

# MU Guide

PUBLISHED BY UNIVERSITY EXTENSION, UNIVERSITY OF MISSOURI-COLUMBIA

## Caucasian Bluestem

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Caucasian bluestem, *Bothriochloa ischaemum*, is a warm-season perennial grass that was introduced from Russia in 1929. Caucasian belongs in the group known as Old World bluestems and is not related to Missouri's native species such as big and little bluestems. Early reports referred to caucasian as a bunch grass, but older stands tend to form a sod. Caucasian bluestem is an erect, fine-stemmed, leafy grass. Forage yields usually exceed other adapted Old World bluestems. Compared with other warm-season perennial grasses, it is easily established from seed. No serious disease problems have been reported on caucasian, and it is well adapted throughout southern and central Missouri. However, in yield and adaptation, it compares less favorably with native warm-season grasses when grown in the northern part of the state.

### Growth characteristics

Caucasian bluestem is like other warm-season perennial grasses in that most of its growth comes in the summer, when cool-season grasses such as tall fescue are not productive. Warm-season grasses have maximum growth when temperatures are 90 to 100 degrees F. In addition, they use water more efficiently, producing about twice as much growth on the same amount of water as cool-season grasses during the summer growing season.

Caucasian bluestem starts spring growth a few days later than switchgrass but earlier than big bluestem and Indiangrass. First growth of caucasian usually appears by early May, but a major portion of the grazeable growth of caucasian occurs after June 1. This compares to about 70 percent of the grazeable growth being produced after June 1 for switchgrass. All of the grazeable growth of big bluestem and Indiangrass is produced well after June 1.

Caucasian was first considered for use in Missouri because it is relatively easy to establish and

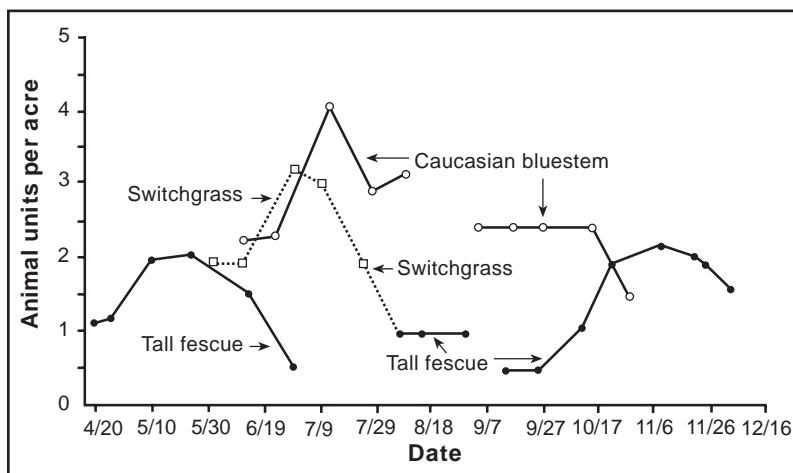


Figure 1. Carrying capacity of tall fescue, switchgrass and caucasian bluestem measured as animal units per acre at the Southwest Research Center in 1971.

has the ability to withstand close and frequent defoliation. It also produces high yields of forage under hot, dry growing conditions. Caucasian also ranks higher than switchgrass in its regrowth potential after late summer rain. Caucasian bluestem pastures planted more than 30 years ago near Ft. Supply, Oklahoma, have survived many extremes in climate and remain productive. Similarly, there are several pastures in southern Missouri that are more than 15 years old.

The ability of caucasian to produce considerable forage in the summer and withstand heavy stocking rates of animals has contributed to its popularity in south Missouri (see Figure 1).

Caucasian bluestem has some plant characteristics that may not be acceptable to some Missouri farmers. For example, its light, fluffy seed makes harvest and mechanical seeding more difficult than for cool-season grasses and some native warm-season grasses.

Early studies at the University of Missouri Southwest Research Center reported individual animal performance on caucasian bluestem was slightly lower than on switchgrass. However, one study reported 128 days grazing on caucasian versus 85 days on switchgrass. This greater carrying capacity is largely due to better regrowth of caucasian. In trials at other states in the Midwest, big bluestem and

\*The information in this publication was originally developed by former extension specialist Jimmy C. Henning.

