

Summer Annual Forages for Beef Cattle in Western Nebraska

Karla H. Jenkins, Beef Specialist/Range Management Specialist
Aaron L. Berger, Extension Educator

Summer annuals can be grazed or harvested as feed for beef cattle. There is some potential for prussic acid or nitrate toxicity, but forage testing and management practices can reduce or eliminate the potential.

Summer annuals are typically warm season grasses that can provide grazing or be used for harvested feed for beef cattle. Summer annuals can work well when planted in dryland or irrigated cropping systems and as an emergency/salvage crop that can be inter-seeded through hail damaged crops to provide grazing, silage, or hay for beef cattle. Summer annuals complement cool season forages because their peak growth occurs in July and August when cool season plants are mature and decreasing in quality.

Forage summer annuals that do well in western Nebraska include sudangrass, forage sorghum, sudangrass x forage sorghum hybrids, teff, pearl, and foxtail millet. Although proso millet is typically grown in the Panhandle for grain, it has been used effectively for forage, and proso millet straw can be used as feed for beef cows.

In western Nebraska it is important to avoid planting most summer annuals before June 1 due to cool nighttime temperatures.

Summer Annual Selection

Summer annual forages have varying attributes that fit different management practices. Forage yield and quality will depend on soil fertility, moisture, growing conditions, and stage of maturity at harvest. Summer annual forages are the most water use efficient and drought tolerant of the annual forages. Forage sorghum, sudangrass, forage sorghum x sudangrass, foxtail millet, pearl millet, proso millet, and teff are all good options for Nebraska producers depending on forage needs and plans for how the crop will be harvested. Therefore, the summer annual that is the best fit for a production system will depend largely on the goals of the producer.

Summer annual forages should be planted once soil temperatures reach 55°F to 60°F to ensure rapid germination. In

western Nebraska, soils typically reach these temperatures in mid-May to early June. Summer annual forages can be planted through mid-July and still have acceptable yields.

Forage Sorghum

Forage sorghum, often referred to as cane, produces considerable tonnage and is often a good choice for silage or hay production. However, it is not as well suited for grazing as some other summer annuals due to slow regrowth and the potential for high prussic acid content. Producers can decrease hay curing time by selecting smaller stemmed varieties, increasing plant population at planting, and conditioning the hay before baling.

Sudangrass

Sudangrass is a relative of forage sorghum. However, it is differentiated from forage sorghum by its smaller stems, tillering, and high regrowth potential as well as its tendency to be lower in prussic acid content. These characteristics make sudangrass a desirable choice if producers want to plant the crop for grazing.

Forage Sorghum x Sudangrass

Sorghum x sudangrass is a very high yielding summer annual but much of the yield comes from stem material, making it lower in protein and energy than sudangrass. It also has a slower regrowth rate than sudangrass. However, it can be used for grazing or harvested multiple times for hay. Much variation exists among varieties, and producers should choose the one that is most suited to the growing conditions of their area as well as their goals for the crop.

Foxtail Millet

Foxtail millet is particularly adapted to western Nebraska as it has a short growing season and is very water-use efficient in terms of pounds of forage produced per inch of water used. It is not as suitable for grazing as sudangrass because it is easily pulled from the ground and regrowth tends to be limit-

Table I. Nitrate levels and safety recommendations for beef cattle¹.

<i>ppm Nitrate (NO₃-)</i>	<i>Safety Recommendation</i>
0-3,000	Virtually safe
3,000-6,000	Moderately safe; dilute to 50 percent for stressed or pregnant cows
6,000-9,000	Potentially dangerous; feed with safe feed; do not feed to stressed or pregnant cows
>9,000	Dangerous and will likely cause death

¹See NebGuide G1779, *Nitrates in Livestock Feeding*, for additional nitrate reporting methods and conversion charts.

ing. It has a small stem and, therefore, tends to dry quickly when being cured for hay. In addition to baling, foxtail millet makes a nice windrow grazing forage for winter feed. For more information, see NebGuide G1616, *Windrow Grazing*. Foxtail millet is a known host of wheat curl mite, which is the carrier of the wheat streak mosaic virus. Foxtail millet should be cut or destroyed before planting wheat. Planting wheat after the first killing frost will reduce the risk of this disease when wheat is seeded next to a foxtail millet field.

Pearl Millet

Pearl millet is fairly drought tolerant and has a low prussic acid potential, but it has thicker stems than foxtail millet, making it slower to dry down when cured for hay. While research at the University of Nebraska has shown pearl millet to be an acceptable summer annual for grazing, its inability to grow in cool weather and regrow rapidly after grazing limits its use compared to sudangrass in western Nebraska.

Proso Millet

Proso millet is grown in western Nebraska primarily as a grain crop. However, because proso millet grown for grain is swathed prior to full maturity and then combined, the resulting straw is higher in feed value than most other small-grain crops. The straw has been successfully fed to dry, pregnant beef cows. Proso millet is not a major host of the wheat curl mite. It has been used as a forage crop but with lower yields than the other summer annual forages.

Teff

Teff is another summer annual grass that does best when planted when the soil temperature is at least 65°F. Teff has small stems and a high leaf:stem ratio. Teff has been shown to be fairly drought tolerant once established. It can be harvested 45-55 days after planting. In western Nebraska the short growing season may limit the potential for a second hay crop. However, grazing the regrowth into the fall is an option for producers without risk of prussic acid or nitrate poisoning. However, grazing on sandy soils has resulted in some uprooting of the shallow crop and should be done with caution early in the growing season.

