crops and do not refer to the home garden, where cruciferous crops grown for home consumption require a greater degree of protection from insect attack, and where insecticides must be used.

Consignments of *Diadromus collaris* have been sent to the Government Entomologist at Suva for use against the diamond-back moth in Fiji.

COCKSFOOT STEM-BORER (*GLYPHIPTERYX ACHYLOESSA*)

Considerable progress has been made with the researches into the biology of this insect, the larvæ of which extensively infest the stems of cocksfoot in the seed producing areas and elsewhere in New Zealand. As far as can be ascertained, the insect is a native species. Apart from cocksfoot, other hosts include four species of native grasses (two of which are the hard and silver tussocks), nine introduced grasses, and, to a small extent, wheat.

The infestation of a cocksfoot crop varies according to the locality in which it is grown and the age of the area. In Ashburton and Banks Peninsula very high infestations are found in the old areas, showing a percentage of 50 to over 70. In Rangiora, where the areas are more scattered and younger, the maximum infestation was 37 per cent., whereas in Timaru the highest infestation found in a sampled field was 16 per cent. On the whole young stands were found to be more lightly infested in comparison with the older ones. In Eiffelton a young paddock was sampled in 1943 and again, using the same method, in 1944, when the infestation was found to have increased from 12 per cent. to 29 per cent. A twelve-year-old area was also sampled and the infestation in 1943 was 86 per cent., while in 1944 it had dropped to 62 per cent. This drop in the older paddock may have been due to variation in climatic conditions at the time that the moth was active.

The moths are on the wing during September and until November, and place their eggs on the blades of cocksfoot near the base of the plants. The incubation period is from nineteen to twenty-two days. Though some of the young larvæ enter directly into the cocksfoot stems, most of them first burrow in the supporting tissues, thus cutting the majority of the scattered vascular bundles. This encirclement of the stems is the cause of injury to the seed-head, the heads of damaged stems often assuming a whitish appearance.

After encirclement is complete, the larvæ enter the hollow interior, where the remainder of the cycle is completed. At first most of the larvæ migrate upwards, and then descend when the cocksfoot ripens. During autumn, 75 per cent. of the larvæ were found below the crown in the underground tiller of the plants. Later, in winter and early spring, they again ascend, and pupation commences during July.

Experiments are being carried out with the object of ascertaining whether any measure of control can be secured by cutting the stubble at varying heights at different times of the year. Inquiries overseas have failed to secure any data on parasites that might be of use against the cocksfoot stem-borer.

CHEESE-MITES RESEARCH

The survey of cheese-mites in cheese-factories has brought to light additional information. It has been found that the constitution of mite colonies differs specifically in different factories. As the species differ in their physical reactions, information is being sought on the factors determining the incidence of each species. These observations are being carried out both in the factory and laboratory. The morphological taxonomic characters of all stages of each species have been studied, together with the duration of development of each stage of each species. These data are fundamental in the application of control measures.

The control of cheese-mites and the protection of cheese against them has been investigated. In this the influence of waxes, dusts, and fumigants has been studied. The experiments with waxes and dusts have shown that a measure of control and protection can be secured. In regard to fumigants, these have given promising results under some conditions.

The fumigants experimented with were ammonia, carbon dioxide, methyl bromide, and dichloroethyl ether. The first two proved unsuitable. Methyl bromide was found to be effective, but has certain disadvantages, and in searching for other substances it was decided to try dichloroethyl ether.

Though this substance has been experimented with as an insecticide against wireworms, woolly aphis, and as a glasshouse fumigant, it had never, until the present occasion, been used as an acaricide. The results of the experiment have been extremely satisfactory so far, in that the dichloroethyl ether has been found to be highly toxic to the common cheese-mite, *Tyroglyphus siro*, even at extremely low concentrations. For example, a concentration of 0.046 lb. per 1,000 cubic feet of air space gave 100 per cent. kill of the mites after twenty-four hours' exposure at 70° F. and 80 per cent. relative humidity. It was also found that timber such as shelving, crating, &c., which comes in contact with cheese, if treated with dichloroethyl ether, gives a very definite measure of protection to the cheese.