Indiangrass generally produce higher average daily gains than switchgrass. In Oklahoma, caucasian bluestem compares favorably, but big bluestem and other native grasses are preferred in Kansas. Studies in Nebraska indicate caucasian is not well-adapted. These different reports reflect change in climate and its effect on the relative adaptation of the species. Missouri data have also shown that caucasian is more favorably used in south Missouri than in north Missouri. When big bluestem or Indiangrass can be properly managed, they offer more potential in animal performance. But they are much less tolerant of management variations, especially close grazing.

Wildlife biologists prefer native warm-season grasses for wildlife, especially big bluestem, little bluestem and Indiangrass. Caucasian bluestem forms more sod than the native grasses mentioned above and is normally grazed much closer than they are. These factors make caucasian less desirable for bobwhite quail nesting and cover. Field observations indicate that caucasian may be difficult to control using herbicides and tillage. In Lawrence County, caucasian bluestem survived even after treatment with glyphosate in the spring followed by plowing. Use caucasian to seed permanent pasture ground and not for land that needs to be rotated to another forage or row crop.

There have also been reports of caucasian spreading into adjacent areas. Twenty-year-old stands of caucasian at the Southwest Research Center near Mt. Vernon have moved less than 5 feet into adjoining fields of tall fescue. However, some areas in Texas report an Old World bluestem similar to caucasian encroaches vigorously road rights-of-way and adjacent fields. The above observations would indicate caucasian has the ability to spread by seed, but this may be more of a problem in areas with long, hot growing seasons and less competition from grasses such as fescue.

## Establishing stands

Caucasian bluestem seed, usually containing some trash, is difficult to establish. It is important to have a weed-free, firm, finely textured seedbed. Good seed-to-soil contact is essential. Recent work in Missouri shows that the best stands result when planted during the last few days of April or early May. Seedings made at a later date may be successful if followed by good summer rains. However, these late seedings are not recommended.

No-till drills that are designed for fluffy grass seeds will do a good job of seeding clean caucasian bluestem seed. Most of the earlier seedings in the state were made by mixing the seed with phosphorus and potassium fertilizer and seeding with various kinds of equipment. Good stands of caucasian have been obtained from seeding this mix through grain

drills set to seed very shallow, "easy flow" fertilizer distributors, fertilizer buggies and even fertilizer trucks. The seed/fertilizer mix will move better from the broadcast spreaders that have a chain-type belt to pull the material back to the spreader fans.

When using the broadcast method, blending the seed-fertilizer mix for up to 30 minutes will make the seeding operation easier. Note: When broadcasting seed, the equipment must be driven very close (almost track to track), or streaking will occur. Seed should be covered lightly, preferably  $\frac{1}{4}$  inch or less. A cultipacker or roller used before and after seeding will help firm up the seedbed and make better seed-to-soil contact. This will usually do an adequate job of covering broadcast seed.

Seed will flow better through most seeders if it is first run through a hammermill. Best results are achieved when using a  $\frac{1}{8}$ -inch screen and operating at between 400 and 450 rpm. A note of caution: The hammermill process will shell out the small hard seed that settles to the bottom of the container. This settling makes it difficult to get a representative seed sample for testing. Test seed for germination and purity before the hammermill process.

Seeding rates of 2 pounds of pure live seed (PLS) per acre will produce acceptable stands. Considerable variations will be seen in the quality of caucasian bluestem seed. When purchasing seed, always ask for the results of a purity and germination test so that the percentage of PLS can be determined. To determine PLS, multiply percent germination by percent purity and divide by 100. Example: 40 percent germination  $\times$  60 percent purity = 2,400, which when divided by 100 = 24 percent PLS. In this example, 10 pounds of bulk material will give 2.4 pounds of PLS.

Limestone and starter fertilizer should be applied according to soil test recommendations. You can safely exceed the soil test recommendations for phosphorus and potassium when broadcasting seed if more carrier material is needed to obtain good seed distribution. Always spread the fertilizer/seed blends as soon as possible after blending.

Young caucasian plants grow very slowly and do not compete well with fast-growing weeds. Timely clipping or temporary intensive grazing can be used to reduce weed competition. However, the proper use of 2,4-D will usually better control broadleaf weeds.

First-year growth of caucasian bluestem should not be used for hay or pasture until the plants are near maturity. This delay will help promote good root growth and stronger, more dense stands.

