

standardization of source-indicators of agricultural seeds (in co-operation with the Seed Control Station, Zurich, Switzerland); standardization of methods of seed-analysis (in co-operation with the Royal Seed Control Station, Copenhagen, Denmark); statistical study of seed impurities and germination behaviour of New-Zealand-grown agricultural seeds.

*Agrostology*.—Research work into the establishment and maintenance of pastures has been followed up. The accurate determination of just which pasture species will thrive and persist on each soil type has received special treatment, and the various phases in the pasture cycle leading up to a permanent grassland sward are being closely studied. Investigations have been initiated into the state and causes of deterioration of hill country in the Whangamomona County, covering which a report is in course of preparation. Research work on our hill country is each year becoming more and more insistent if the apparent tendency to bracken-fern and other secondary growth is to be stopped. Already in New Zealand there are just on 4,000,000 acres now in scrub, fern, and other secondary growth, and each year additional areas are being added.

Special investigation work into the possibilities of extension of our export seed trade to America in brown-top (*Agrostis tenuis*) seed has been carried out, and possibilities of extension in this direction have been opened up. Collections of the various *Agrostis* species have been made throughout each district in New Zealand, and these have been studied and the dominant forms determined as to species. The dominant form of *Agrostis* in New Zealand has now been determined by Dr. C. V. Piper, Agrostologist, United States Department of Agriculture, as being brown-top (*Agrostis tenuis*), for the seed of which he reports there is, in his opinion, an unlimited market in America. The outcome of this research will have quite an important bearing on the economy of grassland farming on our first-class short-rotational grassland soils.

*Entomology*.—In comparison with last year the number of correspondents seeking advice regarding the control of destructive insects has almost doubled. The parasites liberated against the sheep-maggot flies are to be found in certain districts, but there is no evidence as yet to show that they are reducing the pests to any appreciable extent. The gum-tree scale since its establishment in the North Island has spread rapidly, and caused considerable damage to eucalypt plantations. Large consignments of the ladybird beetles which attack this scale were liberated shortly after the first outbreak of the pest was reported, and the beetles have bred so rapidly that they are now making a decided reduction in the infestation at many points. Further consignments of the ladybird are to be liberated this spring and summer. It is hoped to secure consignments of parasites for the pear-midge from England this year. The Imperial Bureau of Entomology, London, has undertaken to secure these insects on behalf of the Department. An investigation into the life-history of the cattle-tick in the North Auckland District has been undertaken by Mr. J. G. Myers, and a great deal of information of value has resulted.

*Agricultural Botany*.—Among routine work may be mentioned the identification of large numbers of weed specimens, advice as to the best control methods being given in each case. Many other plants of importance in agriculture have also been dealt with. There has been a further demand for weed-, grass-, and clover-seed identification cards, and a quantity of these were prepared and distributed. One of the most important undertakings during the past year has been the establishment of a herbarium of economic plants, which is of very great importance for the efficiency of this branch.

*Mycology and Plant Pathology*.—A survey of the agricultural and horticultural diseases caused by fungi and bacteria has now been completed. Especial attention has been paid to the diseases affecting fruit-trees, and the manuscript of a book dealing with these is now nearing completion. The mycological herbarium has been steadily added to, and now contains collections of all the fungous and bacterial diseases attacking plants in New Zealand.

*Forest pathology*: In collaboration with the State Forest Service a study of the diseases attacking forest-trees and timbers is being undertaken. A serious disease of willow-trees made its appearance in the North Island, in many cases these trees having been killed outright. Information regarding the checking of the spread of the causative organism has been widely disseminated among those who are employing this tree on river-margins. Certain soil fungi have proved troublesome to nursery stock.

*Diseases of agricultural crops*: A commencement has been made with the study of the smuts of cereals and grasses, together with their remedial treatment, and it is hoped shortly to be able to publish the information gathered. Potato-diseases are now being investigated, and a bulletin dealing with these diseases is in course of preparation.

Fungi attacking agricultural weeds, particularly blackberry and gorse, are being experimented with in the Laboratory, with a view of ascertaining whether such fungi may be practically useful in checking the spread of these weeds.

*Utilization of Phosphate*.—Preliminary investigations in connection with soil-bacteria are worthy of comment. A study is being made of a bacillus recently isolated by Dr. Joffe, of the New Jersey Experiment Station. The discoverer claims that in the presence of sulphur it is capable of converting 80 per cent. insoluble phosphate into soluble phosphate. There are great possibilities in this. A series of laboratory experiments with the organism is in progress, and the Chemist to the Department is making the chemical analysis of the soils under test.

*Apple Shipment and Local Cool Storage*.—Data covering last year (1921-22) show that apple flesh-collapse or brown-heart caused much loss; 30 per cent. of our exported apples were sold in England as damaged, involving an estimated loss of £7,500; and a loss of some £25,000 was sustained in our land cool stores. Investigation into the causes have since met with much success, and have resulted in considerable modification in storage methods both on land and sea. Recent reports from London and from the local stores already indicate a considerable improvement this season.

*Bee-diseases*.—Nosema apis, the protozoon occupying the epithelial cells of the chyle stomach of bees, has been traced to many parts of the Dominion, and it would appear to be almost universal. Its presence in bees, however, cannot be associated with any acute disorder in New Zealand, though minor troubles occasionally were present in bees harbouring the organism.