BIOLOGY SECTION.

REPORT OF THE BIOLOGIST.

The Director-General. Wellington, 1st June, 1920.

I HEREWITH submit my annual report on the main lines of work carried out by this Section during the year ended 31st March last.

A. H. COCKAYNE, Biologist.

VISIT TO THE UNITED STATES.

I left New Zealand on 11th August, 1919, and visited the United States, returning on 14th February, 1920. During this period Mr. R. Waters carried out the duties of officer in charge of this Section with every satisfaction. To him and to all the other members of my staff I give my sincere thanks for the very capable way in which they carried out their various duties during my absence.

In the four and a half months spent in the United States I was enabled to visit many of the agricultural institutions in the west, middle west, and eastern States, devoting myself mainly to a study of agronomical conditions from the standpoints of education, research, and extension.

SEEDS AND SEED-TESTING.

The seed-testing branch of my Section continues to grow steadily, and during the year over eight thousand samples were analysed for germination and purity. While in the United States I paid considerable attention to seed-testing methods in vogue there, and also studied the effect of many of the seed laws that are in operation. With regard to seed-testing great care is taken that lines reported on are extremely carefully sampled. This is a matter requiring considerable attention on the part of merchants here. Many if not all the discrepancies arising in the germination of such seeds as cocksfoot, Chewings fescue, and the like are due to the sending into the laboratory of samples carelessly sampled and not truly representative of the line in question. I found this same defect had been quite common in the seed-testing work of many of the States, but seed-merchants there now recognize that the laboratory test is true only of the sample submitted, and if not sampled properly may give quite an erroneous result so far as the whole line is concerned.

Very special emphasis is given in the United States on the control of imported seed, and unless lines come within the standards of real value—*i.e.*, certain definite percentages of purity and germination such seed is not allowed to be sold. Some similar method of control of imported seed should operate in New Zealand, and this phase of the question has been embodied in a Pure Seeds Bill which has now been prepared.

During the year very considerable losses have been suffered by merchants in the export from New Zealand of Chewings fescue, owing to its great loss in vitality during transit overseas. The causes of this deterioration are now being made the subject of special investigation in co-operation with the Bureau of Plant Industry, at Washington. The overseas demand for Chewing's fescue is rapidly diminishing owing to the unsatisfactory germination on arrival in Europe and America. It is hoped that the studies on the loss of vitality in Chewings fescue will have a wide significance, and will be valuable in putting the storage and shipment of many agricultural seeds on a better footing.

The prices for agricultural seeds have been maintained at an extremely high level during the year. This is especially true of grass and clover seeds, such as danthonia, brown-top, lotus, and others that are particularly necessary for the grassing of our poorer lands. In fact, so high has the price of danthonia become that it should be the policy of all large users of the seed of this grass to lay down paddocks specifically for seed-production.

PLANT-PATHOLOGY.

The two main lines of work in plant-pathology have been a study of the dry-rot fungus of swedes (*Phoma napo-brassicae* Rost.) and fire-blight (*Bacillus amylovorus* Burr.). Much valuable information on the control of cabbage *Phoma* was secured in Wisconsin, where infected seed has been shown to be the main method of spread. From experiments conducted here, however, it appears conclusive that the swede dry-rot fungus is a soil saprophyte capable of living in the ground for several years. Nevertheless its appearance from time to time in crops grown on virgin land indicates that the sowing of infected seed is a factor in its dissemination. From the preliminary experimental work carried out it has been shown that the application of large quantities of water-soluble phosphates increases the disease considerably, and that potash manures have a depressing effect on the development of the fungus. Much work of a fundamental nature still remains to be done before practical methods of control can be laid down.

Fire-blight, which is justly considered one of the most dangerous diseases of pip-fruits, made its appearance for the first time in New Zealand during the summer in the Auckland District. Conditions being favourable for flower-infection, the disease spread rapidly, and considerable areas of the Auckland Province have become infected. It is especially bad in the Waikato. Apart from apples and pears, hawthorn has been found to be seriously affected, and much work has been done to determine whether hold-over cankers are developed on this plant. Present indications are that such is the case, and if this proves correct it will make the control of fire-blight extremely difficult in districts where hawthorn hedges are largely grown. Just how and when this bacterial disease was imported has not yet been ascertained, but from investigations conducted it appears that the disease is of extremely recent origin here, and the reports that it has been in the Dominion for many years have no foundation.

Considerable attention has been given to wheat-diseases, especially with regard to take-all (*Ophiobolus graminis* Sacc.). The control of wheat-diseases, owing to the altered economic and national position of this crop due to the lessened production of the world's breadstuffs, has become of considerable moment in New Zealand, and warrants special study being given to the subject.