K-STATE Kansas State University Research and Extension

FORAGE FACTS

Publication Series

FORAGE SORGHUM SILAGE

INTRODUCTION

Forage sorghum is an important silage crop for beef and dairy producers in Kansas. Sorghum is well adapted to environments with limited rainfall, high temperatures, and low soil fertility, and producers usually will harvest greater quantities of forage dry matter (DM) than from other crops, such as corn or grain sorghum. The general constraints to forage sorghum silage production and utilization have included a generally lower nutritive value than corn or grain sorghum silage, an accumulation of a high level of nitrate under certain environmental stress conditions, and prussic acid poisoning in early primary growth or regrowth situations.

PLANTING

Sorghums should be planted when the soil temperature reaches 70 to 75˚F. Planting in a cooler soil reduces seed germination and delays emergence, which could subject the seed to attack by soil microorganisms. Planting in late April and early May could result in shorter plants than an early to mid-June planting. However, delaying the planting date could decrease total dry matter production by reducing the amount of grain produced. Late planting might not allow the crop to reach the optimum cutting stage before frost. Because sorghums have a wide range of growth characteristics, adjusting the planting date to a sorghum hybrid or variety season-length is essential.

Optimum planting depth of sorghums varies with soil type and moisture conditions, but 1½ inches generally is recommended. Germination is enhanced by covering the seed with moist soil to provide firm seed-to-soil contact. Sorghums usually are planted in 30-inch rows, but that might vary according to the harvesting equipment available to the farmer. Seeding rates for forage sorghums are similar to those recommended for grain sorghum and are relatively high because only 65 to 70 percent of the seeds normally emerge. Rates vary across the state depending on cultivar, rainfall, growing conditions, and intended use of the forage.

FERTILIZATION

Fertilizer and lime needs are best determined by soil tests because sorghums are grown in all areas of Kansas under a wide range of climatic and cultural conditions. Nitrogen is the nutrient most frequently lacking for optimum production. On nitrogen deficient soils, apply 30 to 40 pounds of nitrogen per acre for each expected ton of DM production. Split applications provide better nutrient distribution and reduce the potential for nitrate or prussic acid accumulation. A high nitrate concentration is likely if excessive nitrogen is applied or if production is limited by drought. To minimize nitrate accumulation, application rates should be based on a soil test and previous crop and manure credits. Phosphorus, potassium, and other nutrient applications should be based on soil test recommendations.

CULTIVAR SELECTION AND NUTRITIVE VALUE

Cultivar selection should be based on the nutrient requirements of the livestock, because large differences exist in agronomic and nutritional quality traits among species, hybrids and varieties. The sorghum types available for silage production include: forage sorghum hybrids, grain sorghums, the older forage sorghum varieties, sudangrass hybrids, and sorghum-sudangrass hybrids. Those best suited for silage are the forage and grain sorghums. Sudangrass and sorghum-

sudangrass hybrids usually are better suited for hay production or grazing than for silage.

Forage sorghums generally are categorized into three groups according to season length: early-, middle-, and late-season. Early- and middle-season cultivars tend to be shorter and produce more grain than the late-season cultivars. Because forage sorghums of different season lengths can mature during varying environmental conditions, a tremendous variability exists among cultivars for both agronomic and nutritional quality traits. Early-season cultivars can have drastically low silage DM yields, if summer growing conditions are dry, and late-season cultivars can be adversely affected by early frost or wet fall weather. Most forage sorghum silages have lower nutritive values compared to corn or grain sorghum silages.

Grain sorghum compares favorably to corn as a whole-plant silage when harvested at the mid- to late-dough stage of kernel maturity. Grain sorghum silage usually has a higher crude protein content than corn silage, but slightly lower net energy values for beef and dairy cattle.

Important characteristics to consider when choosing a sorghum cultivar for silage include: high whole-plant DM and grain yield potential; season-length; adequate whole-plant DM content for ensiling; high nutritive value; low lodging potential; and insect and disease resistance.

STAGE OF MATURITY

Research at Kansas State University has established that harvesting sorghums in the mid- to late-dough stage of kernel development optimized both silage yield and nutritive value. Harvesting sorghum at an earlier stage of maturity (lower DM content) could result in excessive effluent, a silage with a higher acid content, and the chance of a greater dry matter loss in the silo. Harvesting the crop at a later stage of maturity (higher DM content) could make the forage more difficult to chop and pack, and the drier silage could be more aerobically unstable during the feedout phase.

LIVESTOCK POISONING POTENTIAL

Sorghums can accumulate potentially toxic nitrate levels when stressed by drought, shade, frost, or temperature extremes. Nitrates normally are highest in young plant growth; however, concentrations can remain high in mature sorghum. Raising the cutter bar 6 to 12 inches to exclude basal part of the stalk can reduce nitrate levels. Environmental conditions in Kansas create high nitrate concentrations in some forages virtually every year; therefore, feed analysis is necessary to determine management options. Generally, forages that contain more than 6,000 ppm nitrate (DM Basis) should be considered potentially toxic. The fermentation phase in the ensiling process converts about 50 percent of the nitrates to a nontoxic form. Toxicity is related to the total amount of silage consumed and how quickly it is eaten. High nitrate silages can be fed if proper precautions are taken. These include diluting the forage with other feeds; supplementing grain; gradually adapting livestock to increasing nitrate amounts; and not feeding to hungry, sick, pregnant, or stressed animals.

Prussic acid, or hydrogen cyanide (HCN) poisoning, is caused by cyanide production in sorghums that grow rapidly following a stress situation. Cyanide is concentrated in young, actively growing leaves and is commonly associated with new shoot growth at the end of a summer drought or after the first autumn frost. The ensiling process does not decrease the prussic acid concentration in the silage; however, field wilting prior to ensiling might decrease the level of prussic acid by percent.

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