Drought Effects on Yield, Persistence, Quality, & Management of Stands

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Last summer and fall, many Midwestern alfalfa producing states were affected by drought, as early as March in Wisconsin and in July and August in other states. Many questions have arisen regarding how to manage an alfalfa stand once it has been subjected to drought stress. This article addresses the most important tips on management of alfalfa and newly seeded alfalfa during and following a drought.

Alfalfa Growth & Development

Alfalfa is a perennial crop, deep rooted, and a high user of water. It has been reported that alfalfa requires 5-6 inches of water for each ton of dry matter produced in the Midwest where daily water evaporation is about 0.2 inches per day. Thus, for a 5 ton/ac yield potential, alfalfa needs 25-30 inches of rainfall. In many areas, rainfall was below normal (50% or greater), reducing the yield potential and the number of harvests in the season.

Most producers were able to get the first and second cut with moisture available from the spring; however, the third and fourth cut had much lower yield or simply were not harvested.

Alfalfa subjected to drought closes the stomata, which does not allow the plant to cool down when exposed to high temperatures in the summer months. This stops photosynthesis and growth, reducing yield. Once growth has stopped, yield loss will occur. Unfortunately, the yield loss cannot be recovered by irrigating following stress. Alfalfa goes dormant until water is available again, but it rarely dies unless the drought stress is prolonged for many months.

The moisture deficit reduces growth, height, stem/leaf ratio, and NDF, thus decreasing yield. Stressed plants grow slower and usually mature faster in the second, third, and fourth cut. Usually, drought-stressed alfalfa will bloom shortly after cutting at a height of only 6 inches or less.

Drought is not the only factor that affects maturity in alfalfa. Temperature, especially night temperatures, have a great influence in alfalfa quality. Higher temperatures in combination with drought will increase NDF and decrease digestibility, reducing overall forage quality.

The higher the temperature, the shorter the time to flowering. Previous research data indicates that at an average temperature of 63˚F, alfalfa takes 52 days to reach maturity while at 90˚F, it takes only 21 days to mature.

Recently established or diseased alfalfa stands are more susceptible to drought stress than healthy, older stands. This is the reason to select varieties with multiple disease resistance to root rots providing good insurance for drought–stricken years.

Drought Effect on Winter Survival & Stand Persistence

There are many factors influencing the ability of alfalfa to survive the winter. Many of them are not controllable, but it is good to know what combination of factors increases winter-kill and winter injury. Extremely cold temperatures, excess soil water in the fall, snow cover (or lack of it), ice sheeting, or any combination of these factors can increase or decrease the risk of winter-kill.

Most reports indicate temperatures below 5-10˚F at the crown for prolonged periods of time will cause winter-kill. Snow cover will insulate the crown from getting to these low temperatures. It has been demonstrated that a snow cover of only 3 inches can adequately protect alfalfa from winter injury.

Excess rainfall and water logged conditions in the fall prevent alfalfa from acclimating or hardening to survive the winter. Excess moisture in the soil kills many roots due to the lack of oxygen in the soil. Usually, years of high winter-kill are associated with excess moisture in the fall. Also, excess moisture in the spring during the thawing and freezing cycle can cause ice sheeting, preventing the normal oxygen flow to the roots and buds in the crown which are needed to resume growth in the spring.

There are other factors which also influence the severity of winter-kill, such as stand age and soil fertility (especially potassium fertilization).

Fall Harvest Management

Recent published studies indicate that a fall harvest could increase the risk of winter-kill if conducted too early in the fall, depleting the root carbohydrate storage before going into dormancy. When harvest is conducted late in the fall, low temperatures will prevent the plant from re-growing. Fall harvest should be done when alfalfa is taller than 10 inches in height, flowering, and is economical to harvest. Although the first cut of the year might have a decreased yield due to the fall harvest, the additional harvest will offset the loss of yield in the first cut.

There is no advantage to raising the cutting height in drought-stressed alfalfa, thus, cutting height should be

the height normally used any other year.

Drought-stressed newly seeded alfalfa should not be harvested in the seeding year or in the fall to reduce the risk of winterkill. If enough growth is observed in the fall due to available moisture late in the season, then a harvest can be considered.

Considerations for Alfalfa Establishment After Drought

Selecting an alfalfa variety is a very important decision in any year but especially when the possibility of a drought exists. Select a variety with WS1 or 2 and fall dormancy (FD) 2 to 5 according to fall forage needs. Select a variety with resistance to root rot diseases (including Aphanomyces race 2 if the pathogen is present in the field) and potato leafhopper. Although forage quality is mainly dependent on harvest management, there are available varieties with increased forage quality.

Conclusions

Alfalfa management can be modified slightly to fit drought conditions. If managed correctly, stand and yield losses will be minimal. The good news is drought conditions also increase hay prices, which will give extra income to those who have good quality hay available in drought-stricken years.