CIRCULAR 151 MARCH 1966

SORGHUM-SUDAN HYBRID

vs.

JOHNSONGRASS PASTURE

for

DAIRY COWS

Agricultural Experiment Station
AUBURN UNIVERSITY
E. V. Smith, *Director*
Auburn, Alabama

WHAT THE EXPERIMENT SHOWED

Sudax, a sorghum-sudan hybrid, shows promise of producing much needed summer grazing for dairy cows. This crop compared favorably with johnsongrass as a dairy forage in tests at the Black Belt Substation, research unit of Auburn University Agricultural Experiment Station.

Whether grazed continuously or rotationally, Sudax was superior to johnsongrass in crude protein content and digestibility of dry matter. It proved equal to johnsongrass for milk production.

Milk production, body weight change, and forage dry matter intake of cows showed no differences between continuous and rotational grazing of Sudax. (Rotational pasture plots were divided into four subareas, and cows were changed from one to another about every 5 days during the 6-week test periods.)

During the 6-week experiments, continuous grazing was the most satisfactory method of managing Sudax for dairy cows. Less labor was required, problems associated with forage lodging and trampling were reduced, and clipping was not necessary to maintain forage quality. When Sudax is to be grazed over a period of several months, however, observations indicate that clipping is needed to maintain high quality forage. This would necessitate having at least two fields, so one pasture could make regrowth after clipping while the other was being grazed.

Since johnsongrass is a perennial and does not require reseeding each year, it may have an economic advantage over Sudax or other annual sorghum-sudan hybrids as a dairy forage. However, this would depend on cropping system being used and other individual farm conditions. Being able to plant sorghum-sudan following small grains or other winter crops could be a distinct advantage under certain situations.

Sorghum-Sudan Hybrid vs. Johnsongrass Pasture for Dairy Cows

L. A. SMITH and H. W. GRIMES, *Black Belt Substation*
J. A. LITTLE and G. E. HAWKINS, *Dept. of Dairy Science*

SCARCITY OF HIGH QUALITY PASTURE forage in late summer is a perennial problem for Alabama dairymen. In an attempt to overcome this shortage many dairymen are planting sorghum-sudan hybrids. These annual hybrids are capable of rapid growth initially and make good recovery after grazing. Thus, they appear to have the potential to supply forage during the critical summer grazing period.

While yield data are available, information on systems of grazing management for sorghum-sudan hybrids is lacking. Also, additional information is needed on nutritive value of these crops for lactating dairy cows. Because of these needs, studies were conducted at the Black Belt Substation of Auburn University Agricultural Experiment Station System in 1963 and 1964 to (1) determine feeding value of a sorghum-sudan hybrid pasture for lactating cows under two grazing management systems, and (2) to compare a sorghum-sudan hybrid with johnsongrass as a summer grazing crop for dairy cattle.

Since sorghum-sudan hybrids differ little in yield and growth characteristics[1], Dekalb SX-11 (Sudax) was selected as a representative hybrid for this study.

EXPERIMENTAL PROCEDURE

Four 2-acre plots were seeded to Sudax in late spring each year. Seed were drilled in 8-inch rows on a prepared seedbed. Two additional 2-acre plots containing established stands of johnsongrass were maintained under the same fertilization regime as the Sudax forage and served as a control. Planting dates, seeding rates, and fertilization practices for each year are given in Table 1.

Twelve cows ranging in production from 30 to 48 pounds of 4 per cent fat-corrected milk (FCM) per day were used in a 6-week grazing trial each year. Following a 7-day standardization period during which all cows grazed a common forage, they were

[1] HOVELAND, C. S., EVANS, E. M., AND PATTERSON, R. M. *Performance of Sorghum Silage Varieties.* Progress Report Series No. 86, Auburn Univ. Agr. Expt. Sta. June, 1963.

