

Summer Annual Forage Grasses

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The summer annual grasses used most frequently for forage in Nebraska each have unique growth characteristics. Proper management is essential for optimum production.

Summer annual grasses are used for summer pasture, green chop, hay, silage, and winter pasture. They are often used as emergency forage. In addition, residues of summer annuals make excellent seedbed mulch for new stands of perennial grass, particularly on sandy soils.

The summer annual grasses most often used for forage in Nebraska are sudangrass, sorghum-sudangrass hybrids, forage sorghums, foxtail millet, pearl millet, and teff. Each of these grasses has unique growth characteristics that require proper management for optimum production.

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. Alkali soils can reduce yields considerably, but plants will tolerate a moderate amount of salinity. They are well-adapted to most areas of the state and grow rapidly following planting in late May or June. They provide good growth from mid-July through August, and then moderate growth until stopped by fall frost.

Plant Descriptions

Each type of summer annual grass has characteristics that make it more or less suitable for various uses or growing conditions. Forage yield and quality are affected by plant type, soil fertility, moisture, growing conditions, and harvest management. Some comparative yields under irrigation are shown in *Table I*.

Sudangrass

Sudangrass has relatively thin stems, tillers extensively when conditions permit, and can regrow rapidly. Thus, it is better suited to pasturing than other types of sorghum. Hybrid sudangrass crosses usually yield slightly more than true sudangrass varieties in multiple-cut harvest systems.

Sudangrass usually has less risk of prussic acid poisoning than sorghum-sudangrass or forage sorghum.

Table I. Range of dry matter yield for summer annual forages under irrigated conditions.

Forage	Tons/acre*
Sudangrass	4.1 to 4.8
Sorghum-sudangrass hybrid	4.2 to 5.3
Forage sorghum	4.4 to 5.3
Pearl millet	3.8 to 4.5
Foxtail millet	2.8 to 3.8
Teff	2.6 to 3.8

*Yield ranges include the primary and regrowth harvest for all forages except forage sorghum and foxtail millet.

Sorghum-Sudangrass Hybrids

Sorghum-sudangrass hybrids are the most numerous of the various types of summer annual grasses. Most of these are available as commercial hybrids. They are high-producing forage grasses, but more than 50 percent of their yield usually comes from their stems. Their rate of regrowth after repeated clippings or grazing is lower than that of sudangrass. Thus, sorghum-sudangrass hybrids are best suited for hay or green chop.

Cattle consuming sorghum-sudangrass hybrids sometimes gain or milk less than cattle consuming other summer annuals, apparently due to lower energy content. When these hybrids are cut at immature stages, quality is higher but yields are much lower.

Forage Sorghum

Forage sorghums are usually tall growing and mature late in the growing season. Often called “cane,” forage sorghums often have sweet and juicy stems. Many have relatively small grain heads.

As silage, forage sorghums usually yield more dry matter per acre than dryland corn, and will yield similarly to corn under irrigation. However, yields of TDN (total digestible nutrients) per acre are usually lower from forage sorghums than from corn.

Grazing of forage sorghums is not recommended. They usually contain much higher levels of prussic acid than other summer annual grasses and can be dangerous to graze even

when plants are completely headed, especially when young shoots are present. Forage sorghums can be cut for hay, although their stems dry very slowly after cutting.

Foxtail Millet

Foxtail millet has relatively coarse stems yet dries quickly following cutting. It has a short growing season and is more dependable than other summer annuals on light, sandy soils. It will usually produce higher hay yields than other summer annuals following a late planting in the western two-thirds of Nebraska.

Foxtail millet does not root securely into the soil during early growth and is slow to regrow following grazing. Thus, it is not recommended for grazing except in an emergency.

Foxtail millet is a known host of wheat curl mite, which is the carrier of the wheat streak mosaic virus. While foxtail millet is not injured seriously by the virus, use proper precautions when planting foxtail millet and wheat in close proximity.

