

## (7) FRUIT AND FRUIT-TREE INVESTIGATIONS.

(a) *Sprays*.—A comprehensive series of field experiments is being conducted with a view to improving the spray control of our major orchard diseases. For the purpose 676 experiments concerning thirty-three district investigations were handled during the year. Analyses are being made of commercial sprays with a view to making operative the Fungicides and Insecticides Act of 1927. In this connection the sulphurs and lime-sulphurs have been dealt with, and completed accounts published in the *New Zealand Journal of Agriculture*.

(b) *Fruit-rots in Store*.—A second season's survey of all rots found in cool stores, has been completed. The fungi responsible have been isolated, identified, and are now being inoculated into fruits to determine their pathogenicity. A study has been made of the factors which enhance or inhibit fungous attack, with a view to working out methods of reducing losses.

The serious losses experienced in lemons in the curing-sheds at Tauranga led to an investigation being made into methods of handling and storing fruits. Recommendations made were adopted and losses materially reduced.

## (8) CHEESE-MOULD.

An investigation into the possible role played by fungi in producing discoloration of cheese, has been in hand for the past twelve months. This has necessitated a critical investigation of species and strains of those fungi found in association with discoloured areas. So far it has been ascertained that one strain of *Penicillium* is more or less directly involved in one type of discoloration.

## (9) SILAGE INVESTIGATION.

Experiments have been initiated to ascertain the effects of various organisms on the preparation of grass silage. Preliminary work has shown that it is possible to alter the quality of silage by means of artificial inoculation. Attempts are being made to work out a technique whereby this may be made use of in farm practice.

## (10) FOREST-TREE DISEASES.

(a) *Die-back of Pines*.—During the year investigations were made of a serious outbreak of disease in many of the afforested areas in the Dominion. It was found that the disease was due to two species of fungi (at present but tentatively named) attacking trees weakened by snow, frost, or as a result of growing in unsuitable soils or localities. It would appear that both are species of exotic fungi, probably introduced to nurseries with the seed, and from these to the field during the process of blanking.

(b) *Seed-borne Diseases*.—Investigations into the preceding disease, and into failure of certain seed lines to germinate satisfactorily, have shown that parasitic fungi may be carried with the seed. Preliminary work is being undertaken with a view to working out a method of sterilizing forest-tree seed without materially affecting vitality. Some method of disinfection becomes necessary in view of the discovery that pine die-back may be seed-carried.

(c) *Timber-preservatives*.—A process of testing wood-preservatives is being developed in the laboratory, so that their relative values may be brought to a common basis for comparison.

(d) *Mycorrhiza*.—The economic significance of mycorrhizal fungi has been experimentally demonstrated. In our experiments it was found that very material results were secured when *Pinus radiata* was grown in soil infected with certain fungi, as species of *Rhizopogon* and *Boletus*. Further experiments are in progress to determine the effects of four species of fungi on several different species of forest trees, and methods of propagating and introducing these beneficial fungi into nursery soils.

## ENTOMOLOGY SECTION.

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## RESEARCH.

(1) *PIERIS RAPÆ* (THE CABBAGE WHITE BUTTERFLY).

*Pieris rapæ* is an Old-World species of butterfly well known in many parts of the world as a pest of cruciferous crops. It was first noticed in New Zealand at Napier, Hawke's Bay, in 1930. During the past season it has bred up in such large numbers as to constitute a menace to growers of cruciferous crops. Owing to the reports of the seriousness of this pest in Hawke's Bay it was deemed advisable to make a brief survey of the position.

From this survey it was found that *P. rapæ* was very common in the Hastings district. In all of the crops visited the adult butterfly was common, but very little of the other stages of the butterfly were present. The survey indicated, however, that most of the damage to the cruciferous crops in Hawke's Bay was due to the diamond-backed moth (*Plutella maculipennis*). It is not to be inferred from this, however, that *P. rapæ* will not be a serious pest to cruciferous crops, as it can only be within the next one or two years that the full effect of its presence will be felt.

## CONTROL.

(a) *Chemical Control*.—The chemical-control method would be of value so far as home or market gardens are concerned, but this method would hardly be applicable on a field scale.

(b) *Biological Control*.—Well known parasites of the pest occur in Britain, and thanks to the promptitude of the Imperial Institute of Entomology we are now in possession of a number of these parasites which at present are being reared under insectary conditions. From the first consignment of two thousand parasites a complete generation has been reared. At the time of writing three thousand pupæ of *Apanteles glomeratus* have been reared in the insectary from the initial supply. This work is being carried on under glasshouse conditions during the winter months. The parasites reared are being held in cold storage for liberation in selected localities in the coming spring. Should these liberations under field conditions be successful, it is not anticipated that any great difficulty will arise in the further distribution of the natural enemy.

(2) *GNORIMOSCHEMA* (*PHTHORIMEA*) *MELANOPLINTHA* (THE TOMATO-STEM BORER).

The tomato-stem borer at one time thought to be endemic is now known to be an introduced species apparently coming from Peru. A point of great interest at present is the fact that a similar if not identical tomato-stem borer occurs in Australia and has been described under the name of *Phthorimæa plasirosema*.

Owing to the pressure of other work, we have been unable to carry on the life-history study of this insect as desired, but the control methods recommended for the Australian species should apply equally well under New Zealand conditions.