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Johnsongrass as a Forage in Mississippi

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Johnsongrass

as a Forage in Mississippi

Johnsongrass [*Sorghum halepense* (L.) pers.] is native to regions that border the Mediterranean Sea from southern Asia to southern Europe. It was introduced into the United States about 1830, but documentation of its distribution was hampered by the use of more than 40 common names and eight Latin names in the 1800s (13). A Colonel Johnson brought the

grass to the Black Belt of Alabama where it was named johnsongrass. It is believed to have been distributed throughout the United States by late in the 19th century and became such a pest in field crops that it led to the first federal appropriation specific to weed control. The first report on johnsongrass control was issued in 1902.

Johnsongrass still is best known as a weed in the cotton producing states. However, it is an important grazing and hay crop in the southeastern United States, and its value as pasture and hay outweighs its disadvantages in many production situations. It is particularly well adapted to the dark prairie soils of Alabama, Mississippi and Texas (Figure 1).



Figure 1. Johnsongrass is popular as a hay crop on the dark prairie soils of Mississippi, Alabama, and east Texas.

Value in Dairy and Beef Programs

Lusk et al. (7,8) cut johnsongrass in the boot and late milk stages of maturity and fed the hay to yearling dairy heifers for 64 days. One half of the heifers were fed the hay plus 2 lbs of a 14% protein concentrate mixture per day; the others were fed the hay plus 4 lbs of the concentrate.

Heifers fed the early-cut hay plus 2 lbs of concentrate gained at the expected 0.86 lbs/heifer/day calculated from the most generally used standards, but heifers fed the late-cut hay plus 4 lbs of concentrate gained at less than 0.86 lbs/day. Lactating cows respond more noticeably to the palatability and digestibility of the roughage portion of a ration; therefore, the researchers concluded that johnsongrass cut early for hay should give even more favorable results when fed to the milking herd.

The same researchers compared the value of johnsongrass, soybean, alfalfa and oat hays as roughage for lactating dairy cows. They concluded that alfalfa cut for hay in the 1/10 to 1/4 bloom stage was most desirable for milk production. However, johnsongrass cut in the boot stage, soybeans cut in the late bloom and oats cut in the milk stage made satisfactory hay for milk production.

Browning, Lusk and Miles (4) reported that alfalfa had proven to be the best hay tested for milk production but was not widely grown by Mississippi milk producers. Therefore, they compared the composition and digestibility of hay from johnsongrass and Coastal bermudagrass grown without fertilizer and with applications of 200-100-200 (N-P₂O₅-K₂O) to the johnsongrass and 250 or 300-150-300 (N-P₂O₅-K₂O) to Coastal.

Crude protein content and digestibility of all components were higher for hay from fertilized grass. The greatest differences were in the percentage and apparent digestibility of the crude protein fractions, both of which were about 38% higher for hay produced from fertilized grass. Voluntary consumption of hay from the fertilized Coastal was significantly greater than for hay from the less-heavily fertilized johnsongrass. The more-heavily fertilized Coastal also was higher in crude protein and protein digestibility.

Coats (5) studied the performance of beef steers on johnsongrass fertilized with different rates of N over a three-year period. Returns were lower for john-

songrass fertilized at 240 lb N/acre than at 60 or 120 lb N/acre because growth at the higher rate was much more rapid and could not be controlled or used as readily.

Hay was harvested from one half of each pasture in 1967 in an effort to maintain quality forage over a longer period. Mowing and recovering clippings after johnsongrass reached the boot stage was not satisfactory because it forced the cattle to eat more of the remaining grass, which was of poor quality. He concluded that mowing to maintain quality requires mowing several times each season to maintain the grass at a height of 8-12 inches.

Results of research with johnsongrass for forage in dairy and beef production systems suggest conclusions as follow:

1. Management of johnsongrass for grazing will be more difficult and animal performance likely will be lower than for other perennial grasses.
2. Production for hay should be the major use of johnsongrass.
3. Fertilizing johnsongrass grown for hay increases yield and improves forage quality, animal performance and stand maintenance.