TABLE 1. PLANTING DATES, SEEDING RATES, AND FERTILIZATION PRACTICES FOR SUDAX AND JOHNSONGRASS, BY YEAR

Item	1963		1964	
	Sudax	Johnson-grass	Sudax	Johnson-grass
Date of planting	June 4	[1]	May 31	[1]
Seeding rate per acre, lb.	25	----	25	----
Fertilizer applied per acre[2], lb.	500	500	500	500
Nitrogen topdressings, no.	1	1	1	1
N applied per acre, lb.	70	70	60	60
Date N applied	July 5	July 5	June 14	June 14

[1]Johnsongrass test areas were on an established stand.
[2] 0-14-14 fertilizer applied to Sudax areas in late fall of preceding year with oats.

grouped according to level of production and randomly assigned to one of three experimental treatments: (1) Sudax continuously grazed, (2) Sudax rotationally grazed, or (3) johnsongrass rotationally grazed.

Paddocks to be rotationally grazed were divided into four subareas, with the cows rotated from one subarea to another at approximately 5-day intervals. Rotationally grazed paddocks were not clipped between grazing periods. Cows on continuous grazing had access to the entire paddock at all times. The lactating cows were kept on the pastures continuously except for daily milking periods. Additional cows (nonlactating) were used with all treatments on a put-and-take system to utilize extra forage and to determine maximum forage carrying capacity.

In addition to the forage grazed, lactating cows on each treatment received 1 pound of a 16 per cent crude protein concentrate mixture for each 3 pounds of FCM produced daily during the standardization period. Shade, water, and salt were available in the paddocks at all times.

The cows were milked twice daily and milk weights were recorded. Milk fat percentage for each cow was determined on a 2-day composite sample at the end of the standardization period and at biweekly intervals throughout the study. Body weights were measured on 3 consecutive days at the end of the standardization period and at the end of the experimental period.

Samples of forage representing the plant portions consumed by the cows were taken periodically throughout the 1963 study and at weekly intervals during the 1964 test for protein analysis. Forage intake by lactating cows was determined during the second and final weeks of the grazing period each year by the

chromic oxide method.[2] Forage digestibility was measured with nonlactating cows during the second and final weeks of the 1963 test and at weekly intervals during the 1964 trial by the chromogen method.[3]

RESULTS AND DISCUSSION

Grazing was begun each year when the forage was 20 to 22 inches tall. The time interval from planting Sudax until beginning of grazing was 45 days in 1963 and 42 days in 1964.

Composition and Quality of Sudax and Johnsongrass Pastures

The crude protein content of forage samples ranged from 26.6 to 17.6 per cent for continuously grazed Sudax, 27.5 to 17.5 per cent for rotationally grazed Sudax, and 21.0 to 12.3 per cent for johnsongrass. Both continuously and rotationally grazed Sudax averaged 22.0 per cent crude protein, significantly higher than that of johnsongrass, 16.4 per cent, Table 2. System of managing Sudax had no apparent effect on the crude protein content of forage available for grazing.

Digestibility of Sudax pastures was similar under both management systems and was significantly higher than that of johnsongrass during each year, Table 2. Ranges in digestibility percentages from the second to final week of the 6-week grazing periods were: continuous Sudax, 71.7 to 63.2; rotational Sudax, 71.6 to 63.8; and rotational johnsongrass, 67.8 to 59.7. During the 1964 trial, digestibility of forage dry matter was highest the first week, Figure 1. Digestibility of Sudax declined during the

[2] Reid, J. T., Woolfolk, P. G., Hardison, W. A., Martin, C. M., Brundage, A. L., and Kaufmann, R. W. *A Procedure for Measuring the Digestibility of Pasture Forage Under Grazing Conditions.* J. Nutrition, 46:255. 1952.

[3] Hardison, W. A., and Reid, J. T. *Use of Indicators in the Measurement of the Dry Matter Intake of Grazing Cows.* J. Nutrition, 51:35. 1953.

Table 2. Composition, Digestibility, Intake, and Carrying Capacity of Sudax and Johnsongrass Forages Grazed by Dairy Cows, 2-Year Average

Criteria	Sudax		Johnsongrass, rotational
	Continuous	Rotational	
Crude protein content, per cent[1]	22.0	22.0	16.4
Digestibility of forage dry matter, per cent	67.7	67.4	63.9
Forage dry matter intake/cwt., lb.	2.4	2.1	2.2
Acres per cow, no.	0.55	0.57	0.54

[1] Crude protein contents expressed on dry matter basis.