Summer Annuals and Toxicity

Two types of toxicity are possible with summer annual forages: nitrate poisoning and prussic acid poisoning. Generally, toxicity is not an issue but is something producers should be aware of and use good management practices to avoid.

Nitrate Accumulation

Nitrate poisoning is most likely to occur under stressful conditions to the plant. When plants are stressed nitrate conversion to amino acids is reduced and nitrates accumulate. In western Nebraska, plant stress is most likely caused by drought, hail, or frost. Frequently, the dry period is not the time when nitrate levels are a concern. It is actually after a rain, when the plant starts to grow again, that nitrate concentrations can be a concern. It can take one to two weeks before the nitrate levels return to a safe level for grazing. Producers should plan to have an alternative forage source available should high nitrates occur. This could mean moving grazing cattle to a native forage pasture for temporary grazing or feeding some hay to dilute the amount of nitrates consumed. Stressed, sick, and pregnant animals have a lower tolerance for nitrates than healthy cattle. Hungry cattle should never be turned out on forages that are potentially high in nitrate levels. University of Nebraska research has shown grazing cattle tend to select the leaves of the plant where nitrates are lowest. Cattle should not be stocked so heavily as to force them to consume the mid and lower parts of stems. If nitrate levels are not extremely high (*Table I*), cattle can be adapted to consuming them by gradually increasing the moderately high nitrate feed.

Producers harvesting potentially high nitrate forage for hay should have the forage tested prior to cutting. It is important to note that nitrates accumulate mostly in plant stems being concentrated in the lower one-third of the plant. Nitrates will dissipate in silage, but will remain high in cured hay. Producers harvesting summer annuals for hay can reduce nitrate concentrations in the hay by raising the cutter bar and leaving more stem since this is the area where nitrates are most highly concentrated. After hay has been harvested, send potentially high nitrate forage samples to a commercial lab for testing before feeding. County extension office personnel can help producers with proper sampling techniques. See NebGuide G1779, *Nitrates in Livestock Feeding*, for additional information on managing of nitrates in feed.

Table II. Prussic acid levels and safety recommendations for beef cattle.

<i>ppm HCN (hydrogen cyanide)</i>	<i>Safety Recommendation</i>
0-500	Generally safe
500-1,000	Potentially toxic; should be mixed with safe feed and not fed to stressed or hungry cattle
1,000 and above	Dangerous to cattle and will likely cause death

Prussic Acid Poisoning

Prussic acid does not occur freely in normal, healthy plants. When plant tissues are damaged, such as by freezing, chopping, or chewing, certain plant enzymes can come in contact with plant sugars and produce prussic acid (a cyanide compound). Bacterial action in the rumen of cattle and sheep can also release prussic acid from these sugars. Once cyanide is absorbed, it is readily transported throughout the body and is toxic to all animals.

Certain varieties of sudangrass or sorghum-sudangrass hybrids are known to be lower in prussic acid potential than others. If summer annuals are going to be used for grazing, select varieties that are known to have low potential for the production of prussic acid and do not begin grazing until plants have reached a height of 18-30 inches. *Table II* lists the range of cyanide levels considered to be safe to toxic.

Grazing Management

Grazing of new growth and regrowth of summer annuals should not begin until forage height is 18-30 inches (with the exception of teff). Dividing the field into at least three paddocks with temporary fencing is a management tool that allows producers to move cattle through the forage while maximizing utilization and allowing regrowth in the previously grazed paddocks. Producers need to be careful not to stock the paddocks such that the cattle will be forced to eat a high percentage of stalks.

Research from the University of Nebraska indicated the crude protein content of the leaves of sudangrass to be approximately 20 percent protein and the digestibility to be near 65 percent. The cattle in this trial were stocked at 1.8

AUM/acre, rotated through the paddocks weekly and gained 1.4 lb/head/day. This experiment was conducted on the eastern side of the state where rainfall is more abundant. Stocking rate and expected gain should be adjusted based on growing conditions.

Hay Production

Timing of harvest of summer annuals will depend on the desired level of forage quality. Summer annuals harvested earlier in maturity will generally result in higher quality forage. To optimize quality and tonnage, forages should be cut for hay in the late boot to early head stage. A crimper or conditioner will help speed the drying process considerably. Prussic acid is very volatile and any formed during the harvesting process will likely dissipate prior to baling.

Conclusion

Summer annuals provide a good source of grazing, hay, or silage for beef cattle in western Nebraska. Although summer annuals have some potential for prussic acid and nitrate toxicity, forage testing and management practices can reduce or eliminate this potential making them complementary forage for cool season pastures or quality winter feed.

This publication has been peer reviewed.

UNL Extension publications are available online at <http://extension.unl.edu/publications>.

**Index: Beef
Feeding & Nutrition**
Issued June 2012

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska–Lincoln cooperating with the Counties and the United States Department of Agriculture.

University of Nebraska–Lincoln Extension educational programs abide with the nondiscrimination policies of the University of Nebraska–Lincoln and the United States Department of Agriculture.

© 2012, The Board of Regents of the University of Nebraska on behalf of the University of Nebraska–Lincoln Extension. All rights reserved.