## Management and use

Caucasian bluestem will have its greatest value when used for pasture in June, July, August and September. It will produce much better animal performance when it is grazed close to keep it in the vegeta-

tive stage of growth. Earlier grazing trials in Missouri allowed the plants to become too mature before grazing. With this grazing management, yearling beef steers gained about 1 pound per day. Recent summer grazing trials have produced about 2 pounds per day with yearling Holstein steers and heifers when grass was kept in a more vegetative stage. Oklahoma summer grazing trials report gains of 1.4 to 1.7 pounds per day with yearling beef cattle.

Evaluation of 11 warm-season grasses in small, ungrazed plots at the Forage Systems Research Center in north Missouri showed that caucasian bluestem had the most desirable leaf-to-stem ratio on May 21 because it produced an abundant supply of leaves early. But on June 17, only Pathfinder switchgrass had a lower leaf-to-stem ratio than caucasian bluestem. Big bluestem and Indiangrass had more desirable (higher) leaf-to-stem ratios than caucasian on June 17. Big bluestem and Indiangrass do not develop stem growth until later in the season.

These facts point out that early summer growth of caucasian bluestem must be harvested, by grazing or hay, to keep the forage in good quality and in a palatable stage of growth. Best animal performance occurs if spring grazing is started when caucasian is no more than 6 to 8 inches tall. This will usually occur in the last part of May in south Missouri and about the first of June in north Missouri. This may vary as much as seven days from year to year.

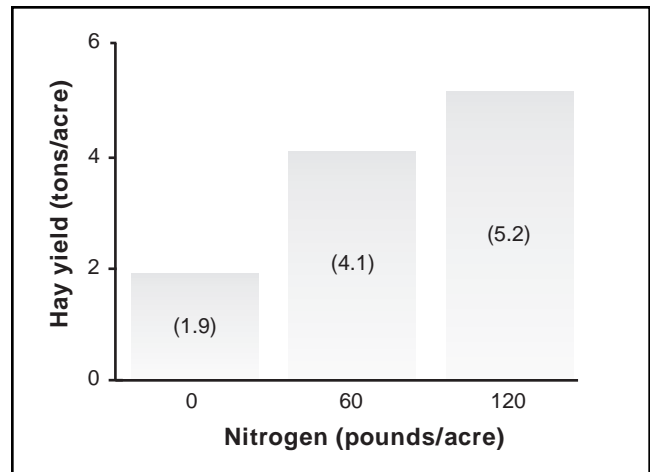
Surplus caucasian growth will make hay of acceptable quality if harvested at late boot stage of maturity. Then allow plants to start regrowth for late summer (September) pasture or let it grow for a seed crop to be harvested in October. Caucasian is not good for fall and winter grazing. Tall fescue is a better choice for fall and winter stockpiled feed (see Table 1). Considerable feed supplementation will be required when grazing stockpiled caucasian bluestem.

**Table 1. Accumulated forage, Dec. 20, in south Missouri.**

Forage species	ADF <sup>1</sup>	Protein (dry matter basis)	TDN <sup>2</sup>
Caucasian bluestem	56.9%	2.14%	47.2%
Tall fescue	44.7%	6.53%	56.9%

<sup>1</sup>ADF stands for acid detergent fiber and represents the portion of plant fiber that is poorly digested.  
<sup>2</sup>TDN = total digestible nutrients.

Producers and researchers agree that the best use of caucasian bluestem is to fit it into a grazing system that includes cool-season grasses or mixtures of cool-season grasses and legumes plus separate pastures of one or more species of warm-season grasses for summer grazing. Since caucasian is usually a high-yielding summer forage, make sure that adequate numbers of grazing animals are available to use the pasture. Warm-season grasses will be much easier to



**Figure 2. Response of caucasian bluestem to nitrogen. Five-year study. Southwest Research Center, Mt. Vernon, Missouri.**

manage in a pasture if only one species is seeded in a field. In evaluating caucasian bluestem for use in a pasture system, remember that it is fairly easy to establish, it tolerates close grazing and it produces grazeable pasture a few days later than switchgrass.

Researchers and producers report that caucasian bluestem responds well to moderate applications of fertilizer. A 5-year study at the University of Missouri Southwest Research Center reported that 60 pounds of nitrogen produced 4.1 tons of hay per acre (see Figure 2). Increasing the nitrogen rate to 120 pounds per acre raised hay yields by 1.1 tons.