Botanical Characteristics

Johnsongrass is a warm-season perennial, sod-forming species that spreads by both seed and scaly, creeping rhizomes (Figure 2). The inflorescence is an open panicle that produces abundant seed. A single seed (Figure 3) may produce a plant with from one to two or more than 170 stems, depending

upon fertility, moisture, space and inherent differences (2). An average plant will initiate rhizome production at three weeks of age and will produce 20 ft of rhizomes and 4 lbs of seed in a season. Mature plants continue to produce rhizomes that grow until frost, overwinter and sprout new plants

the next spring.

McWhorter (9,10,12,14) reported that 80% of the johnsongrass rhizomes produced in sandy loams and clays occurred in the top six inches of the soil. He also stated that johnsongrass in a normal growing season has three sets of rhizomes---primary, secondary

and tertiary. Growth arises in spring from primary rhizomes that decay two or three weeks after growth starts. Young plants initiate growth of secondary rhizomes as the primary rhizomes

decay, and growth continues until late summer. Growth of tertiary rhizomes begins in late summer. The tertiary rhizomes generally are not as large or vigorous as secondary rhizomes and usually are

more rounded. They grow until frost, remain dormant throughout the winter and become primary rhizomes the next spring.

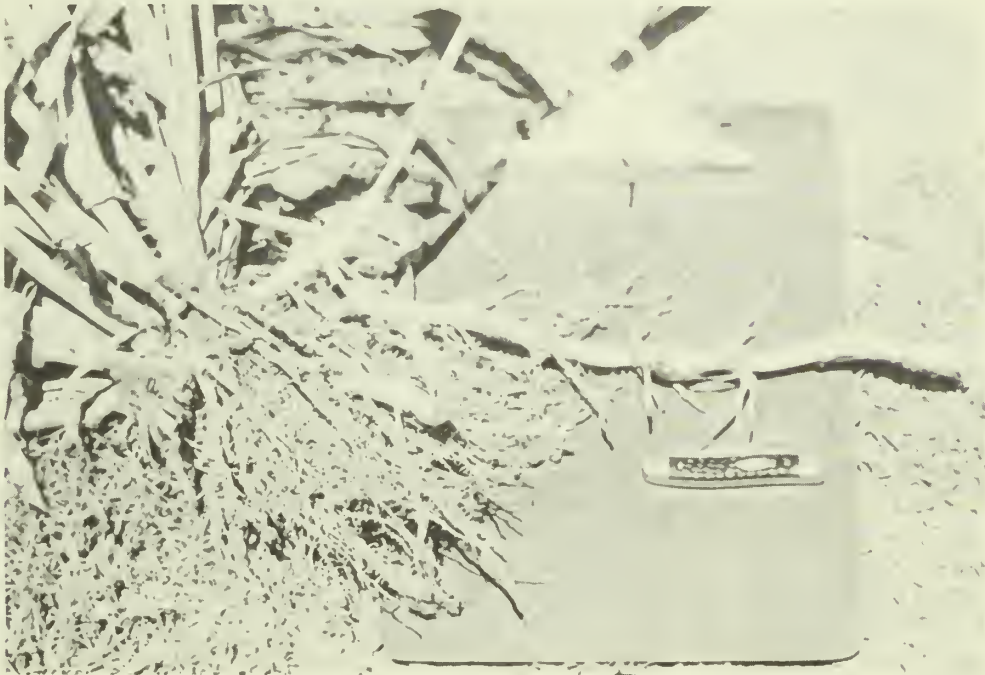


Figure 2. Johnsongrass plant showing the rhizomes that store carbohydrates for initial growth in spring and regrowth after harvest.

