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Cold Injury to Alfalfa and Forage Crops

By Stephen K. Barnhart, Department of Agronomy

Most of Iowa alfalfa fields have broken winter dormancy. A few early April nights with temperatures in the low 20 degrees F or below will pose a risk of cold injury to alfalfa and other forage species. Low temperatures, whether visible frost is present or not, may affect the growth of both established forage plants and newly emerged seedlings.

Cold injury risk is reduced where snow or ice cover is protecting the new growth from low air temperatures. This issue is complicated by temperatures that are not uniform in and around the forage plants. Reported air temperature is measured a few feet above bare or grass covered soil surface. Plant tissue temperature is influenced by leaf surface color, density of the plant canopy, air movement within the canopy, the temperature of the soil, and more subtle conditions. The air within the forage canopy is likely 'layered', meaning the temperature at the top of the canopy is colder than the temperature at the soil surface, and below the soil surface in the taproot and crown area.

This makes simple statements about the influence of the reported temperature misleading. To complicate things even more, leaf tolerance to frost varies somewhat among varieties and individual plants, and is not always related to winter hardiness of the variety.

Established Stands

Well established, developing forage plants have lost their winter cold hardiness. Exposed tissue is susceptible to cold temperature injury. Several hours of 24 to 25 degrees F temperature, or lower, will damage leaf tissue and may seriously damage buds and growing points. If recovered plants are several inches tall, low 20s air temperatures will likely damage one to several sets of trifoliolate leaves exposed at the top of the canopy. The buds and growing stem tips are somewhat more protected and often continue to grow normally. One of the most difficult decisions in alfalfa scouting is whether these temperature ranges have damaged the crown and taproot tissue - a more serious physiological plant concern.

New Forage Seedings

At emergence, alfalfa and most winter hardy forage grass and legume seedlings have good cold tolerance. But, spring cold snaps can hurt new seedlings too. I tend to agree with the article from Oregon that states, "For alfalfa, at second trifoliolate leaf stage (and older) seedlings become more susceptible to cold injury and may be killed by four or more hours at 26 degrees F or lower temperatures. Alfalfa seeded with a companion crop survives lower temperatures and longer exposure times before showing frost damage."

Where does that leave us? There will likely be leaf tissue damage in some parts of the state where overnight temperatures go lower than 25 to 26 degrees F for several hours. Slope position, soil temperature, companion crop of oats, wind, snow cover, all will influence what has occurred in a particular field or part of a field. It is too early to determine whether crown and

taproot damage has occurred.

Management Suggestions

The only management suggestion at the moment is to wait a week or so to see what the damage is.

New seedings – Seedlings that were frozen so that all trifoliate leaves are discolored and dying will not regrow. If new seedings were permanently damaged, consider re-seeding as soon as possible. Keep the good areas and drill into thin or damaged areas. Tillage may not be necessary. If you think that a cereal grain companion crop, still present, will be too competitive or will impede the reseedling, then tillage may be required.

Established stands – If regrowth shows frost/freeze damage, wait a week to ten days then dig some random plants. Check whether remaining crown buds are still firm and intact. Split the taproots. Healthy taproots are creamy-white in color, with a firm texture. Freeze-injured taproots will begin to be watery, tan/brown in color and beginning to soften.

If cold injury to established stands was light, only affecting some of the early top growth, determine if the growing point of the stems have been damaged. If there was only leaf damage and the stem tip is recovering normally, follow your normal harvest plans. If the stem tips are permanently damaged, let the plant produce more branches and harvest a week or so later than normal – relative to the development of the new branches. Cold injured plants may recover more slowly than normal and should be given an extra week or two during one of the early summer regrowth cycles to recover their physiological vigor.

If there has been widespread, severe cold injury, consider replanting a new alfalfa stand in an adjacent field.

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