



Summer Annual Grasses

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Livestock production in Tennessee is based on cool-season perennial forages such as tall fescue and orchardgrass. These grasses are productive during the spring and fall, but become semi-dormant during the summer months. The need for quality forage during this time of the year can be met by using summer annuals such as pearl millet and sorghum X sudangrass hybrids. These summer pastures provide the opportunity to rest cool-season pastures such as orchardgrass-clover, resulting in a pasture that is more persistent and productive in the fall.

There are several opportunities to use summer annuals in a feeding program. They can be cut and taken directly to the cows, wilted and placed in a silo, or dried and stored as hay. These forages could also be harvested through grazing. Using temporary electric fencing to divide an area into paddocks (small pastures) and then grazing each paddock in rotation is an efficient way to harvest a summer annual forage.

Summer annuals can be planted following a small grain crop, providing almost year-round production of high-quality forage. Beef producers can use the pasture as a creep pasture for growing calves, or as a high-quality summer supplement for beef cows on pasture. Dairy producers can use summer annual pasture to reduce feed costs. Allowing

cows to obtain a portion of their intake through grazing will help decrease the dependence on stored feed, while maintaining milk production.

The major summer annual grasses grown for forage in Tennessee are sorghum X sudangrass hybrids and pearl millet. Both are leafy plants that can grow 3 to 8 feet tall and produce relatively high-quality forage if utilized before the forage becomes mature. Even though these two grasses are often considered to be similar in their potential uses, there are several differences between these plants which result in contrasts in the practices needed to produce each forage (Table 1).

Steps for establishing summer annual forages:

(1) Planting method - Pearl millet and sorghum X sudangrass hybrids can be planted by using conventional or no-till methods. Conventional tillage ensures the reduction of competition from existing vegetation. For successful no-till planting, this vegetation must be killed chemically with a burn-down herbicide such as Gramoxone Extra® or Roundup®. No-till plantings generally provide a firmer base for grazing than conventional establishment. Sorghum X sudangrass hybrids should be planted 1 to 2 inches deep. Because of the smaller seed size of

pearlmillet than that of sorghum X sudangrass hybrids, pearlmillet should be planted $1/2$ to $1\frac{1}{2}$ inches deep.

- (2) **Planting dates** - Summer annuals can be planted from late spring through mid-summer. Sorghum X sudangrass hybrids are more tolerant of low temperatures than pearlmillet and can be planted earlier in the year, when there is still a chance of a late spring frost. The recommended seeding dates for sorghum X sudangrass hybrids are from April 20 to July 1. Pearlmillet should be planted from May 1 to July 15.
- (3) **Seeding rates** - Pearlmillet should be planted at the rate of 10-15 lb/acre if drilled, or 20 lb/acre if broadcast. Sorghum X sudangrass hybrids should be planted at 30 lb/acre if drilled, or 45 lb/acre if broadcast.
- (4) **Fertilization** - Summer annuals should be fertilized with potash and phosphate and limed according to soil test. Oftentimes these crops may follow a small grain crop which has been well fertilized. There is no way to know if the crop will be under- or over-fertilized without a soil test. Apply 60 lb N/acre at establishment, and up to 60 lb N/acre in mid-July after a harvest.
- (5) **Weed control** - Once the crop has been established, evaluate the stand periodically to determine the need for chemical weed control. For broadleaf weed control in

sorghum X sudangrass hybrids and pearlmillet, 2,4-D can be used. Apply 1 to 1.5 pints per acre of the amine formulation after the plants have tillered. Be aware of any sensitive crops in nearby areas. Significant movement of this herbicide can occur through volatilization during hot weather. Refer to the label for more information.

A second option for weed control in sorghum X sudangrass hybrids is atrazine. Apply 2.0 lb active ingredient per acre. Apply overtop once a stand is obtained and before the weeds exceed 1.5 inches in height. Do not apply atrazine after the crop reaches 12 inches in height. Atrazine should also not be used on fields that will be fall planted to alfalfa. Atrazine is not labeled for use in pearlmillet. Refer to the label for surface and groundwater protection measures.

