



Selecting Summer Annual Forage Grasses

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Introduction

Shortages of forage most often occur during the summer. In the last couple of years, drought stress has decreased perennial forage crop yields and has increased the immediate forage need to sustain livestock production. Summer annual grasses provide excellent forage during the summer to help meet forage needs. Summer annual grasses grow best at relatively high temperatures (80 °F) and can produce under conditions of limited moisture. They differ in growth and production potential, but have several similar characteristics. Some major disadvantages include the high cost of annual establishment and the increased risk of stand failure due to low rainfall in late spring and early summer. Some of the desirable characteristics of summer annuals are rapid growth (especially in mid-season), excellent drought resistance, and good response to fertilizer and water.

Sometimes producer are confused with which type of summer annual forage grasses to plant. Summer annual grasses that can be grown in Mississippi include sudangrass (*Sorghum bicolor*), forage sorghum (*Sorghum bicolor*), sorghum x sudangrass hybrids, browntop millet (*Panicum ramosum*), pearl millet (*Pennisetum americanum*), foxtail millet (*Setaria italica*), and crabgrass (*Digitaria sanguinalis*). Each of these species has its strengths and weaknesses, but the choice should be based on livestock nutritional needs and intended forage use (grazing, hay, silage, or green chop). They can be valuable in the development of a year-round forage system. Each of these grasses has unique growth characteristics that require proper management for optimum production.

Species

Sudangrass and Sorghum-sudangrass hybrids

Sudangrass is a rapid growing warm-season grass which can produce good quality forage if managed properly. It usually grows between 3 and 8 feet high. True sudangrass usually has fine stems and grows rapidly after grazing. Sudangrass develops only fibrous roots and does not have rhizomes. It usually contains lower levels of prussic acid than sorghum-sudangrass hybrids, but is also lower yielding.

There are several sorghum-sudan hybrids in the market nowadays and they resemble sudangrass in growth. These hybrids are taller, have larger stems (stalks), and are higher yielding. Some of the new varieties use the "Brown Midrib (BMR)" genetic trait that produces less lignin. This genetic trait has shown a decrease in lignin concentration (40 to 60%), an increase in forage palatability (15 to 30%), and therefore, an increase in digestibility and improvement in forage quality. The BMR hybrids have also shown a better yield potential compared to traditional sorghum-sudan hybrids.



Browntop, Foxtail, and Pearl Millet

Millet has smaller stems and greater leaf biomass than forage sorghum, sudangrass, and sorghum-sudangrass hybrids. Browntop millet is a very short and leafy species with high tolerance to soil acidity. Browntop has a growing season of about 60 days and only hay cut is obtained. Pearl Millet is usually preferred due to faster growth after cutting or grazing. Pearl millet does not produce prussic acid, and the summer forage produced is safe for pasturing horses. Millet is best used for hay or pasture. It is not as drought tolerant as some of the other summer annual grasses. Foxtail millet has smaller stems and is leafier than the sorghum, sudangrass, or sorghum-sudangrass hybrids. However, foxtail millet does not grow after harvest. Foxtail millet yields are usually lower than yields of sorghum-sudan hybrids. Start grazing millet at 18 inches tall and stop at a height of 8-12 inches. Manage additional growth in same manner.

Forage Sorghums

Forage sorghum is best adapted to fertile, well-drained soils that have a good water holding capacity. Forage sorghums have improved leafiness, better seedling vigor and excellent yield potential. Most of the growth (90%) occurs in June, July, and August. Sorghum can be grazed 45 to 60 days after emergence. Summer grazing may occur with caution due to higher levels of prussic acid even when plants are completely headed. Before grazing, sorghum should be at least 30 inches tall and graze to a height of 5 to 7 inches. Manage additional growth in the same manner. Forage sorghums are best used in a single hay cut. Haying is best done when plants are in bloom or early dough stage and a mower-conditioner should be used to crush the stems. Allow drying time for stems to dry before baling. In the fall after plants have been killed by frost, insure that plants have no re-growth before allowing livestock to graze.

Crabgrass

Crabgrass is commonly considered a weed, but possesses significant potential for supplying high quality summer forage. Some advantages of crabgrass are that it occurs naturally in most summer pastures, especially those that have been overgrazed, and it has a good reseeding potential. Crabgrass is best adapted to well-drained soils such as sands, sandy loams, loamy fine sand, loams, and silt loams. Crabgrass is best utilized in a rotational grazing system. It can produce grazable forage in as little as in 35 days, but normally 40 to 60 days are required. Grazing can be started at 6 to 8 inches and stopped at 3 to 4 inches. Hay should be cut at the early-to-late boot stage or at a height of 18 to 24 inches. Animals should be removed at least two to three weeks before the first expected frost in the fall to allow for reseeding.

