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Edward K. Twidwell
South Dakota State University

Kevin D. Kephart
South Dakota State University

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Winter Injury in Alfalfa: Assessment and Management

Edward K. Twidwell, Extension forage specialist
Kevin D. Kephart, forage research agronomist

Injury to alfalfa plants during the winter can cause serious stand losses and is a major problem in growing alfalfa in South Dakota. Stand hardiness is affected by climatic conditions, soil conditions, and cultural practices.

CLIMATIC CONDITIONS

Temperature

Alfalfa crowns and roots cannot tolerate direct exposure to 5 to 15 degrees Fahrenheit for an extended time without being damaged.

Ice

Ice sheets may smother alfalfa plants by sealing them in solid ice. This restricts oxygen levels needed for normal dormancy metabolism and is usually lethal. Snow and plant stubble prevent ice from making direct contact with plant tissues and provide insulation, which greatly reduces or eliminates injury to alfalfa.

Snow cover

Adequate winter snow cover protects alfalfa plants from prevailing air temperatures and is particularly important during late winter and early spring, when plants may be exposed to wide temperature fluctuations above and below freezing. Sub-freezing temperatures during late spring may cause injury if plants have developed some vegetative growth. Plants will have less cold resistance because of exposure to warmer temperatures. Their carbohydrate reserves may be so low that they are unable to reharden if exposed to a drop in temperature. By this time, hardiness may be greatly reduced or lacking.

SOIL CONDITIONS

Drainage

Collection of water on the soil surface during winter promotes formation of ice sheets. Root and crown-rot diseases in alfalfa are more likely on poorly drained sites.

Fertility

Balanced soil fertility promotes healthy plant growth and helps protect alfalfa against winter injury. Alfalfa winter survival is improved by high levels of potash (K), though the actual mechanism is unknown.

CULTURAL PRACTICES

Seeding

Late-summer seeding may not allow time for alfalfa to establish itself. Alfalfa must develop several trifoliolate leaves and a crown before the onset of winter. Seed at least one month before the average date of the first killing frost to allow adequate plant development and hardening

Harvesting

Fall cutting of alfalfa promotes topgrowth and reduces hardening that may damage stand per-

sistence. Root carbohydrate reserves are used for recovery growth, and plants may go into winter with inadequate reserves and reduced winterhardiness. Harvest alfalfa at least one month prior to the average date of the first killing frost. This will allow the plants time to regrow and develop adequate root carbohydrate reserves for winter survival.

Another option is to harvest after a hard frost when there is little chance for regrowth. Leaving a stubble, however, will help catch snow to insulate the alfalfa crowns, and stubble itself protects the crowns from fluctuations in temperature.

Varieties

Stands of hardy, disease-resistant alfalfa varieties are less likely to be severely damaged or lost entirely during the winter. Extremely winterhardy varieties typically have low-set crowns that are insulated by the soil. They also are less likely to break dormancy during periods of unseasonably warm weather in the late winter and early spring. Resistance to disease may partially substitute for lack of winterhardiness, because plants weakened by disease are more susceptible to winter injury. Select a variety with at least a moderate amount of winterhardiness. Moderate to high levels of resistance to diseases such as Phytophthora root rot and bacterial wilt are needed to assure long-term productive stands.

Age of stand

Newly seeded to 2-year-old alfalfa stands generally are less likely to sustain winter injury than older stands, because younger plants are healthier. Plant populations in new stands are also usually higher. If some plants winterkill, there is a greater likelihood of retaining a productive stand.

IDENTIFYING DAMAGED PLANTS

Winter injury will show up when spring growth begins. Plants may be dead, resulting in thinning of the stand, or they may be weakened as a result of partial injury. Check for winter damage early (about mid-April), then make a final assessment when plants reach a height of 4–6 inches, which could be as late as mid-May. Some plants that appear dead in early spring may recover later. Others may grow 4–6 inches and then die.

Six to 10 healthy plants, not stems, per square foot will provide satisfactory yields in pure alfalfa stands, while three to five plants are adequate for mixtures with cool-season grasses. Variable plant height also may indicate some stress has occurred.

To determine alfalfa stand density and extent of winter injury, dig up and examine the plants from square-foot areas at 10 random spots in the field; it's a more accurate way to identify dead, stressed, and healthy alfalfa plants. Root tissue of a healthy plant is firm and white. Roots of dead plants are soft and brownish, and the top-growth can be pulled easily from the crown. In a moderately injured plant, portions of the crown are brown. The root may also be damaged, but if white tissue remains, the plant may recover.

Do not consider plowing stands until the final assessment is made when the plants are 4–6 inches tall. If you find less than three healthy alfalfa plants per square foot, with some grass invading, apply 50–75 pounds of N per acre, take a cutting, and then plow. If a stand is not more than 2 years old and has large areas with only a few plants, but the remainder of the field has an adequate plant density, it may be possible to reseed the low-producing spots rather than the entire field.

When immediately reseeding older stands, watch for autotoxicity, a condition in which the old alfalfa plants release a chemical into the soil that inhibits the growth of newly-seeded alfalfa. Research from Michigan State University indicates that reseeding is safe one month after the old stand has been plowed.

Another option is to seed a crop such as corn or forage sorghum for one year and then reseed alfalfa the following year. Until further research

information is available, this may be the safest approach.

MANAGEMENT OF WINTER-INJURED STANDS

Do not take the first cutting from an injured alfalfa stand until mid-bloom or later, depending on degree of injury. This allows the plants time to recover from winter-related injuries and store carbohydrate reserves in the roots. The forage will be lower in quality, but yield will be higher and stand vigor will be regained. A normal cutting schedule, based on optimum maturity stage (i.e., late bud to early flower), can then be resumed.

Soil fertility also is critical for recovery of winter-injured stands, so take soil tests and apply P and K fertilizer as needed.

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