Legume Diseases.

(*a*) *Collar-rot of Peas.*—Investigations during the year have shown that this disease is caused by two related fungi, and transmitted from one season to another by means of infected seed. It is spread in the field by means of insects, and can persist in the soil for nine months (one season) but not for twenty-one months (two seasons). In addition to garden and field peas, the disease has been found to infect red clover, alsike, white clover, spotted-burr clover, and bokhara clover, but will not infect lucerne, lupins, beans, or vetches. These results have been obtained by artificial inoculation, for the fungi responsible have only been found under natural conditions on peas. Despite very numerous experiments, no practical method of complete disinfection of the seed has been secured, probably owing to the fact that treatments which kill the fungi so damage the seed as to reduce germination to a small percentage figure. Consequently, the producing, under isolated conditions, of quantities of disease-free seed is being undertaken as a preliminary to bulking up large lines for commercial distribution.

(*b*) *Bacterial Wilt of Beans.*—This disease has recently appeared in New Zealand, and is being made the subject of a special investigation. Cultural studies have shown that the organism is apparently an undescribed one, and not particularly closely related to those recorded as causing a similar disease in other countries. At present the production of nucleus lines of French beans free from the disease is being concentrated on as a preliminary to bulking up quantities for commercial distribution. The bacterium responsible has been demonstrated to be parasitic upon Canadian Wonder and Butter beans, and a strain has been isolated from garden peas.

(*c*) *Lucerne Nodule Organism* (Bacillus radicicola).—During the year cultures sufficient to inoculate 29,000 lb. of lucerne seed have been forwarded free of charge to farmers throughout the Dominion, showing an increase of 11,000 lb. over the previous season. Cultures for inoculating red and white clover (a new departure) are also being supplied on request; and initial work in the production of cultures suitable for lupins is being undertaken. The success of this work has been outstanding, as since the introduction of cultures some hundreds of acres of lucerne have been established on areas which hitherto have failed to grow this crop successfully.

(*d*) *Sore Shin (cause unknown).*—A serious disease of blue lupin, named "sore shin," is apparently the cause of land becoming lupin-sick where successive crops are grown. Preliminary work has shown that a species of Fusarium, and an Ascochyta are associated with the disease. As yet all preliminary disinfection experiments have failed to control the disease.

Mangold Diseases.

Work is in progress on disinfection of mangold seed against seed-borne diseases, several organic mercury preparations being tested, but as yet results are inconclusive.

Sclerotial Diseases.

Sclerotinia Disease (Sclerotinia sclerotiorum).—This disease has in recent years proved a serious problem to those growing vegetables, small fruits, and flowering-plants, being especially severe on tomatoes, blue lupins, sunflowers, and potatoes. Investigation showed that its spread has been partly due to the use of blue lupin as a green cover crop in market gardens and the like, for of the twenty-two samples tested, seven were found to carry the disease. Disinfection tests have failed to render seed free from the disease; but some success has been secured with a flotation process, by which all diseased seed can be separated from healthy seed. Lines treated by this process are being grown at the station, with a view to producing nucleus lines of clean lupin seed, preparatory to bulking up for commercial distribution.

Tobacco Diseases.

Preliminary investigations into the cause and control of tobacco-leaf spots are in progress, and a series of experiments on disinfection of seed by the hot-water process has been conducted. As yet these experiments have not progressed sufficiently far to indicate whether any measure of success has been obtained.

Fruit-tree Diseases.

(*a*) *Fire-blight* (Bacillus amylovorus).—An intensive cultural study of this organism has been made, and its distribution fully worked out.

(*b*) *Tests of Fungicides and Insecticides.*—During the year a section was added to the laboratory with a view to dealing with experimental work on horticulture, an officer of the Horticulture Division being seconded for the purpose. A commencement has been made on a comprehensive series of experiments designed to improve the insecticides and fungicides in commercial use, a three-years programme of work being laid down in Auckland, Hawke's Bay, Nelson, Canterbury, and Otago. Chemical analyses have been conducted with most of the sulphurs, lime-sulphurs, spreaders, and of certain proprietary compounds, with a view to securing information enabling improvements to be introduced into practical disease-control, and to formulating standards for insecticides and fungicides.

(*c*) *Cool-store Fruit-rots.*—Investigations were conducted into the fungi responsible and the conditions leading to fruit-rots in cool store. Preliminary investigations have shown that most of these losses are due to faulty handling of the fruit prior to storing, and to the running of stores at unsuitable temperatures and relative humidities.

(*d*) *Lemon-bark Blotch.*—Inoculations conducted have shown this disease to be due to the fungus *Ascochyta corticola*, typical cankers being produced on stems, branches, and orange-stocks. Control measures recommended have proved successful under field conditions both in Tauranga and Gisborne, localities in which the disease is prevalent.

Forest-tree Diseases.

During the latter part of the year a section was established at the laboratory to investigate diseases of exotic trees in nursery and field, timber-rots, sap-stain fungi, and the like. For this purpose a laboratory has been fitted, and an officer seconded from the State Forest Service. Preliminary investigations have been undertaken with a view to determining the part played in forest-establishment by mycorrhizal fungi, and the cause of the dying of *Pinus radiata* throughout the Dominion.