What Causes Winterkill of Alfalfa and What Forage Alternatives Are Available When it Occurs?

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Since weather is always variable, there are times when it causes significant problems in alfalfa production. Alfalfa is an expensive crop to establish and manage, but it is a very important forage crop that provides a good source of protein as well as necessary effective fiber, particularly for dairy cows. By understanding the factors affecting winterkill of alfalfa, producers may be able to reduce winterkill damage. This article discusses the causes of alfalfa winterkill, ways of reducing the risk of alfalfa winterkill and options of potential crops to grow if alfalfa is winterkilled.

What Causes Winterkill of Alfalfa?

1. Ice Encasement. One of the most important factors affecting winterkill of alfalfa is ice encasement. Heavy snowfall and moderate, fluctuating, sub-zero winter temperatures tend to create periodic ice formation, particularly in low lying, poorly drained areas that collect water. Ice can form as the snow melts and then re-freezes, which frequently occurs following mid-winter thaws. This ice generally penetrates into the soil surface and completely encases the upper regions of the alfalfa root and crown buds, which does not allow diffusion of gases such as carbon dioxide. Solid ice can kill the plants very quickly by suffocating alfalfa from lack of oxygen, but granular ice with interconnecting air passes is less severe. Alfalfa covered by ice for 3 to 4 weeks will most likely be injured or die. The presence of stubble from the previous crop is one way to reduce the risk of ice-encasement because crop residues or stubble tend to create channels and cracks in the ice through which gas exchange may occur. In addition, stubble tends to catch and retain snowfall which results in an insulation effect for the alfalfa crowns.

2. Soil Drainage. Good drainage is essential to prevent winterkill of alfalfa. In wet, poorly drained clay soils, alfalfa is much more subject to frost heaving during the late winter-early spring. Heaving can break the taproot and more...
often it forces the crown out of the ground, exposing it to drying winds and to mechanical injury during harvest. These weakened roots can be invaded easily by disease and sometimes these damaged alfalfa plants may die during the summer. Tile drainage can correct a poor drainage problem and surface drainage ditches in very level areas may be required to remove surface water in winter when soil is frozen. In addition, leaving enough stubble in the fall will provide more snow cover and less fluctuation in soil temperature.

3 Soil Potassium Level. A low potassium level in the soil can be one of the major factors resulting in alfalfa stand loss. Why? Because low soil potassium reduces storage of carbohydrates in the roots and crowns. High carbohydrate levels are needed to keep the alfalfa plants alive through the winter months as well as for new growth in the spring. Therefore, it is important to evaluate the soil potassium level in late summer or early September by obtaining a soil sample for analysis and applying a fertilizer if necessary.

4 Stand Age. The risk of winterkill in alfalfa increases with the increasing age of the alfalfa stand. Four- or five-year-old stands of alfalfa are more susceptible to winter injury or winterkill than one- or two-year-old stands when subjected to the same cutting schedule. This is because younger plants have lower disease infestations and have been exposed to less physical damage.

5 Varieties. Variety selection is one of the most important factors affecting winter survival of alfalfa because alfalfa varieties differ in winter hardiness and tolerance of disease or insects. Varieties with resistance to several diseases (Phytophthora root rot, Verticillium wilt, Bacterial wilt, and Fusarium wilt) and high winter hardness will have a lower chance of winterkill than those that are not winter hardy or not resistant to disease nor insects. Alfalfa varieties with high winter hardness can be found in the Michigan State University Forage Information System website at <http://web1.msue.msu.edu/fis/>.

6 Harvest Management. The timing of harvest (whether by cutting or grazing) can affect potential winterkill and persistence of alfalfa. Several factors are involved: stage of maturity at cutting, the frequency of cutting per year, timing of fall cutting, and cutting height of the last harvest going into winter. If alfalfa is harvested at the vegetative stage frequently, the stands are going to be weak since the plants don’t have enough time to accumulate carbohydrate reserves in the roots. This is very important for regrowth after each cutting and for new growth in the spring. Therefore, it’s important to harvest alfalfa plants at late bud to early flowering stage to meet the goals of both forage yield and quality which results in better stand persistence. Leaving a 6 to 8 inch cutting stubble in the fall can be effective in catching snow for insulation.

Growing Degree Days (GDD) can be a useful tool in aiding late season cutting decisions. A GDD is the average of the minimum and maximum daily temperatures minus 41. Recent Quebec research (1,2) has shown that if 500 GDD accumulate after the last cutting in late summer, there will be enough regrowth for good carbohydrate accumulation before a killing frost. So growers can cut alfalfa in September as long as enough warm weather remains before a killing frost. The Quebec research also showed that cutting later in the fall was acceptable as long as there was less than 200 GDD accumulated after cutting. When less than 200 GDD accumulated, there would be little regrowth to use up valuable stored carbohydrates and proteins in the alfalfa roots. This would result in good winter survival of the alfalfa plants.

7 Deer Damage. Deer can seriously damage alfalfa stands by grazing the alfalfa down to the crown areas, thereby making them more susceptible to winterkill. Simple solutions are not available to prevent alfalfa damage from deer. Herd population control conducted in cooperation with the State DNR wildlife biologists is the best long term solution. Fencing also can be an effective way to reduce deer damage, but it is expensive. Legume-grass mixtures may be an option to reduce the alfalfa damage from deer.

Options for Winterkilled Alfalfa

Once you notice that most of your alfalfa plants are winterkilled, a decision needs to be made on what options are available for your situation as soon as possible. A small grain such as oats and peas, spring triticale and peas, barley and peas, oats, spring triticale, and barley are all good choices for planting mid-April to mid-May for those needing forage in early/mid summer. Whether the small grain is planted alone or mixed with peas, harvesting forage should be based on the maturity stage of the small grain (e.g., late boot for lactating dairy cows and soft dough stage for heifers and beef cattle).

If you miss the spring planting time for small grains after winterkill alfalfa, summer annuals would be an option. Forage choices for planting mid-May to mid-June are corn silage, sorghum-sudangrass hybrids (for hay or silage) and sudangrass (for hay or grazing). These crops can do well in drought conditions too. The seeding rate for sorghum-sudangrass and sudangrass is 20 to 30 lbs/acre and they can be cut whenever they reach about 30 inches height for high quality forage or 36 inches height for heifers and beef cattle.

Best choices for planting mid-June to early July will be sorghum-sudangrass hybrids, forage sorghum, sudangrass for highest yield for the remaining portion of the season until killing frost. When planted this late, forage sorghums will likely be killed by frost to dry sufficiently for ensiling. Harvesting within one week of a killing frost is recommended to reduce potential for prussic acid poisoning. Forage sorghums may not be the best choice if the year is average to cool in temperature because forage sorghums perform better in warm temperature conditions.
(i.e., 90 to 95 degrees Fahrenheit). Previous studies on annual emergency crops have shown that corn silage results in the highest dry matter yields with the least risk of crop failure.

References