Pearl Millet

Pearl millet has become increasingly popular for grazing in recent years due to the development of commercial varieties adapted to Nebraska. It is very leafy, regrows well after grazing, yields about the same as sudangrass, and does not cause prussic acid poisoning.

Pearl millet is fairly drought tolerant and has low prussic acid potential, but it has thicker stems than foxtail millet so it dries down more slowly when cured for hay. Its sensitivity to cool weather limits its usefulness to only the hottest times of the year.

Teff

Teff has very fine stems, grows rapidly once established, regrows rapidly in mid-summer, and has a high leaf:stem ratio. It is fairly drought tolerant once established. It can be harvested 45-55 days after planting. It is used most commonly for hay. Grazing can result in some uprooting of the shallow crop, especially early in the growing season. Teff is not known to cause either prussic acid or nitrate poisoning.

Seeding

Seedbed Preparation

A firm, well-prepared seedbed is essential for good stands of summer annuals. As in all grass seedings, firm seed-to-soil contact is necessary for rapid germination. Stands also can be established using minimum tillage methods into small grain stubble if annual weeds and volunteer grains are controlled. Other methods, such as interseeding summer annual grasses into existing grass sod, generally have not been effective in Nebraska.

Date

Summer annual grasses are warm-season grasses. Growth is slow during cool weather and seeding into cold soil can result in poor stands and stunted growth. Soils should be

above 60°F when seed of sudangrass and sorghum is planted. Seedings made in late May and early June usually give good results in Nebraska.

Pearl millet, foxtail millet, and teff cannot tolerate cold, wet soils, and air temperatures below 50°F can stunt growth. Soils should be 65 to 70°F before seeding in June. Seedings can be made throughout July and still produce a respectable hay crop if moisture is available.

Plan your seeding date to produce desirable feed when you need it. Stagger planting dates to aid rotational grazing as illustrated in *Table II*. Seed about August 1 for winter pasture. Remember: little usable forage is available until about six weeks after planting.

Method

The best method for planting sudangrass, sorghum-sudangrass, and pearl millet for pasture or hay is with a grain drill at a depth of 1 to 1½ inches into moist soil. Plant forage sorghum 1 to 1½ inches deep in conventional width (20- to 40-inch) rows for silage. Foxtail millet should be planted ½ to 1 inch deep with a grain drill or cultipacker seeder.

Teff has extremely small seed that must be planted no more than ⅛ to ¼ inch deep. A cultipacker seeder is effective, as is a grain drill when the seedbed is very firm. Broadcast seedings can be effective on slightly rough, loose seedbed soils if irrigation or rainfall is adequate soon after seeding.

Double or cross drilling (seeding one-half the seed in one direction and the remaining seed in a different direction) sometimes can help develop stands and a plant canopy that aids in weed control.

For good stands, plant high-germinating seed that has been treated with a fungicide.

Rate

Seed sudangrass, sorghum-sudangrass, and foxtail millet at 15 to 25 pounds of seed per acre. Use 6 to 12 pounds per acre for forage sorghum and pearl millet. Use the lower rates in dry areas and higher rates in humid and irrigated areas. Higher seeding rates will help produce finer stems, which is often desirable for pasture and hay. Some varieties and hybrids have larger seeds that may require higher seeding rates to assure good stands.

Teff should be planted at 4 to 6 pounds of raw seed or 8 to 10 pounds of coated seed per acre.

Fertilization

Summer annual grasses do best on fertile soil, but will grow successfully on most soil types from heavy clays to light sands. Because they can grow rapidly, moisture and nutrients must be adequate for high production.

Use soil tests to determine phosphorus and other fertilizer needs. Apply 40 to 80 pounds of N per acre around seeding time. Where moisture is adequate, higher rates may be justified. Split applications of nitrogen will provide a better distribution of grass growth and lessen the nitrate poisoning potential, especially when the total amount of N to be applied exceeds 60 pounds per acre.

Table II. Plan for rotation grazing.

