

Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 1441

1970

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Recommended Citation

McCollough, R.L.; Drake, C.L.; and Harrison, K.F. (1970) "The nutritive value of four varieties of sorghum grain," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. <https://doi.org/10.4148/2378-5977.2844>

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The Nutritive Value of Four Varieties of Sorghum Grain

(Project 567)

R.L. McCollough, C.L. Drake and K.F. Harrison

Introduction

In 1969, Kansas harvested 182,896,000 bushels from 3,266,000 acres of grain sorghum for a 56-bushel-per-acre average. Much of it is fed to beef cattle; therefore, it would be an economic advantage for both grain producers and cattle feeders to have a sorghum grain of superior feeding quality.

Work in Texas¹ has suggested that a new, white sorghum grain may be superior to red sorghum grain in nutritive value. We compared four varieties of sorghum grain for digestibility. Feedlot performance of cattle fed the four varieties is underway.

Materials and Methods

Three popular red varieties grown in Kansas were compared with the new white grain. The varieties used were: Funk's G-766W², white; ACCO R-109³, red over yellow endosperm; DeKalb E-57⁴, red; Northrup King 222A⁵, red.

Sorghum grain used to conduct a digestion trial in 1968 was purchased from local farmers. Four Hereford steers, weighing approximately 820 lbs. each, were used in a four-by-four latin square design to obtain digestion coefficients reported in table 25. They were fed an all-concentrate ration shown in table 26.

In 1969, a second digestion trial was conducted and an effort was made to reduce variety variation. June 9, 1969, approximately 7 acres each of four varieties were planted in the same field, at 7 pounds per acre in 36-inch rows. No consideration was given to individual company specifications for seeding rate. Weeds were controlled by rotary hoeing, field cultivating and spraying with 2, 4-D July 15. The field was hilled for irrigation and irrigated August 15. One hundred fifty lbs. N/A were applied preplant as anhydrous ammonia with 9 lbs. N, 22 lbs. P₂O₅, 16 lbs. K₂O, and 5 lbs. Zn supplied per acre as a starter fertilizer.

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- 1 Nishimuta, J.F., L.B. Sherrod and R.D. Furr. 1969. Digestibility of Regular, Waxy, and White Sorghum Grain Rations by Sheep. Proceeding, Western Section, American Society of Animal Science 20:259.
 - 2 Supplied by: Funk Bros., Lubbock, Texas
 - 3 Supplied by: Anderson, Clayton & Co., Belmond, Iowa
 - 4 Supplied by: Dekalb Seed Co., Lubbock, Texas
 - 5 Supplied by: Northrup, King & Co., Lubbock, Texas

All varieties were harvested November 16-19, 1969. Yield data are in table 27. The field loss was calculated by difference between actual grain harvested by combine and yield calculated by hand harvesting heads from 6 plots, per variety.

Results and Discussion

There were no significant differences in yield among the four varieties of sorghum grain. We did notice the Funk's G-766W was 3 to 4 inches taller, and lodged more at harvest time than the red varieties. Proximate analysis of the four sorghum varieties are presented in table 28.

Digestion coefficients did not differ significantly. When the cattle first started on feed, a difference in palatability of varieties was noticed in both the feedlot and digestion trials. Less ACCO R-109 was consumed the first few days but after 7 days consumption was the same for all varieties.

Table 25. Digestibility Coefficients of Sorghum Grain

	Rations			
	Funk's 766W	ACCO R-109	Dekalb E-57	Northrup King 222A
Daily DM intake lbs.	10.91	9.94	10.03	10.49
Digestibility, DM basis%				
Protein	62.84	62.95	66.89	60.20
Crude Fiber	51.11	49.80	48.16	46.89
Ether Extract	58.18	52.80	60.26	61.31
Nitrogen Free Extract	78.90	80.52	79.89	79.21
TDN	75.66	76.51	76.86	75.73
Dry Matter	74.85	76.05	76.44	75.00
Gross Energy	73.25	73.75	69.75	71.75
Nitrogen Retention	.15	.05	.21	.12
Gross Energy Kcal/kg	4,541.00	4,520.00	4,511.00	4,541.00
Digestible Energy Kcal/gm	3,326.00	3,333.00	3,147.00	3,258.00

