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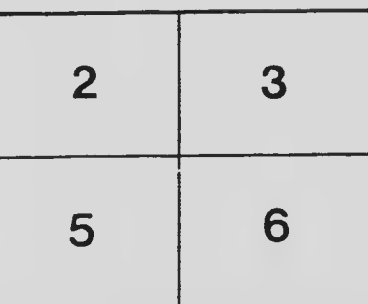
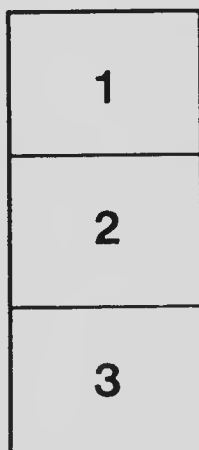
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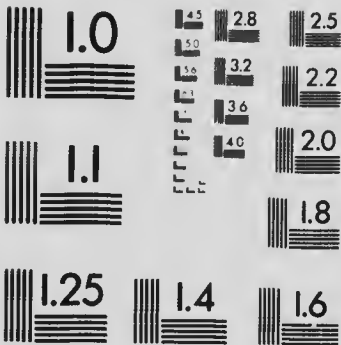
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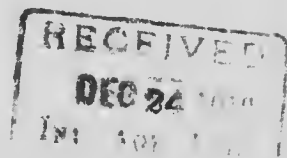
CLUB-ROOT OF TURNIPS AND ALLIED PLANTS

(*Plasmodiophora brassicae* Wor.)

BY

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(Photo. H. T. Gussow.)
Turnip Root showing malformation due to Club Root.

DOMINION EXPERIMENTAL FARMS.

J. H. GRISDALE, B.Agr.,
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EXHIBITION CIRCULAR No. 91.

(February, 1916.)

CLUB-ROOT OF TURNIPS AND ALLIED PLANTS.

Club-root is a serious disease of turnips and cabbages. Badly infected land is useless for raising these crops. It is spread by infected seed, infected seedlings, barnyard manure and farm machinery. It can be controlled by crop rotation, destruction of diseased roots, thorough drainage, and the application of lime.

Description of the Disease.

Club-root is a disease of cruciferous plants such as turnips, cabbages, cauliflowers, radishes, wild mustard, shepherd's purse, and many other weeds. The disease is caused by a microscopic organism, which may persist in sour, undrained soil for several years, particularly if the above plants are grown continuously. The roots and rootlets infected by the parasite become distorted and swollen to many times their normal size and are unable to absorb nourishment from the soil, or to transfer the food or water collected by healthy roots to the place of storage. This functional failure of the roots starves and stunts the plants. The leaves of diseased plants wilt during warm weather, turn yellow and ultimately die. In the latter stages of the disease, the swollen roots develop a black, soft rot. In the case of turnips this rot may continue and destroy most of the crop after it has been placed in storage.

Damage Caused by the Disease.

The injury caused by this disease to turnips, cabbages and similar crops is very great, sometimes destroying the whole crop. Already the disease has become very serious in the Maritime Provinces, and many farmers have had to abandon turnip raising because of its ravages. It has also been observed in Ontario and British Columbia.

Spread of the Disease.

The disease apparently came from Europe. It is readily introduced into sour, undrained or poorly drained soil through the use of infected seed, infected cabbage seedlings, or infected manure. Once established in a field it readily spreads to other fields by means of the above agents and in addition, through soil carried on farm machinery, on the feet of animals, through the droppings of animals fed on diseased roots and by wash-water carrying soil from infected fields to healthy fields. It does not establish itself on well drained alkaline soil, but the excessive use of acid fertilizers may leave the soil liable to infection.

PREVENTION AND CONTROL.

The disease is combated by eliminating the conditions which encourage its spread and development. Four important means to this end should be considered:—

- (1) Rotation of crops.
- (2) Destruction of diseased roots.
- (3) Soil drainage.
- (4) Application of lime.

Rotation of Crops.

Continued growing of turnips or cabbages on a diseased soil increases the disease and encourages its persistence in the soil. Therefore, a four- or five-year rotation of crops should be practised, avoiding the growing of turnips or cabbages on the same soil oftener than once in eight years. It is also necessary to eliminate all weeds of the mustard family, as they likewise harbour the disease.

Destruction or Boiling of Diseased Roots.

Since a diseased root contains myriads of the germs which are liberated in the soil or manure when the root decomposes, it is essential that all diseased roots be collected and destroyed.

If it is necessary to feed diseased turnips or other roots, they should be thoroughly boiled before feeding, as the organism survives passage through the digestive tract of animals. These organisms discharged in the droppings readily infect barnyard manure and are thus spread over the farm. Farmers should not buy manure from stables where diseased turnips have been fed as it invariably carries the disease.

Liming.

Lime will prevent the disease if applied in sufficient quantity and three or four years before the turnips are to be sown. The amount of lime required depends on the character of the soil and on the time allowed for its action. A smaller quantity of lime if given longer to act will have practically the same influence as a larger quantity, with a correspondingly shorter time for action.

For most farms, 150 bushels (3 tons) of air-slaked lime or 150 bushels (approximately 5 tons) of crushed limestone per acre will be sufficient. It is essential that the lime be added immediately after the diseased crop has been harvested and a period of three or four years allowed to elapse before turnips or cabbages are again planted. Smaller or larger quantities may be added later on according to the lime requirements of the soil. As lime does not readily become diffused through the soil, it should be thoroughly incorporated into the soil to a depth of from six to nine inches by thorough cultivation; otherwise its full benefit cannot be secured.

Where the disease is likely to occur on acid soil, it should be combated or its possible attack frustrated, by the application of lime; and when occurring on non-acid soil, thorough drainage and improved physical soil conditions are advisable.

It might also be pointed out that where such large amounts of lime have been applied, it is advisable to add larger quantities of barnyard manure or other humates, as the lime has a tendency to deplete the soil of its organic matter.