<i>When to SEED</i>		
<i>Field A</i>	<i>Field B</i>	<i>Field C</i>
During late May or early June.	10 to 14 days later than Field A.	10 to 14 days later than Field B.
<i>How to PASTURE</i>		
<i>Field A</i>	<i>Field B</i>	<i>Field C</i>
Begin about early July after grass is 15-20 inches high and for 7 to 10 days. Then move livestock to Field B.	Graze for 7 to 10 days. Then move livestock to Field C.	Graze for 7 to 10 days. Then move livestock back to Field A.

Weed Control

Weeds are seldom a problem when summer annual grasses are planted into weed-free, well-prepared, warm, moist soils, due to rapid growth of the forage. Cultivation will control many weeds in row plantings. A few herbicides are labeled for use on various summer annual grasses. See Extension Circular EC130, *Guide to Weed Management*, for more information and be sure to read and follow label directions on all herbicides. Nitrate and prussic acid levels may increase for a short period of time following spraying with some herbicides.

Methods of Use

Summer Pasture

Sudangrass, pearl millet, and sorghum-sudangrass can provide supplemental summer pasture when cool-season grasses go dormant and the feed supply is short.

Sudangrass and pearl millet often produce better pasture than sorghum-sudangrass because they are usually leafier. They also provide a more uniform supply of feed for grazing and support higher daily gains or milk production. Sorghum-sudangrasses produce higher yields, but are better used to support livestock on maintenance or lower productivity levels.

Graze these summer annual grasses in a short, rotational grazing system. Subdivide fields into three or more pastures so that each pasture can be grazed down in 7 to 10 days. Stagger the date of planting each pasture by about 10 to 14 days so that grazing will begin on each pasture when growth is at the appropriate height. This rotation system allows maximum production of nutritious forage. Pastures can be irrigated and fertilized after each grazing period if desired.

Graze sudangrass and pearl millet when they reach 15 to 20 inches in height and sorghum-sudangrass hybrids when they are 18 to 24 inches tall. Danger from prussic acid poisoning will be low when grazing is delayed until grass is this tall. Graze down rapidly to 6 to 8 inches of stubble before moving livestock to a fresh pasture, and do not graze regrowth until at least 18 inches of growth accumulates. If growth is more than 36 inches tall, harvest as hay, green chop, or silage since grazing cattle will trample and waste much of the growth. Regrowth will be more rapid following cutting this taller growth than if it is trampled.

Summer grazing lasts about two months. Grazing management, soil fertility, and moisture will determine production at any location.

Sudangrass, sorghum-sudangrass hybrids, and forage sorghum pastures are not recommended for horses because kidney ailments may develop.

Winter Pasture

Winter pasture can come from either standing summer annual grasses or by windrow grazing. See NebGuide G1616, *Windrow Grazing*, for more information.

Some summer annual grasses make acceptable winter pasture for beef cows and dry dairy cows. The quality of this feed will be higher if planting is delayed so that the crop does not reach maturity before frost. Tonnage of dry matter per acre will be lower, but protein content of the forage will be higher. Less lodging should occur if frost catches the crop prior to the flowering stage of maturity compared to later stages of maturity.

Trampling and field losses will be lower during pasturing of a standing crop if it is planted in rows 20 inches wide or wider, and cattle are limited to areas that furnish no more than a week to 10 days supply of feed at a time. Only mineral and vitamin A supplementation should be needed when cattle are grazing immature forage during early winter. If the crop matures before frost, protein supplementation may be desirable for cows within 60 to 90 days of calving.

Green Chop

Sorghum-sudangrasses and pearl millet are well-suited to a green chop program. Under a 3- to 4-cut system, these forages produce higher yields than other summer annual grasses.

Field losses are less from green chopping than from grazing or haying. However, the fast rate of growth of sorghum-sudangrass results in variable amounts and quality of feed throughout the growing season. When grass is young and growing rapidly, it may contain 20 percent crude protein and produce a highly succulent feed. As the crop grows taller and nears maturity, the protein content may drop to 7 percent or less, and a coarse, fibrous, low quality green chop is produced (*Table III*).

Table III. Feed value of sorghum-sudangrass forage at six stages of maturity.