Another point considered is the effect of the acaricide on the cheese itself. A cheese kept for six weeks in an atmosphere saturated with dichloroethyl-ether vapour presented no foreign flavour in the interior of the cheese and only a slight off-flavour in the rind. Other cheeses were exposed to the vapour for shorter periods and no foreign flavour could be detected.

This work is being extended in order to procure more detailed and conclusive data.

LINEN FLAX

An investigation was carried out into certain physical factors that influence the presence of the mite, *Tyroglyphus farinae*, on flax-seed. Experiments indicated that (apart from effects on germination) if seed moisture is the factor determining the presence of mites, then the seed should not be stored under cool, but under higher, temperatures.

DAMAGED PASTURE

An Australian species of fly, *Metoponia rubriceps*, was found breeding in large numbers in damaged pasture at Opotiki. Though this type of insect is not generally found to be injurious, observations in Australia reveal that the larvæ of *M. rubriceps* insert their mouth parts into, and apparently draw nourishment from, the roots of certain pasture plants.

GRASS-GRUBS (ODONTIA SPP.)

A comprehensive investigation has been inaugurated into the grass-grub problem in New Zealand. The biology, ecology, and systematics of the species are being studied as a preliminary to developing means of control by cultural methods (if possible), and by parasites. So far the only parasites in New Zealand are certain species of tachinid flies, but steps have been taken to ascertain what species of Australian parasites, of types not present in New Zealand, could be of service in the solution of the problem.

GRASSLANDS DIVISION, PALMERSTON NORTH

Director: Mr. E. BRUCE LEVY

Despite shortage of labour and technical assistance and dearth of specialist supervision, the work of the Station has been well maintained. The season has been difficult owing to an early cold and dry winter followed by excessive wet during the late winter and spring and an exceedingly dry summer that has persisted up to the time of writing. The one redeeming feature has been the excellent harvesting weather for all grass and clover seeds and the good yields obtained.

PLANT-BREEDING

The use of pedigree strains of pasture species is fundamental in any attempt to increase the efficiency of pastoral production. The aim of the Grasslands Division is to supply high-producing bred strains of the more commonly used pasture species, and further, by hybridization, to evolve entirely new types by combining the desirable characters of different strains or even of different species. Pedigree strains of perennial rye-grass, Italian rye-grass, white clover, and red clover are now available to farmers, and next season seed will be available of a new type of rye-grass, known as H1 rye-grass, evolved by hybridization between perennial and Italian rye-grass.

The plant-breeding programme has been maintained as far as possible with perennial rye-grass, Italian rye-grass, H1 rye-grass, Western Wolths rye-grass, cocksfoot, timothy, white clover, and red clover.

Perennial Rye-grass.—Breeding is being continued with this species, some 8,500 single plants from controlled pollinations being studied in the field. Thirty-seven bushels of nucleus-stock seed have been obtained at Palmerston North for increase, and 78 bushels from the area at the Agronomy Division. The investigations into the possibility of breeding a strain of rye-grass less susceptible to the blind-seed disease than the standard strains are being continued. From crosses made between resistant and susceptible plants it appears that resistance and susceptibility to the disease are inherited characters. The majority of the resistant plants so far obtained are, however, not of the best agronomic type, and breeding is being continued to ascertain the possibility of combining desirable agronomic type with resistance to the disease. This season approximately one hundred plants have been artificially inoculated with the blind-seed-disease organism, and forty-two further crosses have been made.

Italian Rye-grass.—The nucleus-stock area at Palmerston North has produced 17 bushels of seed, and the area at the Agronomy Division 68 bushels. Breeding is being continued with this species, and some 3,800 plants from controlled pollinations have been studied in the field. A new glasshouse isolation to provide a nucleus-seed supply has been made. Reports from trials in Great Britain indicate that pedigree Italian is markedly superior to any other lines of Italian rye-grass included in their trials.

Short-rotation or H1 Rye-grass.—Twenty bushels of nucleus-stock seed have been harvested this year at Palmerston North, and 104 bushels at the Agronomy Division. It has been decided to release this new type of rye-grass under certification, and next year mother seed will become available to farmers.