Note: No significant difference among any of digestion coefficients

Table 26. Ingredients in Pounds Per Ton of Ration

Ground limestone (38%)	8.42
Vitamin A premix (10,000 IU per gm)	.33 (150 gm)
Chlorotetracycline premix (10 gm/lb)	.71 (322.8 gm)
Trace mineral premix ¹	1.00
Salt	20.00
Sorghum grain ²	19.54
Total premix	50.00
Rolled sorghum grain	<u>1,950.00</u>
Total ration	2,000.00

1 Percentages of indicated elements in trace mineral premix: Maganese 4.4%; iron 6.6%; copper 1.32%; cobalt .23%; iodine .30%; zinc 5%; magnesium 20%; sulfur 2.70%.

2 Grain varied with urea added to make rations isonitrogenous to 12% protein (dry matter basis)
 Urea added, as percent of ration:
 Funk's G-766W, .57%; ACCO R-109, .62%
 Dekalb, E-57, .70%; Northrup King, 222A, .23%.

Table 27. Actual and Expected Yields of Sorghum Grains (Summer 1969)

Sorghum Grain Varieties	Funk's G-766W	ACCO R-109	DeKalb E-57	Northrup King 222A
Acre/field	6.2	7.8	9.3	6.3
Lbs./field	33,030.0	51,520.0	57,490.0	38,630.0
Moisture %	15.0	15.2	15.0	15.0
Test wt. (lbs./bu)	59.5	59.5	60.5	59.5
Bu/field (56/lbs./bu)	589.8	920.0	1,026.6	689.8
Bu/acre (as is)	95.1 (80.9) ¹	117.0 (99.2)	109.7 (93.2)	109.5 (92.5)
Expected yield (as is) ²	114.7 (99.9)	132.7 (114.8)	118.6 (102.9)	111.1 (96.2)
Field loss bu/acre	19.6 (19.1)	15.6 (15.6)	8.9 (9.6)	1.5 (3.6)
Field loss %	17.1 (19.1)	11.8 (13.6)	7.6 (9.4)	1.4 (3.8)
Av. leaves/plant	8 to 9	8 to 9	9 to 11	7 to 8
Mature plant height in.	54-58	52-53	52-55	49-52

1 Parenthesis indicates 100% DM basis

2 Expected yield = grain harvested by hand from 20 ft. of a 36 inch row.

Calculation of expected yield:

43,560 sq. ft./acre, 60 sq. ft. or .00138 of an acre

$1 \div .00138 = 726.005$

$726.005 \div 56 \text{ lbs./bu} = 12.964$

$12,964 \times \text{lbs. of grain/20 ft.} = \text{expected bu./acre}$

Table 28. Proximate Analysis of Varieties of Sorghum Grain

	Varieties							
	Funk's G-766W		ACCO R-109		Dekalb E-57		Northrup King 222A	
Dry Matter %	84.20		84.84		84.49		84.11	
Moisture %	15.98		15.16		15.51		15.89	
Protein (6.25) %	8.95	(10.58) ¹	8.90	(10.49)	8.59	(10.17)	9.95	(11.82)
46 Ether extract %	2.74	(3.26)	2.70	(3.18)	2.47	(2.92)	2.69	(3.20)
ASH %	1.29	(1.54)	1.43	(1.69)	1.33	(1.57)	1.33	(1.58)
Crude fiber %	1.55	(1.85)	1.80	(2.12)	1.58	(1.87)	1.57	(1.87)
Nitrogen free extract %	69.49	(82.77)	70.01	(82.52)	70.52	(83.43)	68.57	(81.52)
Starch %	64.97	(77.33)	67.06	(79.04)	66.13	(78.27)	64.73	(76.96)

1 Parenthesis 100% dry matter basis