



DISEASES OF SWEDE TURNIPS

Clubroot

THE familiar, knobby swellings appearing on the roots and "bulb" of turnips need no detailed description. These abnormal growths vary in size from small clubs to large knobby masses, often involving the entire root system and "bulb." The affected plants remain stunted, the leaves wilt during warm, dry weather, and finally seriously damaged turnips rot away.

Clubroot is caused by a fungus parasite. Infection of a crop results from infested soil. The parasite enters the delicate roots of the young plant and gradually produces the characteristic swellings. As a result the diseased roots are unable to function normally, viz: to absorb food material from the soil and store it in the "bulb."

Control Measures for Clubroot

Clubroot is difficult to control. The spores resist drought and extremely cold temperatures besides having the ability to retain their infectious nature in the soil for years. It is highly important, therefore, to avoid using land that has once produced a diseased crop, if such is practical.

General Precautions

1. Manure and Crop Wastes

It should be clearly understood that clubroot is most commonly spread to new fields by manure from live stock fed with diseased turnips, unless such feed has been thoroughly boiled. The millions of spores produced by this parasite in each root, remain alive while passing through the digestive organs of animals. The habit of throwing all kinds of refuse on the manure pile is responsible for a great deal of the trouble a farmer encounters from weeds and diseases. Decaying roots should under no circumstances be thrown on the manure heap. This includes the refuse of other crops susceptible to clubroot such as cabbage, cauliflower, etc.

It is a wise precaution not to purchase manure from farms where clubroot occurs. (Incidentally, mangels are not subject to the disease). At harvest time, refuse from a diseased crop should not be left on the ground; it will only make things worse. Machinery, feet of animals and men, and surface drainage

water are also known to carry clubroot from one field to another. Inattention to all these factors undoubtedly accounts for the wide prevalence of clubroot.

2. Crop Rotation

Continued cropping to turnips, cabbages, and all related plants on infested land multiplies the disease rapidly. Long rotation of crops in which turnips appear but once every six or seven years is a practice to be followed.

For convenience the following suggestions are made:—

	<i>Example 1</i>	<i>Example 2</i>	<i>Example 3</i>
1st Year.. . . .	Roots	Roots	Roots (part potatoes and part turnips or corn or both).
2nd Year.. . . .	Grain	Grain	Grain
3rd Year.. . . .	Clover or alfalfa	Clover	Clover
4th Year.. . . .	Timothy	Timothy	Timothy
5th Year.. . . .	Pasture	Pasture	Pasture
6th Year.. . . .	Oats	Pasture	Oats
7th Year.. . . .	Roots	Oats
8th Year..	Roots

Where long rotations are undesirable it should be borne in mind that the objective of these suggestions is the reduction of losses from clubroot.

3. Drainage

Water-logged land should be avoided unless adequate drainage is provided and the land is put into first-class cultural condition.

4. Liming the soil

Where clubroot is troublesome its activity may be reduced very considerably by applying lime to the soil every few years. This should be done preferably three or four years before the land is to be used for turnips. The best procedure is to do this immediately after a diseased crop has been harvested. The lime will do its work before the next crop of turnips is planted. The amount of lime will depend upon the nature of the soil and the time it will have to act. In most cases 2 to 3 tons of ground limestone per acre will suffice. Future applications may require to be reduced, but it is urged to have soil tests performed in order to determine the correct amounts needed. (Ask your agricultural representative.) The lime should be worked into the soil to a depth of from five to eight inches, otherwise it will not become quickly available to the roots.

Heavy applications of lime require corresponding increases in manure applications in order to provide the proper amount of humus which is reduced by the action of lime. The amount of lime recommended has one drawback in potato growing districts as it is bound to favour scab development. This objection, however, may be overcome by rearranging farming operations to provide separate areas for the production of these important crops. Thus the production of potatoes on turnip land would be avoided. (See rotation example 3.)

5. Weed control

Weed members of the turnip family are all liable to infection and may serve to keep clubroot alive in the soil. They should not be tolerated. These weeds are quite well known, the most important being Wild Radish, Worm-seed Mustard, Black Mustard, Shepherd's Purse, Charlock, Yellow Rocket, and others of the same tribe.

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6. *Varieties Resistant to Clubroot*

A number of clubroot-resistant turnip varieties have been under test. The most promising of these is a strain of the variety Wilhelmsburger, a purple top swede which is recommended to farmers. Canadian grown registered seed is highly reliable and carries a guarantee of purity. The Secretary of the Canadian Seed Growers' Association, Ottawa, Canada, will furnish information as to where this seed may be obtained. Incidentally, any observant farmer harvesting a crop of turnips from a uniformly clubroot-infested field has the chance of coming across one or more turnips absolutely free from clubroot. While these may not prove resistant when tested, it is always possible that one of them may be the turnip hunted for by scientists for years. Keep any such turnip specimen for stecklings and raise seed from it. Plant it in an isolated spot where it cannot be cross-pollinated by a susceptible variety—or better still turn it over to the Dominion Experimental Farms for a critical test.