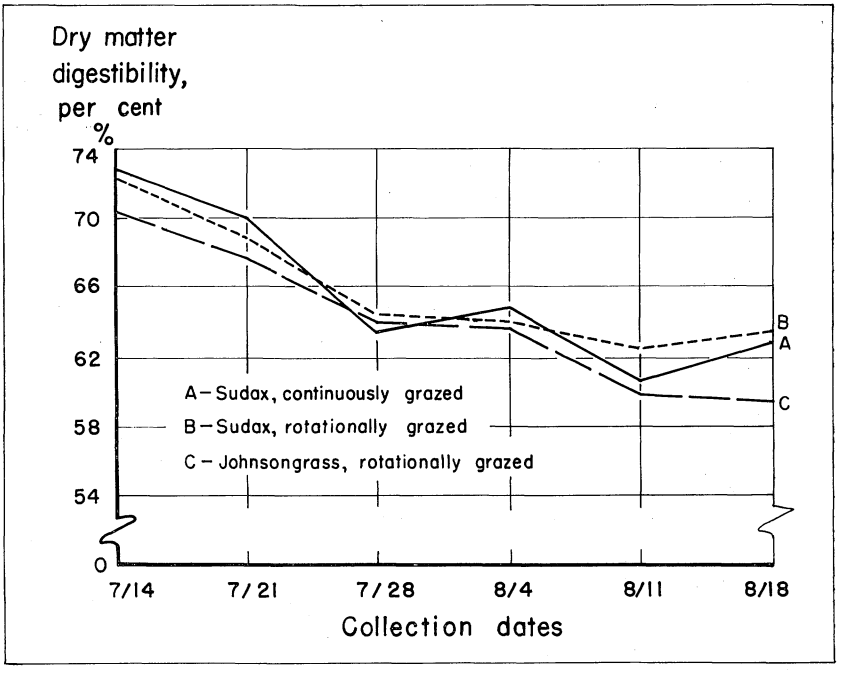

FIG. 1. Digestibility of test forages, by weeks, during 1964 grazing trial.

second and third weeks, then remained relatively constant in the final 3 weeks. In contrast, digestibility of johnsongrass forage dry matter declined at a nearly constant rate throughout the test. The relatively high crude protein contents and apparent digestibility coefficients of the forages indicate that good quality grazing was maintained throughout the experimental periods.

Cows on continuously grazed Sudax consumed more forage dry matter per 100 pounds of body weight than cows on rotationally grazed Sudax, Table 2. This was in contrast to results of previous studies with johnsongrass[4] in which dry matter consumption was higher on rotationally grazed forage than on forage grazed continuously. Ranges in dry matter intake for the two trials were: continuous Sudax, 1.94 to 3.25 pounds; rotational Sudax, 1.81 to 2.34 pounds; and rotational johnsongrass, 2.06 to 2.54 pounds per 100 pounds of body weight.

Acreage required to support one cow was about the same for all forage treatments, Table 2. However, there seemed to be a

[4] HAWKINS, G. E., SMITH, L. A., GRIMES, H. W., PATTERSON, R. M., AND LITTLE, J. A. *Managing Johnsongrass for Highest Possible Milk Production.* Auburn Univ. Agr. Expt. Sta. Highlights of Agricultural Research, Vol. 10, No. 2, Summer, 1963.

difference in utilization because of lodging and trampling losses. There was considerably more trampled forage in the rotationally grazed Sudax subareas than where continuously grazed. This probably accounted for the slightly reduced carrying capacity and forage intake by cows on rotational grazing. Additional studies are being conducted to determine if wider row spacing will reduce lodging and trampling losses in Sudax under grazing conditions. Lodging and trampling have not been a serious problem with johnsongrass.