<i>Stage of Maturity</i>	<i>TDN</i>	<i>Crude Protein</i>
	<i>percent</i>	
Early Vegetative	69-72	18-20
Late Vegetative	67-71	15-17
Boot	64-68	11-14
Heading	62-66	10-13
Bloom	58-62	9-11
Dough	55-59	6-9

Nitrates can become a problem in a green chop program under certain growing conditions. Never feed green chop that has heated in the wagon, feed bunk, or stack, or that has been held overnight. Nitrates are converted to nitrites as plants respire; nitrites are about 10 times more toxic than nitrates.

Hay

For good quality hay, harvest sudans, sorghums, and pearl millet before heads emerge or when they are 30 to 40 inches tall. Leave about 8 inches of stubble to hasten drying, reduce nitrates, and encourage regrowth. Use a hay conditioner to speed drying of the stems. Even then, it will normally take several extra days to dry to satisfactory moisture levels. Harvest teff in the boot to first head appearance stage, leaving 4 inches of stubble. These hays will contain slightly less protein than alfalfa hay and as much energy as good quality prairie or alfalfa hay.

Foxtail millet should be harvested in the late boot to early bloom stage for good quality hay. Since it will produce little or no regrowth, cut short to maximize yield. Crude protein then will be about 8 to 10 percent and TDN about 55 to 60 percent. Later harvest will lower quality and cause feeding problems due to seedhead bristles.

Do not feed horses foxtail millet hay as a major component of their diet. Damage to the kidneys, liver, and bones can occur due to setarian, a glucoside.

Silage

Forage sorghums are frequently planted for silage production on dryland acres throughout Nebraska. Generally, forage sorghum silage has 75 to 85 percent of the energy value of corn silage per unit of dry matter, while other summer annual grasses have 60 to 80 percent of the value of corn silage.

Most summer annual grasses need to be wilted or mixed with dry feeds to make satisfactory silage. Silage is often cut soon after frost to reduce moisture, especially with forage sorghums. Cutting short will maximize yield from that harvest. Taller stubble (8 inches) can hasten drying, reduce the risk of nitrate poisoning, and encourage regrowth.

The moisture content should be 70 percent or less for good preservation in upright silos. Wilting high moisture forage can be difficult because the crop dries slowly and regrows rapidly when soil moisture is adequate. Silage between 70 and 75 percent moisture can be stored in trench or bunker silos. Dry feed can be added to high-moisture forage to reduce the overall moisture level.

Prussic Acid Poisoning

The young plants and leaves of sudangrass, sorghum-sudangrass hybrids, and forage sorghum contain a chemical that breaks down and is released as prussic acid (hydrocyanic acid). Its content in plants can be affected by climate, soil fertility, and plant maturity as well as variety. Its presence should not deter producers from realizing the potential value of these annual forage crops.

Avoid feeding hungry animals young, succulent feed of these grasses. Allow plants to reach heights of 15 to 20 inches for sudangrass and 18 to 24 inches for sorghum-sudangrass crosses before grazing to dilute the concentration of prussic acid in the plant. Do not graze forage sorghums unless they are several feet tall. Give animals a full feed of hay before first turning them onto pasture, and always have plenty of clean, fresh water available. Free choice salt and mineral with added sulfur will help minimize the toxin's effect. See NebGuide G2184, *Cyanide Poisoning*, for more information.

Teff, pearl millet, and foxtail millet have not caused prussic acid poisoning, and prussic acid has not been found in the plants.

Nitrate Poisoning

The nitrate content of summer annual grasses can be high under a variety of growing conditions. While not usually a problem in pasture unless cattle consume the lower one-third of the stalk, nitrates can become important in a green chop or hay program. When in doubt, put the crop into the silo where the nitrate content is often reduced by 40 to 60 percent during the ensiling process, or feed only limited amounts of green chop and hay in the total ration to limit nitrate intake. For more information on nitrates, refer to NebGuide G1779, *Nitrates in Livestock Feeding*.

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