Establishment

Summer annuals should be planted when soil temperature reaches 70 °F to 75 °F. These summer-annual species can be broadcast seeded and cultipacked or seeded with a grain drill into a well-prepared seedbed. These species should be seeded alone rather than in mixtures since they mature at different



times. A firm, well-prepared seedbed is best, although acceptable stands may be established without tillage using no-till drills. A one-third to one-half acre area could provide adequate grazing for one mature animal during the critical summer months. Seeding one-half of the acreage as early as possible and the remainder four to six weeks later can extend the useful period of these summer annual forages. One disadvantage of late planting is a reduction in yields due to hot and dry conditions in later summer. Seeds could be planted from ½ and 2-inches deep depending on the species. Seeding rates for summer annuals are relatively high because their germination rate ranges from 65 to 75%. Rates vary across the Mississippi depending upon plant variety, rainfall, growing conditions, and intended use of the forage. Plant sudangrass, sorghum-sudangrass hybrids, and millets 1 inch deep in medium to heavy soils and 1 ½ inches deep in sandy soils. If the soil is dry and rain is not anticipated before seedling emergence, cultipack the seedbed to maximize seed-to-soil contact and moisture conservation. See [Table 1](#) for seeding rates and seeding dates.

Fertilization

A soil test will provide the best information related to nutrient needs. Nitrogen is the nutrient most frequently lacking for optimum production. Nitrogen (N) fertilization is critical to achieve high yields and split applications are recommended. Split applications provide better nutrient distribution and reduce the potential for nitrate or prussic acid toxicity. Usually half of the nitrogen should be applied and incorporated prior to or at seeding, assuming that weeds are not a problem for nutrient competition. The remainder of the nitrogen can be equally divided and applied after each grazing or cutting period. This will allow the summer annual grasses to more efficiently utilize the nitrogen. Since most of the summer annuals will be planted under warmer and drier conditions, ammonium nitrate should be used for the nitrogen source. If urea is chosen, apply it prior to rainfall, and increase the amount 15 to 20% to compensate for volatilization losses.

Harvesting and Grazing Management

Summer annual grasses can be used for grazing, green chop, silage, or hay. Summer annual grasses respond better to a rotational grazing system ([Fig. 1](#)). When used for grazing, these grasses must be grazed at the proper stage of growth to reduce herd health problems and to optimize production. Planting dates are sequentially planned so cattle are sequentially rotated to a field that is ready to graze. The best time to graze is when plants are between 18 and 30 inches tall (6 to 8 weeks after planting). The pasture should be subdivided, and high stocking rates should be placed in the pasture to graze the grass down to six- to eight-inch stubble in 10 to 14 days and efficiently rotate cattle to the next field. It will normally take three to four weeks for sufficient re-growth for grazing again. Actual stocking rates are difficult to predict because they depend upon plant species, cattle size, soil type, fertilization, moisture, and other managerial and environmental factors. At least three or more subdivisions are needed in the rotation. With the appropriate rotation, these summer annual grasses can provide between 80 and 90 days of high quality forage. Until the producer has gained experience, committed and able to manage a good rotation, conservative stocking rates are recommended.



Sudangrass and pearl millet are usually best suited for pasture production because of their rapid re-growth rate, and cause fewer animal health issues and poisoning due to lower prussic acid levels. Sorghum-sudan hybrids and pearl millet are best suited for hay or green chop due to higher yields and good feed value when cut two or three times during the growing season. Foxtail millet is also suitable as a summer hay crop, but not well adapted to sandy soils, and it does not regrow after cutting under dry conditions. Forage sorghums, especially the hybrids with high grain production, are best suited for chop silage since they produce high yield and have good feed value. When making hay, a mower-conditioner should be used to increase the drying rate. Making hay can be difficult because of the high moisture content and large stems. Sudangrass, sorghum-sudangrass hybrids, and millet should be harvested for silage when they are between 36 and 48 inches tall or in the boot to early-head stage (whichever comes first).

Potential Animal Health Hazards

The two most frequently reported animal health problems associated with summer-annual grasses are prussic acid poisoning and/or nitrate poisoning. Prussic-acid poisoning occurs in sorghum, sudangrass, and sorghum-sudangrass hybrids after a killing frost or drought. Usually cattle are more susceptible to prussic-acid poisoning than horses. Prussic acid usually dissipates within a week after frost. To avoid issues with prussic acid, it is recommended to follow the guidelines: (1) graze or green chop only when grass is greater than 18 inches tall; (2) do not graze plants during or immediately after a drought; (3) do not graze on nights when a frost is likely; (4) do not graze after a killing frost until the plant is dry or until re-growth is greater than 18 inches; and (5) delay feeding silage for 6 to 8 weeks after ensiling.

