

MYCOLOGY.

(1) *Club-root of Turnips and Swedes*.—Results of outstanding importance have been secured from this work, which has now been carried out for two seasons.

The following are the main features that give promise of great practical value :—

- (a) No type of lime, even in excessive quantities, exercises any appreciable control when the seed is sown immediately subsequent to liming.
- (b) Any type of lime, even in comparatively small amounts of 1 or more tons per acre, appreciably controls the disease if the seed is sown not sooner than three months after liming.
- (c) The controlling effect of lime is nullified if the seed is sown with an acid phosphate.
- (d) The controlling effect of lime is intensified if the seed is sown with a non-acid phosphate.
- (e) Certain strains of the Bangholm type of swede are highly resistant against club-root even when sown on infested unlimed ground. These strains are being selected out and seeded for further trial.
- (f) Promising resistant strains of Superlative swede have been isolated. When Superlative was first introduced it was highly resistant to club-root, but subsequently this resistance became largely lost through the development of non-resistant types.
- (g) A selection of rape practically immune to club-root has been isolated.
- (h) Much valuable information on host, range, soil, persistence, and means whereby soil becomes contaminated has been secured.

(2) *Dry-rot of Swedes*.—A continuance of the work on seed-treatment has shown that, so far, complete control can be secured only by methods that cannot be practically adopted by the farmer, but which can be used with success for the purpose of producing nucleus lines of disease-free seed. It has been shown that the complete control of dry-rot can be secured if clean seed alone is used. In order to effectively carry this out the best method would be for New Zealand to grow her own supplies of disease-free seed. In consequence, studies in methods of seed-production have been carried out, and these show that local turnip and swede seed production is practically sound.

(3) *Loose Smut of Wheat*.—Numerous pedigree lines of wheat have been treated by the hot-water method with a view to distribution of smut-free nucleus lines for future certification.

(4) *Wheat-rusts*.—Work has been commenced on the biology of the wheat-rusts, knowledge of which is a necessary prerequisite in the production of rust-resistant strains. It has been shown on the experimental area at Tiritia that by controlling rust by sulphur dusts high payable yields could be secured. Such treatment, however, is practical only on small trial plots, but this work has indicated how cheapening of wheat for stock-feed could be brought about in the North Island if wheats resistant to the rust types prevalent were available.

(5) *Potato-diseases*.—Much valuable work has been carried out on the control of corticium disease and the value of treatment of seed potatoes with acidulated mercuric chloride has been demonstrated. The fungi occasioning wilt diseases have been studied, and out of twenty-one different fungi that have been isolated only one species of *Verticillium* is responsible.

The virus diseases of potatoes are being intensively studied, and the production of nucleus lines of virus-free tubers is well in hand.

(6) *Lucerne Nodule Organism*.—During the year 29,000 lb. of lucerne-seed has been treated with culture provided by the Station, and the success of treated over untreated seed has been outstanding. Cultures for the inoculation of clovers, lupins, and other members of the pea family also will be available at an early date.

(7) *Sclerotinia Diseases*.—The blue lupin so valuable for green manuring is frequently affected with sclerotinia, and, when such is the case, subsequent crops grown on the same ground are likely to be affected. The production of nucleus lines of sclerotinia-free lupin-seed, therefore, has been undertaken, and shortly will be available for limited distribution for seed-growing purposes.

(8) *Fruit-tree Diseases*.—An important development of mycological research has been developed in connection with orchard diseases and their control. A three-years' programme dealing with the relative efficiency of all sprays in use by orchardists has been decided on, and experimental work in this connection has been started in numerous points in both the North and South Islands. Already very valuable results are being secured which have a direct practical bearing on fruit-tree-disease control.

AGRONOMY.

(1) *Pure-seed Production*.—The work on the improvement of standard varieties of cereals, legumes, potatoes, linseed, and other crops has been continued from the viewpoint of both strains and disease-freedom. The position has now been reached that much of the material is available for increase on a commercial scale, and will provide the nucleus material leading to certification. Of outstanding significance is the improvement that has been effected in many of our standard varieties of potatoes by the elimination of seed-borne diseases. It has been shown that there is a direct correlation between yield and the presence of such diseases, and in consequence their elimination by enormously increasing yield automatically reduces the cost of production.

Work of outstanding importance during the year has been that concerning strain in rape. The wide range in growth, palatability, and fattening-quality in different varieties of rape is a matter of great significance, particularly to the fat-lamb producer; and it is essential that the types should be carefully studied and standardized. This is work that will require several years before any definite conclusions can be drawn, but that already carried out indicates that questions of leafiness, recovery after grazing, and general type are as important in such forage crops as rape as they have been shown to be in grasses and clovers.

An intensive study of strain variation in lucerne also has been commenced, and selection work in this crop offers very great opportunities for practical successful exploitation.