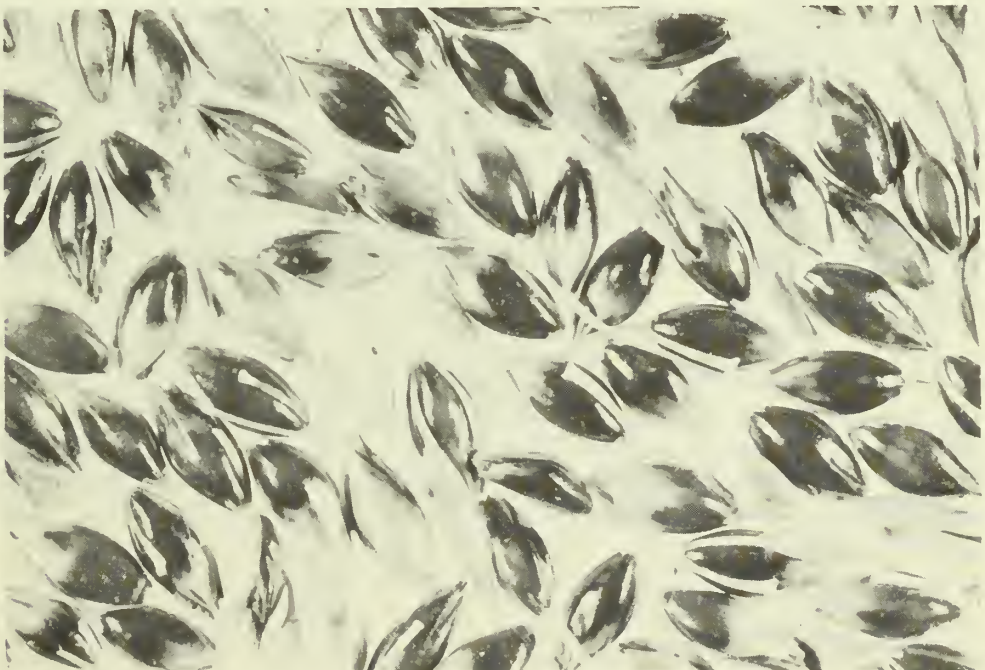


Figure 3. Johnsongrass seed are distinguished from sudangrass seed by being larger and having a cup-shaped apex.

Production Guidelines¹

Soil Selection---Johnsongrass grows well in many soils, but does best on fertile clay loams and clays with high water-holding capacity. It will produce satisfactorily on soil with pH of 5.8 to 7.5, but optimum growth occurs in the 6.0 to 7.0 pH range. Johnsongrass-legume combinations require soil with pH of 6.0 to 7.0.

Fertilization---Apply lime, phosphate (P) and potash (K) to soil test recommendations. In the absence of a soil test, apply 120 to 160 lbs each of P₂O₅ and K₂O per acre in a 1 to 1 ratio for establishment, and go to 80 lbs/acre in a 1 to 1 ratio thereafter. An additional 60 lbs of K₂O per acre are needed each year if the crop is produced for hay only.

High rates of nitrogen (N) are required for high yields. Best results are obtained when N is applied in split applications beginning April 20 to May 1. Johnsongrass can use 1.0 to 1.3 lbs of N per acre per day; therefore, apply the equivalent of 200 to 250 lbs of ammonium nitrate per acre each second month during the growing season or after each hay clipping. Our trials have demonstrated that dry matter production increases with each increase in N up to 480 lbs/A (Table 1).

Higher rates of N also increase the crude protein content of johnsongrass (Table 2). Values obtained range from 9.4 to 13.5% for 0 to 480 lbs of N/A, respectively. The crude protein level generally considered necessary to meet maintenance requirements of a beef cow is 12%, and johnsongrass fertilized with at least 240 lbs of N/A meets this requirement.

¹The guidelines presented in this bulletin are based on the latest MAFES research results available at the time of printing. Refer to the latest **Crop and Fertilizer Guidelines for Mississippi** or consult your area or county Mississippi Cooperative Extension Service (MCES) personnel to determine whether guidelines have been changed.

Table 1. Dry matter production of johnsongrass fertilized with different rates of nitrogen, by location, Mississippi, 1963-1968 averages.

Nitrogen Rate ¹	Location		
	Miss. State	Prairie	Brooksville
-----Forage Lbs/A-----			
0	2354 f ²	2669 f	3030
30	3992 e	4855 e	---
60	4765 d	5500 de	4397
90	5432 d	6300 d	---
120	6658 c	8600 c	6765
240	9578 b	11000 b	7011
480	13613 a	13922 a	8146

¹P₂O₅ and K₂O applied to each treatment at 120 lbs/A.

²Means in a column followed by a different letter differ significantly at the 5% level of probability as determined by Duncan's Multiple Range Test.

Table 2. Average crude protein content of johnsongrass forage produced by johnsongrass fertilized with different rates of nitrogen, Mississippi State University, 1963-1968, averages.