Nitrate poisoning usually occurs when high rates of nitrogen fertilizer are used and drought conditions occur or exist. The high nitrate levels are especially found in the lower stems, and they do not dissipate as the hay cures. Nitrate poisoning can occur in pearl millet as well as in the sorghum-sudangrass hybrids and sudangrass. Nitrate poisoning can also occur when grazing stubble in the fall and winter, after the leaves and upper parts have been consumed by livestock, and they begin grazing the lower part of the stem (stalk). In horses, foxtail millet can cause kidney and joint problems while sorghum poisoning can occur as an infection of the urinary tract. The same precautions for prussic acid poisoning could help prevent nitrate poisoning.

Summary

Maintaining proper herd size, renovating pastures with a legume, fertilizing according to soil test, and utilizing a rotational grazing system can aid in reducing summer forage shortages. However, during drought conditions, the risk of having a short supply of feed still exists. Drought conditions during the last couples of years have shown many cattle producers that summer is a critical time in a livestock operation. You cannot only depend on perennial warm-season pastures to provide adequate forage during the summer. It is time to start thinking about planting a few acres of warm-season annual forage grasses that will serve as emergency forage. Selecting a type or variety of summer annual should be based on the needs of individual livestock programs. Summer annual grasses have different growth characteristics



which influence how they are best used. Large differences in yield and quality occur among species, varieties, and hybrids.

Table 1. Establishment of summer annual forage grasses.

Forage Crop	Seeding rate (lb PLS ¹ /acre)	Planting depth (in)	First grazing (weeks)	Estimated Hay Yield (ton/acre)	Palatability
Crabgrass	4 – 6	¼ - ½	5	4 – 6	High
Browntop millet	15 – 20 25 – 30 ²	½ - 1	4	2 – 3	Medium to high
Forage Sorghum	4 – 6 15 – 20 ²	1 – 2	8	3 – 6 15 – 30 ³	Medium to high
Foxtail millet	15 – 20 20 – 30 ²	½ - 1	5	2 – 3	Low
Pearl millet	12 – 15 25 – 30 ²	½ - 1 ½	5	2 – 4	High
Sudangrass	20 – 25 30 – 35 ²	½ - 1	4	3 – 4	High
Sorghum-sudan hybrids	20 – 25 30 – 35 ²	1 – 2	4	4 – 5	Medium to high

¹PLS = Pure live seed.

²Broadcast rate.

³Silage.

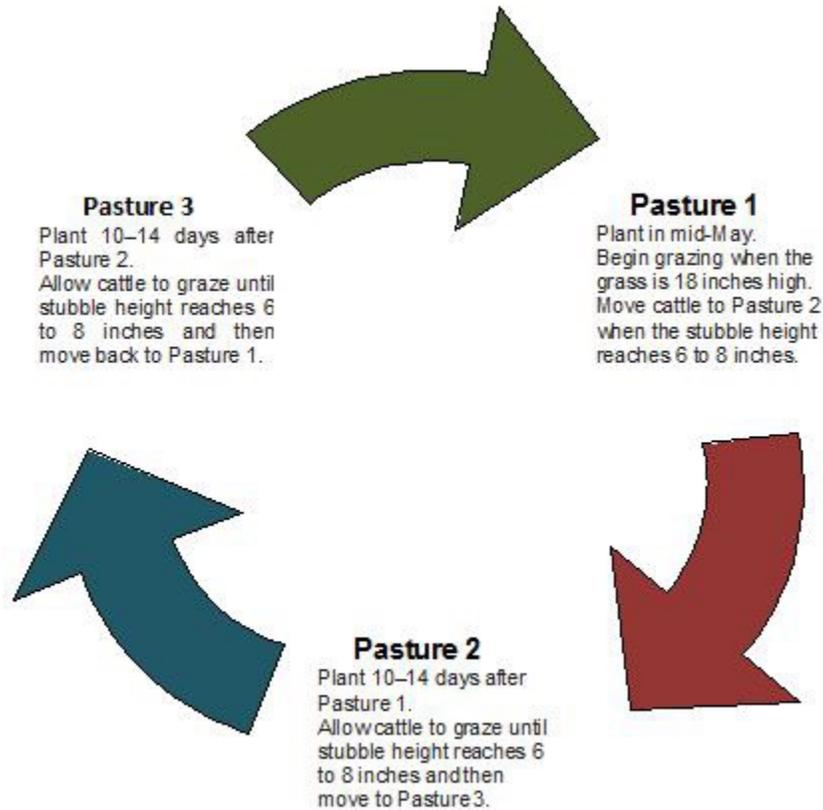


Figure 1. Rotational grazing plan for summer annual forage grasses.