

X. MISCELLANEOUS.

SILAGE-MAKING.

Experiments on the biological nature of the processes involved in the making of silage have shown that great improvements in quality may be made by the addition of bacterial culture, acid, whey, and molasses. Of these, whey and molasses have proved the most suitable in farm practice, and enable good silage to be made from otherwise unsuitable material.

LEGUME CULTURES.

Cultures for the inoculation of over 95,000 lb. of lucerne-seed have been forwarded to growers—a slight increase over last season. Experiments are in progress in conjunction with the Fields Division on the inoculation of clovers, peas, and blue-lupin seed with the appropriate organisms—on the whole, with very encouraging results.

PYRETHRUM.

An investigation is in progress with several strains of Dalmatian Pyrethrum (*Chrysanthemum cinerariaefolium*) to determine that showing the best extract for insecticidal purposes.

STEAM STERILIZATION OF SOIL.

Experiments are in progress on the physical basis for the more exact determination and measurement of various processes for the steam sterilization of soils.

ENTOMOLOGY SECTION.

J. MUGGERIDGE, Entomologist.

The very favourable, warm, and dry climatic conditions over the past season were conducive to the development of insect pests. Consequently, the amount of correspondence regarding their identification and methods of control was considerably more than that of previous years. Insects affecting potato crops were responsible for a considerable amount of loss to the potato-growers in various parts of the Dominion. Insects affecting live-stock and storage products were also more abundant than usual.

PIERIS RAPÆ (WHITE BUTTERFLY) AND ITS PARASITES.

In my last annual report two species of parasites were referred to—namely, *Apanteles glomeratus*, a larval parasite, and *Pteromalus puparum*, a pupal parasite. *A. glomeratus* attacks its host in the first larval stage. Subsequently, when the larva becomes full-grown, the parasites emerge from it, and spin small yellow silken cocoons from which they later emerge as winged adults. About 270,000 of these insects were sent into the field, but up to the present there is no evidence of their proving anything in the nature of a check to the progress of the butterfly. On the contrary, field investigations have proved the presence of hyperparasites which appear to be severely checking the progress of *A. glomeratus*. Further field work to ascertain the relationship between parasite and hyperparasite will be carried out. (Dr. Ferriere has identified the hyper-parasite as an *Eupteromalus* sp. closely allied to *E. nidulaus* Forst., which is very common in Europe, but apparently different from it.)

Pteromalus puparum, the pupal parasite already referred to, attacks its host just prior to pupation and in the pupal stage. The initial and outstanding success attending the liberations of this insect led the Department to concentrate on rearing large numbers of the species for liberation in the field during the summer months, consequently, during the latter part of last autumn and during the winter months large field collections of the pupal stage of the butterfly were made. Approximately 80,000 chrysalids were collected, but owing to disease and other causes only 45,000 of these were successfully parasitized. A considerable amount of experimentation to evolve suitable methods and technique for parasitizing such large quantities of material was at first necessary. The technique evolved proved highly successful, and the number of pupæ parasitized was limited only by the cool-storage space available. Of the 45,000 parasitized chrysalids held in cold storage approximately 4,000 died from disease, and from the 41,000 healthy chrysalids remaining approximately 877,000 adult parasites were reared and distributed in the field throughout the North Island and in parts of the South Island.

Field surveys indicate that the parasite is spreading and multiplying very rapidly, as up to 90 per cent. of the chrysalids collected were found to be parasitized. In Hawke's Bay, where the first liberations of *P. puparum* were made and where the butterfly had bred up in such numbers as to render the growing of cruciferous crops extremely uncertain, it is very pleasing to be able to report that during the past season the butterfly was reduced to insignificant proportions. The results of the work are proving so successful that it is anticipated that within the next two years the butterfly will be under efficient control throughout New Zealand.

CHEMICAL CONTROL BY MEANS OF SPRAYS AND DUSTS.

Experiments were conducted to ascertain the relative efficiencies of the sprays and dusts available for white-butterfly control on cabbages. The materials used were arsenate of lead, calcium arsenate, barium fluosilicate, derris preparations, pyrethrum preparations, common salt, summer oils, and nicotine sulphate. Results show that derris sprays and dusts, more particularly the dusts, are comparable in efficiency with arsenate of lead.

The feature of the derris preparations is that they are non-poisonous to humans if used as directed. Certain of the pyrethrum preparations—viz., kerosene extracts of South African pyrethrum flowers—atomized on to the cabbages gave good control. This material is also non-poisonous to humans.

The results of this investigation are being prepared for publication and will shortly appear.

TRIALEURODES VAPORARIORUM (GREENHOUSE WHITE FLY).

Small quantities of white-fly parasites (*Encarsia formosa*) were sent to glasshouse-owners during the past season. Supplies were also sent to the Australian Entomological Station at Canberra. *E. formosa* has proved a more successful parasite than was at first anticipated. It successfully over-wintered in Hawke's Bay, and during the last summer it spread north and could be found in glasshouses and in the field around about Hastings. It is remarkable, too, that the white fly was far less prevalent in glasshouses in Hawke's Bay than previously. This is explained by the presence of the parasite.

PLUTELLA MACULIPENNIS (DIAMOND-BACK MOTH).

During the past season the diamond-back moth was very much in evidence, and was responsible for very serious losses of farmers' cruciferous crops. Nothing can be done until money is available for the conducting of research into its control by natural means.