Milk Production and Body Weight Changes

Milk production of cows on continuously and rotationally grazed Sudax and rotationally grazed johnsongrass averaged 33.9, 34.6, and 33.9 pounds FCM, respectively, for the two studies, Table 3. These values did not differ significantly. Nevertheless, production by cows on all treatments was below the expected level. Calculations of nutrient intake from concentrates and forage showed that cows on each treatment consumed crude protein and total digestible nutrients in amounts that should have maintained production at a level comparable to that during the standardization period. Data presented in Figure 2 show that rate of production during the first 4 weeks of the experiment declined faster than "normal," then held constant or in-

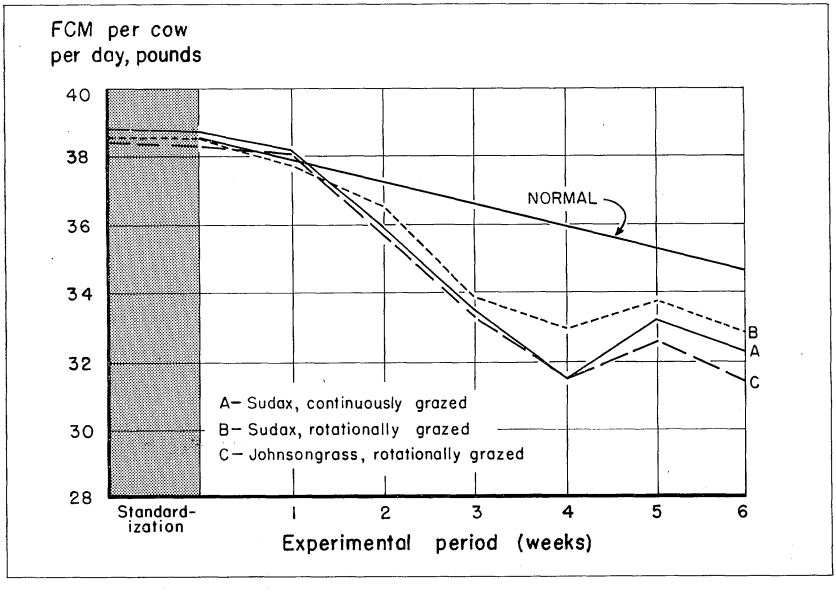

FIG. 2. Two-year average production by cows grazing Sudax and johnsongrass.

TABLE 3. DAILY MILK PRODUCTION AND PRODUCTION PER ACRE OF COWS GRAZING SUDAX AND JOHNSONGRASS PASTURES, 2-YEAR AVERAGE

Treatment	Daily FCM per cow, average[1]			Average daily FCM per acre
	Standardization period	Experimental period		
		Actual	Adjusted[2]	
	Lb.	*Lb.*	*Lb.*	*Lb.*
Sudax, continuous	38.85	34.09	33.93	61.6
Sudax, rotational	38.63	34.59	34.59	60.7
Johnsongrass, rotational	38.42	33.74	33.89	62.8

[1] Each value represents the average for 8 cows.
[2] Adjusted by covariance analysis to take into account differences in initial level of production.

creased. By the fourth week, production had dropped 18.8 per cent on Sudax grazed continuously, 14.5 per cent for rotationally grazed Sudax, and 18 per cent for johnsongrass grazed rotationally. In contrast, the "normal" rate of decline is 6 to 8 per cent per month. Advancing stage of lactation and gestation, high atmospheric temperatures, and lower forage digestibility probably contributed to the rapid drop in milk production levels. A comparison of the digestibility of forage grazed each week with the amount of milk produced daily during the week in 1944 showed that 77 per cent of the decline was associated with the decrease in digestibility of forage grazed.

Average daily milk production per acre was similar regardless of the forage species grazed or the management system imposed, Table 3.

During the 6-week experiment in 1963, cows on rotationally grazed Sudax lost an average of 12.3 pounds in body weight, whereas those on continuously grazed Sudax and on johnsongrass gained an average of 7.3 and 5.3 pounds, respectively, Table 4. In contrast, during the 1964 trial cows on all treatments gained an average of more than 32 pounds.

TABLE 4. AVERAGE BODY WEIGHT CHANGE OF COWS DURING 6-WEEK TRIALS AS RELATED TO FORAGE GRAZED

Year	Average weight change[1]		
	Sudax		Johnsongrass, rotational
	Continuous	Rotational	
	Lb.	*Lb.*	*Lb.*
1963	+ 7.3	−12.3	+ 5.2
1964	+32.3	+40.0	+37.5
Mean	+19.8	+13.9	+21.4

[1] Within years, each value represents the average for 4 cows.