During a 3-year yield study in Oklahoma, 60 pounds of nitrogen per acre produced an average of 4 tons of dry matter per acre on a deep fertile soil. The same rate of nitrogen application produced slightly less than 2 tons of dry matter per acre on a sandy loam soil. In south Missouri, the forage yield of caucasian bluestem was greater than two of the warm-season native grasses (see Table 2). Caucasian has not demonstrated this yield advantage over the native grasses when grown in the northern part of the state (see Table 3).

The time of fertilizer application on caucasian has considerable influence on maintaining clean stands and getting the most economical return on fertilizer

**Table 2. Average yield and quality of grasses.**

Forage species	Forage yield (dry matter tons/A)	Crude protein		Digestibility	
		First Season harvest average	First Season harvest average	First Season harvest average	First Season harvest average
		(percent)			
Tall fescue	2.46	14.5	14.5	65	63
Caucasian bluestem	4.01	8.0	8.0	49	46
Indiangrass	2.94	11.5	9.5	62	56
Switchgrass	3.19	12.6	10.8	59	54

**Note:** Data show average of three years from two locations in the 1960s (Natural Resources Conservation Service Plant Materials Center and MU Southwest Research Center).  
Harvested every 4 to 6 weeks.

**Table 3. Dry matter yield of warm-season grasses, 3-year average (1984–1986).**

Forage species	Average yield <sup>1</sup> (pounds/acre)	1987 yields <sup>2</sup> (pounds/acre)
Plains bluestem	2,859	Stand depleted
Caucasian bluestem	4,383	4,914
Pathfinder switchgrass	7,322	8,208
Big bluestem (avg. three varieties)	6,034	6,765
Indiangrass (avg. five varieties)	5,216	5,848

**Data source:** University of Missouri Forage Systems Research Center, Linneus (north Missouri).

<sup>1</sup>60 pounds of nitrogen applied each year in mid-May.

<sup>2</sup>All species allowed to proceed to 50 percent heading before harvest.

dollars. Fertilizer applications made too early will encourage the growth of cool-season grasses and other undesirable competition. Good results should be obtained by applying 50–60 pounds of nitrogen in early to mid-May along with phosphorus and potassium according to soil test recommendations. This spring application should be made at an early growth stage of the caucasian after it has greened up. To increase late summer production, apply another 40 to 60 pounds of nitrogen soon after the early growth is harvested (about mid to late July).

Missouri studies indicate limited success with interseeding legumes in caucasian bluestem pastures. Most test results demonstrate that annual lespedeza is the most compatible with caucasian. These studies have also included alfalfa, red clover, ladino clover and birdsfoot trefoil. Birdsfoot trefoil is the only other legume that has shown much promise as a companion crop for caucasian bluestem.

### Forage quality

Missouri producers report that beef cattle readily consume caucasian bluestem hay and perform very well on it. Most laboratory analysis of caucasian hay will show results of 6–10 percent crude protein and about 50 percent digestibility. However, cool-season grasses will have higher crude protein and digestibility than warm-season grasses at similar maturities.

Forage quality drops drastically if allowed to go much past the boot stage. In a Missouri hay feeding trial, caucasian tested at 5.3 percent crude protein and 1.9 percent digestible protein (see Table 4). Vegetative, well-fertilized caucasian may contain more than 10 percent crude protein. Laboratory forage tests of warm-season grasses may indicate lower energy values than are actually available to animals. This is demonstrated by the results of feeding trials where animals performed better than was predicted from forage quality analyses. Scientists indicate that some unknown factor in the fiber makeup of warm-season grasses makes it difficult to interpret chemical tests for quality.

### Seed production

The yields of pure live seed of caucasian bluestem have usually ranged from 20 to 40 pounds per acre. Because caucasian does not mature uniformly and produces fluffy seed, harvesting is difficult. Seed heads are formed twice a year — the first in June and the other in September/October. Seed development in Missouri is poor during June and most successful during the fall (October) seed crop.

Oklahoma researchers found that fields to be used solely for seed production will perform much better when planted in rows 24 to 36 inches apart. Following the first seed harvest (late June to early July), remove the residue to a stubble of 4 to 6 inches; then cultivate and fertilize for the fall seed crop.

