

one line of seed, known to carry the dry-rot organism. Results showed that the standard method was much more reliable than either of the other two. A second point under investigation was the possible spread in the field by insects. A field survey showed that certain insects were invariably associated with infected roots. These have been isolated and are at present being tested with a view to determining whether any insect is a carrier, and, if so, the methods by which the disease is conveyed under field conditions. A third point under investigation was to determine the manner in which seed became infected in the field. Swede roots were grown to seed under controlled conditions (in insect-proof cases) and inoculated at various times. As a result a quantity of heavily infected seed was obtained, the method demonstrating that, if the seed-pods became infected, infected seed results. Attempts at producing small lines of dry-rot-free seed are being undertaken on Hautu Prison Farm, Tokaanu. Seed of a few selected commercial lines have been treated and sown on land never before in swedes, and miles away from other root crops in that locality.

(b) Club-root: An intensive series of investigations covering this disease has been carried out during the year, one officer occupying his whole time with this work. Preliminary work of a technical nature was required to work out a method for testing the presence of the disease in the soil; effects of soil conditions, temperature, moisture, spore-load, time of infection, &c. Following this the following major points were investigated: Firstly, the possibility of there being definite biological strains had to be determined, to know whether one type of brassica (as rape) could or could not be grown on land previously under another type of brassica (as swede). No significant results were obtained, indicating that defined biological races do not exist in the New Zealand form of this disease. Secondly, the host range of the organism had to be ascertained in order to determine whether brassica weeds could carry the disease over in grassland for an indefinite period. Seeds of thirty-three species of weeds were collected and sown in specially prepared boxes of sterilized soil, to which viable spores of the club-root organism had been added. Infection was obtained on nine species, only one of which, *Capsella bursa-pastoris*, has any economic significance, in that it is an abundant weed in cultivated areas. Thirdly, an intensive series of investigations were conducted to determine whether the disease was carried with the seed. This work has as yet been negative; but this is to be expected, since preliminary investigations showed that infections were directly correlated with spore-load—in other words, that infection could be obtained artificially only when numerous spores were present in the inoculum. Fourthly, a series of experiments has been conducted with a view to determining whether any varieties of swedes or turnips are markedly resistant to club-root. Of all those tried, Herning swede showed distinct promise, in several of the plots remaining quite free from the disease. Work now in hand is concerned with determining how long the organism may remain in a viable condition in the soil, and whether any manurial, cultural practice, or rotation will affect this period.

(3) Collar-rot of Peas.—An intensive series of seed disinfectant experiments has been undertaken with a view to combating this serious disease, but with indifferent results. It has been found that experiments in control along these lines have been deleteriously affected by secondary infections coming from outside sources. Consequently, until this disease has been more fully studied under laboratory conditions, control experiments have been discontinued.

(4) Potato-diseases.—(a) Virus diseases: These, the most important diseases of potatoes in the Dominion, have been made the subject of a special investigation. Disease surveys of the potato areas have been made, to determine the extent of virus infection, and ascertain, if possible, areas free from this group of diseases. Of all areas examined, Pukekohe alone shows comparative freedom from virus diseases. All types of virus have been studied in the field, and collections of typical material made. These have been planted at the Farm and have been under constant observation, with the result that we are now familiar with the field symptoms. Incidentally, all other diseases of the potato have been collected and are being studied on similar lines. Studies on pathogenicity are being conducted in the laboratory and glasshouse to determine certain points of the life history, &c., with a view to working out methods of control. Commercial virus-free potatoes have been imported from Scotland, England, Ireland, and Canada, and grown under controlled conditions. Some of this material, especially Scottish seed, shows marked superiority to any lines grown commercially in New Zealand. Nucleus lines of completely virus-free tubers have been obtained from the Cambridge Virus Research Station during the past two years. Part of this material is being used in experimental work; the remainder is being bulked under controlled conditions for ultimate distribution. In this way it is hoped gradually to eliminate virus diseases from the potato crops of the Dominion.

(b) Corticium-disease: Experiments on control of this disease have now reached a stage where we can obtain clean lines of seed. In the field, however, other factors, as soil-contamination, have made it difficult to apply this treatment on a commercial scale. It is believed that in conjunction with a certification system now in use more use will be made of this method of ridding crops of this disease. One point affecting the use of this treatment by the farmer was the possibility of damaging seed and thus reducing the yield. Experiments have shown that this is governed by time of treatment, for if tubers are treated some time prior to planting no damage results.

(c) Blackleg, mattery-eye, and wilt: Potato-disease surveys during the past three years have shown that considerable losses are experienced through a group of diseases commonly termed "wilts." Consequently, investigations covering these diseases are being conducted this season. For this purpose material has been collected and grown on the farm. Incidentally, one disease previously unrecorded has been collected by Mr. Chamberlain, who records it as being prevalent in Pukekohe district. This is black-dot disease, due to the fungus *Colletotrichum atramentarium*, recorded abroad as being the cause of a stem-wilt.

(5) Lucerne Nodule Organism.—Inoculation of lucerne with the nitrogen-forming organism has proved such a success that during the season material sufficient to inoculate 18,000 lb. of lucerne seed has been sent out of the laboratory.