Nitrogen Rate	Crude Protein		
	Lbs.	%	Lbs/A
0		9.43 c ¹	221 e
30		10.75 b	429 d
60		11.25 bc	536 cd
90		11.30 b	613 cd
120		11.95 ab	795 c
240		12.90 a	1235 b
480		13.50 a	1837 a

¹Means in a column followed by a different letter differ significantly at the 5% level of probability as determined by Duncan's Multiple Range Test.

Adequate levels of P and K also affect the production and carbohydrate content of rhizomes (Table 3), and density and quality of johnsongrass stands are related directly to rhizome production. We found that rhizome production

increased with increases in nitrogen application and was nearly doubled when adequate rates of P and K were supplied. Differences were not significant, but there was a trend toward higher carbohydrate levels of rhizomes where P and K were supplied.

Results of several years of research show that good production of pure johnsongrass or johnsongrass-legume combinations can be maintained if soil test levels of P and K are kept medium to high. A rule of thumb for N-P₂O₅-K₂O fertilization is to apply these nutrients each year in a 4-1-2 ratio for grazing and a 4-1-3 ratio for hay production.

Seedbed Preparation--- Johnsongrass germinates and grows best when seeded on soil that has been leveled and firmed after tilling 4 to 6 inches deep. Some success has been obtained with seeding of johnsongrass into thin sods of other species.

Varieties and Seed Production--- There are no designated varieties of johnsongrass. Texas is the major source of commercial seed, but seed can be harvested from johnsongrass grown in Mississippi.

Most seed sold in the state are obtained by machine harvest. Seed shatter readily when ripe and reported yields range from 175 to 500 lbs/A.

Johnsongrass seed are relatively dormant when first harvested, and several months may be required for after-ripening. Even then, germination is not complete except when temperature varies in a warm range (15).

Planting--- Plant live seed (20-25 lbs/A) 1/2 to 3/4 inch deep between April 1 and July 1. Increase the seeding rate if the seed tag indicates low germination.

Alfalfa, red clover, wild winter peas or vetch may be seeded into johnsongrass between September 1 and October 31². Grazing of in-

Table 3. Production and carbohydrate content of rhizomes produced by johnsongrass fertilized with different rates of nitrogen, Mississippi State University, 1963-1968 averages.

Nitrogen Rate	Rhizome Production		Rhizome Carbohydrates	
	with P&K ¹	No P&K	with P&K ¹	No P&K
Lbs./A.	Lbs./A.		%	
0	257 d ²	247 b	21.9	18.9
60	367 c	261 ab	23.8	22.9
120	447 bc	333 a	29.1	23.6
240	526 ab	314 a	28.2	20.5
480	607 a	269 a	26.1	20.0

¹P₂O₅ and K₂O applied at 180 lbs/A of each.

²Means in a column followed by a different letter differ significantly at the 5% level of probability.

Table 4. Average forage production of johnsongrass and johnsongrass-legume mixtures at the MAFES Black Belt Branch, 1965-1967 averages.

Treatment	Forage Production	
	LBS. DM/A	
Johnsongrass Plus		
120 Nitrogen ¹	11321	c ²
240 Nitrogen	14721	ab
Alfalfa	9208	d
Alfalfa + 120 N	13179	b
Red Clover	13305	b
Red Clover + 120 N	14867	ab
Wild Winter Peas	13815	b
Wild Winter Peas + 120 N	16057	a

¹Nitrogen was applied at 120 and 240 pounds per acre in split applications to johnsongrass and at 120 pounds per acre to the johnsongrass plus legume plus nitrogen treatments.

²Means followed by a different letter differ significantly at the 5% level of probability as determined by Duncan's Multiple Range Test.

terseeded areas should be deferred until spring, and the first application of N may be eliminated. Shading by the legumes will reduce early growth of the johnsongrass, and the first hay harvest may be reduced. Major considerations for adding legumes to johnsongrass sod are to provide limited forage when johnsongrass is dormant and to supply N to the johnsongrass.

Benefits of adding alfalfa, wild winter peas or red clover to johnsongrass were evaluated over a three-year period at the MAFES Black Belt Branch, and seeding red clover or wild winter peas into johnsongrass sod increased forage production significantly over that of johnsongrass grown alone and fertilized with 120 lbs of N/A (Table 4). Also, no yield advantage

²See footnote 1.

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