D. MANURING OF FRUIT-TREES.

The Director of the Horticulture Division has handed over the control of experiments on the manuring of fruit-trees to the Plant Research Station, and is placing the services of Orchard Instructors at the station's disposal for the carrying-out of the trials. Mr. Dallas, now on the staff of the station, is acting as liaison officer between myself, the Instructors, and the Director of the Horticulture Division, and is personally responsible for the conducting of the trials. Unfortunately, the Orchard Instructors' busy season coincides with the time when most attention will be required for the picking and weighing of fruit. Consequently, the amount of work attempted is strictly limited.

The following experiments have been laid down: Pip fruits: Auckland, 1; Hawke's Bay, 1; Otago, 1. Stone fruits: Auckland, 1. Citrus fruits: Tauranga, 2.

Many points require investigation, but as very little accurate information regarding responses to manure is available it was deemed advisable to determine the fundamental points, viz.: "To what extent are phosphate, potash, and nitrogen limiting production in the districts under trial?" The natural sequel to these trials will be determination of such factors as the effect of quantity, time of application, &c., regarding those treatments which prove beneficial. Dr. Cunningham is watching the trials from the point of view of the effect of treatments on resistance to fungus diseases.

As far as possible five replications in the form of a "Latin square" have been laid down. The arrangement of trees in orchards has necessitated modification of the arrangement of plots in some cases, but five to eight replications of treatments is the general rule.

It is proposed to continue the experiments for from four to five years at least. At the end of that time the question of extension of time of trials will be considered. Up to date of writing results are available only from experiments on lemons and peaches. No differences occurred in the first season, although there are indications already that manuring is having an effect on the production in the case of the lemon-manuring experiments.

MYCOLOGY SECTION.

G. H. CUNNINGHAM, Mycologist.

A large volume of work has been undertaken during the past twelve months, despite financial considerations causing curtailment of travelling, special field-work, and of labour at the experimental area at Tiritea. The activities of the laboratory during the year have been extended to cover forest mycology and orchard experimental investigations.

BRASSICA DISEASES.

(*a*) *Club-root.*—Extensive tests have been conducted to determine effects of nitrogenous, potassic, and phosphatic manures alone or in mixtures, and of differing quantities and types of lime on the persistence of the club-root organism in the soil. Results as yet are inconclusive concerning the effects of manures, save with superphosphate and basic slag, for there is definite evidence on the experimental area at Tiritea and other types of soils showing that the former increases and the latter decreases infection under field experimental conditions. With lime quite definite results have been secured, burnt lime in particular having been proved to have a marked effect in reducing the disease. This is enhanced if the seed is sown with basic slag, but if super is used the controlling effect of the lime has been almost entirely lost. The evidence that has come forward indicating the effect that acid fertilizers may play on reducing the controlling effect of lime is of great practical importance and explains many of the poor results experienced by farmers where lime has been used in large amounts to counteract the disease.

Many tests have been made in order to isolate resistant strains of rape, swede, and turnip. Selections of swedes from Canada have been tested and found to be almost or completely resistant. These have been seeded and are now being bulked for further field tests. A special study is being made of resistance within the variety superlative, and strains have been isolated that promise to be as resistant as was that variety when first introduced into New Zealand. A selection of rape practically immune has recently been isolated, so that there is a probability, provided these lines remain resistant, that club-root may shortly be a disease controllable to the extent of being of little economic significance. Tests have been conducted to determine whether biologic strains are present in the organism, but so far results have proved negative. The host range of the disease has been further examined, and it is now believed our knowledge on this point is fairly complete.

Work on the longevity of spores under both laboratory and field conditions has been continued, and on the effects of soil-types on the persistence of the disease. Transmission studies have been continued, but so far only negative results have been secured in tests designed to determine whether the organism is carried with seed. Positive results, however, have been secured with animal-dissemination studies, for it has been proved that spores will pass unaffected through the alimentary tracts of sheep and cattle fed on club-root-infected swedes.

(*b*) *Dry-rot* (Phoma lingam).—Work during the year has been concentrated on the following points:—

(1) Studies on commercial production of swede seed. For this experiment 1 acre of swedes were grown on the area, half being sown *in situ*, half being transplanted, to enable comparisons to be made between the two common British methods. Over 1,000 lb. of seed has been harvested, showing that swede-seed growing should be a practical proposition in the Dominion. During the experiment studies were made on the spread of dry-rot in the seed crop.

(2) Investigations designed to show whether the disease was transmitted in the soil from a previously infected crop gave negative results, thus supporting the work of previous years that the disease is not carried in this manner.

(3) Seed-disinfection studies of previous years have proved inconclusive, for although clean seed could be secured under laboratory conditions, we frequently failed to secure clean crops in the field. As this work was conducted with commercial lines of seed, containing about 0·2 per cent. of infected seed, it was considered inconclusive, results which were secured as a result of the small percentage of diseased seeds rendering the test unsatisfactory. Consequently, methods were elaborated to secure artificially infected lines, showing a high degree of infection. As a result, by special inoculation, a line of seed with 16 per cent. of infected seed has been produced. And when disinfection of this line was tried, it failed to give complete control. As a result, further disinfection studies have been undertaken, and a different process evolved, which, under laboratory tests, has given complete control. This method, however, is only applicable for the cleaning of nucleus mother lines, and could not be applied satisfactorily on a general scale.

(4) Tests of the viability of spores of the organism under wet and dry conditions were made, and, as a result, it was found that exposure of spores to dry conditions resulted in a rapid decrease in spore viability,