Utilization

Pearlmillet can be grazed when the plants reach 12 inches in height. Sorghum X sudangrass hybrids should not be grazed before they reach 18 inches. There is often a large amount of waste due to trampling when summer annuals are grazed. To minimize the amount of waste, electric fencing can be used to divide a pasture into smaller paddocks. Allow animals access to only one paddock at

Table 1. Planting information about pearlmillet and sorghum X sudangrass hybrids.

		pearlmillet	sorghum X sudangrass
planting date		May 1 to July 15	April 20 to July 1
planting rate	drilled	10-15 lb/acre	30 lb/acre
	broadcast	20 lb/acre	45 lb/acre
planting depth		$1/2$ to $1\frac{1}{2}$ inches	1 to 2 inches
tolerant of light frost after planting		no	yes
tolerant of acid soil		yes	no

a time. Paddocks should be small enough so that no more than three to four days are required for the animals to consume most of the forage. Cattle should be removed when the plants are grazed down to 6 inches. Once the animals are rotated to another paddock, clip the remaining stubble to a 6-inch height. Allow the forage to regrow to the proper height before grazing in the paddock again.

If the plants get to the boot stage (just before heads appear) or 40 inches tall, mow for hay or silage. If for silage, wilt the crop to 50 to 60 percent moisture. If for hay, the plants must be dried to 18 percent moisture before baling. These forages have relatively large stems, so a conditioner will help speed drying.

Toxicities

In certain situations, sorghum X sudangrass hybrids and pearl millet can be toxic to grazing livestock. Even though these toxicities might not be common, they can result in a large economic loss to the producer.

Nitrate poisoning

Nitrate poisoning occurs when animals consume hay or pasture containing high levels of free nitrates. Under drought conditions, both sorghum X sudangrass hybrids and pearl millet have the potential to accumulate high levels of nitrates, especially if they have been fertilized with nitrogen. Grazing these plants during a drought, or feeding hay that was cut during or just after a drought should be avoided.

Nitrate accumulation occurs because the plant continues to take up nitrogen through the roots, but drought conditions cause an inadequate water supply for rapid plant growth. Nitrates are accumulated in the plant for use in protein formation when adequate water becomes available.

When the animal consumes a plant with high nitrate levels, the nitrogen is converted from nitrate to a form called nitrite. These nitrites get into the blood stream and interfere with the ability of red blood cells to

carry oxygen. Animals suffering from nitrate poisoning exhibit labored breathing, muscle tremors and staggering. Membranes of the eyes and mouth are bluish because of the lack of oxygen. Death can occur relatively quickly.

Prevention is the best way to deal with nitrate toxicity. If any pasture is suspected of having high nitrate levels, avoid grazing these pastures until seven to 10 days after an adequate rain. Hay that is suspected of having high nitrate levels can be analyzed. Contact your local Extension office for more information. Table 2 lists a scale of the toxicity of increasing nitrate levels in hay.

Prussic acid poisoning

Prussic acid poisoning occurs when animals consume plants that contain high levels of prussic acid, a form of cyanide. Potentially toxic levels can develop in sorghum X sudangrass hybrids immediately after a frost, or in new growth after a drought. Pearl millet does not produce prussic acid.

Prussic acid interferes with the ability of red blood cells to transfer oxygen. Symptoms include excessive salivation, rapid breathing and muscle spasms. Symptoms may occur within 10 to 15 minutes after the animal consumes the forage high in prussic acid.

It is important to realize that prussic acid poisoning and nitrate poisoning are not the same thing. Nitrates will remain in hay and silage, while prussic acid will deteriorate over time. Forage that has been dried to 18 percent moisture for hay or that has fermented for haylage will not have high levels of prussic acid. Both pearl millet and sorghum X sudangrass hybrids have the potential for nitrate poisoning. Sorghum X sudangrass hybrids also have the potential for prussic acid poisoning, while pearl millet does not.

Summary

Pearl millet and sorghum X sudangrass hybrids are useful in a forage system because they produce of quality forage during the summer. These forages can be used across the state to provide nutrients either as grazing or as stored feed to any ruminant of livestock that requires high-quality forage.

Table 2. Guide to determine the potential for nitrate toxicity in hay.

Nitrate level (ppm, DM basis)		Comments
0 - 2,500	SAFE	Generally considered safe to feed.
2,500 - 5,000	CAUTION	Generally safe when fed with a balanced ration. For pregnant animals limit to one-half of total dry ration. Do not feed with liquid feed or other non-protein nitrogen supplements. Be cautious with pregnant or young animals.
5,000 - 15,000	DANGER	Limit to one-fourth of ration. Should be well fortified with energy, minerals and Vitamin A. May experience milk production loss in 4 -5 days, possible occurrence of reproduction problems.
Over 15,000	TOXIC	Toxic. Do not use in free-choice feeding program. Feed with such high levels should be ground and limited to 15% of total ration.

Source: Ball and co-workers. 1991. Southern Forages.



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