The most successful approach to seed production in Missouri has been to

- Apply fertilizer in May that includes 50 to 60 pounds of nitrogen and follow soil test recommendations for applications of phosphorus and potassium.
- Graze the field close or harvest for hay, removing most of the growth by early July (to at least a 4- to 6-inch stubble).
- Apply an additional 40 to 60 pounds of nitrogen per acre in July — no later than early August. The heavier rates of nitrogen may cause some problems with lodging as seed yields are increased.

Harvest when a majority of seeds are in medium-to-hard dough stage. This stage of maturity will normally occur when about 50 percent of the ripe and ripening seedheads will strip off when pulled through a firmly closed hand. Seed will shatter badly if allowed to advance to full maturity. Because of the nature of the seed, combines must be operated without moving air through the seed to clean it. The air movement would carry seed on through the combine and back to the ground. One south Missouri farmer did an excellent job of reseeding his field by not shutting off the air from the blower. For successful combining of caucasian bluestem, also remember to

- Keep sickle sharp and in good condition.
- Keep the sickle height as high as possible to avoid harvesting excess foliage.

**Table 4. Hay quality and intake of tall fescue, switchgrass and caucasian bluestem.**

Forage species	Crude protein (percent)	Digestible protein (percent)	Daily ha intake* (pounds)
Tall fescue	14.4	11.2	15.8
Switchgrass	6.3	3.7	12.3
Caucasian bluestem	5.3	1.9	12.0

\*Each heifer received 4 pounds daily of a 12% protein grain.

**Source:** Bell, S, F. Martz, and A. G. Matches. 1976. P. 42 in Southwest Center Field Day Report. Agricultural Experiment

- Set the combine reel speed to touch seedstems only once before they are cut and laid on the platform. Excessive hitting of the seedstems by the reel will cause extra seed loss.
- Set the cylinder-concave gap as close as possible without clogging the combine. This setting will vary according to the amount of seedstems and leaf material that is cut to get the maximum number of seed heads.
- Set cylinder speed to the maximum in order to thresh all possible seed from the seedhead. (Speed will usually vary from 1,100 to 1,300 RPM.)

The smaller pull-type combines have been used more successfully in harvesting caucasian seed than larger self-propelled units. Combines should be operated at slow ground speed or considerable seed will be lost on the ground or will not be separated effectively in the combine. A rotating brush type harvester that attaches to the front of tractors has also been used successfully. Best results from this brush-type equipment occurs by going over the field twice at about 7- to 10-day intervals. This interval can vary according to the rate at which the seed matures.

Most caucasian seed will contain about 30 percent to 40 percent moisture at harvest time so seed must be dried. One method that works very well is to build a bin with a "false bottom" area covered with screen wire. Place seed on the wire as it is harvested. Force air through the seed by directing some type of fan under the seed. Drying time will vary according to the amount of air circulated through the seed, the amount of seed and the percentage of moisture in the air. Heating the air is not necessary, and air temperatures higher than 100 degrees F can reduce seed germination.

Always send a sample of the seed to an accredited seed testing laboratory. Obtain a purity and germination test to determine the PLS percentage. If seed is extremely trashy, it should be cleaned further before the seed sample is taken. A common method is to run the seed back through the combine. Some producers have developed screening platforms to remove most of the trash.

## Summary

Caucasian bluestem is easier to establish than native warm-season grasses and will make grazeable pasture in a shorter period of time. Caucasian responds well to fertilization, is palatable to cattle when properly managed, accommodates heavy stocking rates under hot, dry conditions and withstands close grazing. Cattle performance and carrying capacity of caucasian is certainly above that of cool-season grasses under normal summer growing conditions. It often produces higher forage yields than native warm-season grasses in south Missouri.

On the other hand, caucasian is less productive than big bluestem, switchgrass and Indiangrass when grown in the northern part of the state. Good supplies of tested seed may be difficult to find, and the light, fluffy seed is difficult to distribute evenly. The average daily gains of cattle are generally expected to be lower on caucasian than on grazeable stands of big bluestem or Indiangrass. Caucasian is also less desirable for wildlife production than big bluestem, Indiangrass or little bluestem.

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*The authors extend appreciation to Jim Forwood, Jerry Nelson, John A. Jennings and Steve Clubine, Missouri Department of Conservation, for their help in the preparation of this guide.*

## Notes

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