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report on
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ROOT AND CROWN TROUBLES OF CLOVERS

Root, crown, and stolon rots cause more reduction in yields of hay, silage, and pasture than any other disease complex of clovers. All clover plants are affected. In fact, these rots are responsible for the eventual death of practically every red clover plant in Illinois.

Loss of stands from these rots is very common and can limit stand life. Some farmers are not aware that red clover is a true perennial and that loss of stand during the second year is abnormal. It is only when the root rot-crown rot complex becomes especially severe–causing high losses before the second cutting–that farmers give it much attention.

Figure 1. Ice-sheet killing of red clover. Only a few plants survived where snow had drifted next to a snow fence.

Effects on stand are most conspicuous during the second year but losses approaching 50 percent during the first year are not uncommon. Reduction in stand may occasionally occur in the spring when plants are weak as a result of low food reserves or winter injury (Figure 1).

Root rot starts a few weeks after the clover seed germinates, but progress of the disease is usually slow if growing conditions for the clover are good. If unfavorable growing conditions occur, such as a prolonged drought or a severe winter, disease spreads more rapidly and plants die sooner.

A number of soil-inhabiting fungi (*Fusarium* spp, *Rhizoctonia* spp, *Pythium* spp, *Sclerotinia trifoliorum, Colletotrichum* spp, *Macrophomina phaseolina, Mycoleptodiscus terrestris*) are involved in this disease. The relative prevalence and severity of these root- and crown-rotting fungi vary greatly with the type and variety of clover, age of the plant, season of the year, locality, soil type, and management practices. Most of the fungi are widely distributed and cause damage wherever clovers are grown.

Many of these fungi (e.g., *Fusarium*) are weak parasites, attacking plants after they have been weakened by adverse temperatures, insects, virus disease, nematodes, drought, improper management, mechanical injuries, low soil fertility, or other unfavorable soil conditions. All of these factors enhance the activity of root-crown-, and stolon-rotting fungi.

Some of these fungi attack the seed and seedlings. Others attack clover plants of any age. Some attack primarily the roots, while others are primarily crown- or stolon-rotting fungi. Several organisms may attack a single plant simultaneously, or the fungi may follow one another in sequence.

For further information contact Dean K. Malvick, Extension Specialist, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

Symptoms of Root, Crown, and Stolon Rots

Clover plants affected by root, crown, and stolon rots are generally unthrifty, yellowish, stunted, and often wilt during hot, dry weather. In wet weather seeds may rot. Seedlings sometimes wilt, dry up, and die (damp-off). Plants may gradually wither and die at any age or time during the year.

Figure 2. Root rot of red clover.

Decayed root, crown, and stolon tissues are mostly corky, spongy, or soft and light brown, reddish brown, or blackish brown (Figure 2). Affected parts are sometimes covered with a cottony-white growth (mycelium of *Sclerotinia*) in which black bodies, called sclerotia, are later embedded.

Rot may occur on the surface of larger roots, grow up and down the central core of large roots, or prune away the active feeder roots. New roots are attacked as rapidly as they replace the older, decayed roots.

Winter Injury

Various types of winter injury cause high losses in red clover stands. Injured plants are further damaged by the entrance of fungi and bacteria before the injured crown and root tissues have an opportunity to recover.

There are at least four distinct types of winter injury:

HEAVING. Caused by alternate freezing and thawing, heaving often severely damages clover stands. Damage occurs most often on wet, poorly drained land.

LOW TEMPERATURE INJURY. Injury occurs when unadapted varieties and types are used. Southern clover types that continue active growth into early winter often suffer from cold injury. In unusually cold, open winters, even adapted, northern types of clovers may be injured or killed. Late applications of fertilizer (especially nitrogen) tend to aggravate the situation.

ICE SHEETS. The most serious winter injury is produced by ice sheets. Sleet storms of freezing rain can cause ice to form over wide areas. The result is often complete losses of stands (Figure 1). Ice sheets can also form in low, poorly drained areas where water from rain or melting snow accumulates. Clover varieties most resistant to extreme cold are also most resistant to ice-sheet injury.

Other conditions similar to ice sheets, such as waterlogged frozen soil and heavily packed snow, can also produce winter injury. Farmers have long known that clovers frequently survive winterkilling better on rolling, well drained soil than on flat, poorly drained soil.

FROST INJURY. Frosts kills back the tops after plants begin to grow vigorously in early spring. Affected plants recover rather quickly. Damage is most severe in low areas where cold air settles.

Control

Prolong the general vigor and useful life of clover stands by carrying out all cultural practices recommended by University of Illinois Agronomists and your nearest Extension office. Recommended practices include the following:

1. Lime acid soils to attain a pH of 6.2 to 7 (slightly acid to neutral).

2. Practice balanced soil fertility based on a soil test. Avoid excessive rates of fertilizer, especially nitrogen.

3. Sow high-quality, certified, disease-free seed of well-adapted, high-yield varieties recommended for your area. These varieties are listed in Illinois Agricultural Pest Management Handbook. Or plant high-quality, Illinois-grown medium red clover seed. **Avoid** seed grown in southern states or foreign countries.

4. Where practical, keep heavily infected fields out of legumes for three years or more. Grow grasses, cereals, corn, or sorghum. Plow under thin, unproductive stands.

5. Control root- and crown-feeding insects. Follow recommendations made by University of Illinois Extension Entomologists and your nearest Extension adviser.

6. Do not leave straw from the companion crop above the clover plants. Either remove it from the field or break it up enough to let the straw work down through the stubble to the ground.

7. Avoid overgrazing, especially late in the growing season (about September 1 in northern Illinois to October 15 in southern Illinois). Overgrazing cuts down the food reserves in the taproot and crown that plants need for development and winter survival.