Dry Rot of Swede Turnips

Dry rot causes heavy losses to the turnip crop throughout Canada, but particularly in the Maritime Provinces. Each year great quantities of turnips are destroyed by this disease, both in the field and in storage where actually the heaviest losses occur. Stecklings frequently are rendered useless for the purpose intended because of rot developing from undiscovered infections at the time the selections were made.

Symptoms of Dry Rot

Notwithstanding the fact that the disease may cause leaf spots early in growth, the trouble is usually not recognized until the bulbs are being formed when the occasional plant may show a sudden wilt and leaf discoloration, followed by death. Far too little attention is paid to such plants. But in reality this is often the beginning of serious trouble. On examination of a dead bulb one may find it decayed below the neck and beyond recognition of the typical symptoms of dry rot. Earlier than this stage, when examining the area of the bulb just below the neck or crown of leaves one will notice well defined circular or oval sunken patches, usually of a bluish grey colour, which may be single or fusing together. From these patches a decay penetrates into the bulb and soon causes the entire leaf crown to rot away. Gradually the disease spreads from an original infected plant to neighbouring ones and a larger or smaller patch of diseased tops appears in the field. Before the sunken spots have been involved in the general decay their surface becomes studded with minute black dots from which ooze shiny spore masses. These are washed by splashing rain to other plants and under favourable conditions may soon involve a whole turnip field. Now these spots on the bulb originate from spots on leaves in the first instance; the spots on the leaves result from those on the fleshy seed leaves; and these in turn originate from diseased seed. This, in brief, is the life history of the fungus causing dry rot. One factor is worthy of notice: overwintering mummies of turnip bulbs may serve to start an infestation of the soil, especially where a too rapid succession of crops such as turnips, cauliflower, or cabbage, is practised.

Control of Dry Rot

1. *Crop Wastes*

If affected roots are cooked they may safely be fed to live stock, but all precautions should be taken to prevent uneaten refuse from being thrown on the manure pile, only to reach turnip land and ensure future infections and

losses. Similar measures should be taken to destroy unharvested rotted roots, and to guard against carrying soil from diseased to healthy fields by means of farm machinery.

2. Crop Rotation

A long rotation of crops will starve out the fungus, in this way safeguarding turnips against attack. Note the recommendations of rotation practices as given under Clubroot.

3. Disease-free Seed and Seed Treatment

Obtain seed from a reliable source and produced from disease-free plants. Seed crops frequently show infections of the developing seed pods, and seeds harvested from diseased pods, compared with those from clean healthy pods, will produce a surprisingly high rate of infected plants. Seed plots showing a high rate of infection should be destroyed. Seed treatment, especially of the more valuable seeds of cauliflower, etc., is strongly recommended. The seed is soaked 25 minutes in formalin (2 tablespoonfuls to one gallon water) or in corrosive sublimate (1 part of the chemical to 2,000 parts water). In either case the treated seed should be rinsed off in clean water and dried by spreading out in a thin layer on ordinary paper. It has been reported likewise that soaking the seed in hot water (25 minutes in water kept at a constant temperature of 122° F.) gives almost complete control.

4. Varietal Resistance

No fully resistant variety has been developed, but experience has shown that some Purple-top varieties possess considerable resistance; also certain Bronze-top varieties, but to a lesser degree. In some sections of Eastern Canada the variety Wilhelmsburger has shown some resistance. In Scotland fair resistance is claimed for the two varieties Imrie's Improved and Enterkin.

Brown Heart of Turnips

Brown heart apparently occurs in all turnip-producing sections of the globe. It is detected without fail by cutting into the turnip. If present, it will be recognized by clearly marked areas of brownish mottled flesh, usually water-soaked in appearance and glassy. Such names as "brown heart," and "dark centre" are further suggested by the occurrence of alternating dark and light brownish rings within the brown heart area. Occasionally one may find specimens so severely affected that a complete internal breakdown has set in. Frost injury and drying out make it somewhat difficult to be sure of correct diagnosis. Brown heart is objectionable mainly because of the bitter flavour it imparts to, and the general poor cooking qualities of, the turnip affected.

Control of Brown Heart

Unlike clubroot and dry rot, which are caused by disease-producing germs, brown heart injury results from the lack of available boron in the soil. This deficiency is corrected under most farming conditions by using finely powdered borax applied to the soil at the rate of 15 to 20 pounds per acre.

Borax may be applied (1) directly in the drill; (2) broadcast with filler of sand or fine earth; (3) broadcast in home-mixed fertilizer; (4) broadcast in factory-mixed commercial fertilizer containing 2 per cent borax. The product is sold in 100-pound bags.

Borax applications should be made a few days in advance of seeding and worked well into the land.

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