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Abstract

Nine hybrid sorghum grains representing hetero-yellow, all-waxy, white, part-waxy, and white endosperm were fed to finishing steers to determine digestibility. Hybrids were all planted on the same irrigated bottom field and harvested and stored separately till fed. The sorghum grains were dry-rolled and incorporated into 90% concentrate rations. Digestibilities were determined using chromic oxide.

Keywords

Cattlemen's Day, 1973; Report of progress (Kansas State University. Agricultural Experiment Station); 568; Beef; Digestibility; Grain sorghum; Steers

Digestibility of Nine Hybrid Sorghum Grains Fed to Finishing Steers Winter 1971-72[1]

R. L. McCollough and B. E. Brent

Summary

Nine hybrid sorghum grains representing hetero-yellow, all-waxy, white, part-waxy, and white endosperm were fed to finishing steers to determine digestibility. Hybrids were all planted on the same irrigated bottom field and harvested and stored separately till fed. The sorghum grains were dry-rolled and incorporated into 90% concentrate rations. Digestibilities were determined using chromic oxide.

The hybrids differed significantly ($P<.05$) in digestibilities of crude protein, NFE, dry matter, and gross energy and for TDN. The all-waxy hybrid had the highest digestibility. Hetero-yellow endosperm hybrids were more digestible than white or part-waxy white endosperm hybrids.

Introduction

Previous trials here (Bulletin 557, 1972) have shown hetero-yellow endosperm hybrid sorghum grains superior to those with white endosperms in nutritive value when fed to steers. We compared feedlot performance and digestibilities among hybrids having hetero-yellow, white, part-waxy, and all-waxy endosperm types. Waxy refers to amylopectin-type starch in the endosperm.

Feedlot performance of these hybrids was reported in Bulletin 557, 1972. Digestibility data are now available for the hybrids, and are reported here.

Materials and Methods

Digestibilities of the 9 hybrid sorghum grains fed to steers were determined using chromic oxide. The method has been described previously in Bulletin 557. Description of hybrids is shown in table 1. Bulletin 557 (1972) gives chemical analysis of complete rations, yields (bu. per acre), and feedlot performance.

All digestibility means were calculated by least squares.

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[1]Mention of companies, names or products does not constitute endorsement over comparable companies, names or products.

Results and Discussion

Table 2 shows the proximate analyses of the nine hybrid sorghum grains. Differences for crude protein or NFE were small. Amylopectin tended to be lower than the normally reported 75%. Amylopectin contents of hybrids NK-275, and NK-280 (genotype, 1/4 waxy) varied by 7.7%, indicating that parentage of hybrids may affect amylopectin content. The 2/3 waxy hybrid (3135) had 80.2% amylopectin, only 5% more than the 1/4 waxy hybrids. The all-waxy hybrid had 96.7% amylopectin. Waxy and part-waxy hybrids tended to yield less than white or hetero-yellow endosperm hybrids.

Digestibilities of 9 hybrids are shown in table 3. Differences among hybrids were significant ($P<.05$) for digestibility of crude protein, nitrogen free extract (NFE), dry matter, gross energy, and TDN. Digestibility of crude protein, NFE, dry matter, gross energy, and TDN was highest for the all-waxy hybrid, CP-622. If TDN is used as index of digestibility, the endosperm types ranked: all-waxy (TDN, 67.6), hetero-yellow (64.83), white (62.4), and part-waxy (59.8). Rankings for feed efficiency are the same as that for TDN, except that white and part-waxy endosperm are reversed. The improved feed conversions of all-waxy and hetero-yellow endosperm hybrids may have resulted from better digestibility.

X-4087 was an experimental white pericarp, hetero-yellow endosperm hybrid with the same genetic characteristics as G-766W. Digestibility (table 3) and feedlot performance (Bulletin 557, 1972) were much poorer than other hybrids. Digestibility data (table 3) of part-waxy hybrids (1/4 to 2/3 waxy genotype) indicate that not only amylopectin content *per se*, but also associated characteristics may influence nutritive value of grains.

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DeKalb Seed Company, Lubbock, Texas
Nc+ Hybrids, Hastings, Nebraska

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Table 1. Descriptions of Nine Hybrid Grains Fed, Winter 1971-72

Hybrid	Abbrev. in text	Pericarp color	Endosperm	Endosperm code
Funks G-766W	G-766W	White	Hetero-yellow	Y
ACCO R-109	R-109	Red bronze	Hetero-yellow	Y
Northrup King 275	NK275	Red	White, 1/4 waxy[a]	W, 1/4X[b]
Northrup King 280	NK280	Red	White, 1/4 waxy	W, 1/4X[b]
Nc[+] RS-671	RS-671	Red	White	W
Corpustar CP-622	CP-622	White	White, all-waxy	W, AX
Funks G-522	G-522	Red bronze	Hetero-yellow	Y
Northrup King X-4087	X-4087	White	Hetero-yellow	Y
Funks 3135	3135	Red	White, 2/3 waxy	W, 2/3X[b]

[a]Waxy refers to amylopectin starch.
[b]1/4, 2/3 refers to waxy genotype contributed from parents.

Table 2. Chemical Composition of Nine Hybrid Grains, Dry Matter Basis

Hybrid	Endosperm[a]	Crude protein (%)	Ether extract (%)	Crude fiber (%)	ASH (%)	NFE (%)	Starch (%)	Amylopectin[b] (%)	Gross energy Kcal/kg
G-766W	Y[b]	10.35	3.31	2.19	1.64	82.51	75.16	68.53	4.459
R-109	Y	10.30	3.04	2.10	1.56	83.00	72.80	68.07	4.513
NK-275	W 1/4X	10.84	3.15	2.12	1.61	82.28	74.63	69.51	4.349
NK-280	W 1/4X	9.91	3.11	1.99	1.63	83.36	68.78	77.17	4.484
RS-671	W	11.24	2.99	1.92	1.63	82.22	72.74	69.31	4.446
CP-622	W, AX	11.19	2.97	1.91	1.62	82.31	73.85	96.66	4.425
G-522	Y	10.67	3.20	1.78	1.59	82.76	73.77	67.09	4.482
X-4087	Y	10.34	3.03	2.23	1.66	82.74	75.79	67.45	4.424
3135	W, 2/3X	10.90	3.17	2.14	1.86	81.93	72.89	80.18	4.508

[a] Y = hetero-yellow, W = white, 1/4X, 2/3X = waxy genotype from parents, AX = all-waxy.
[b] % amylopectin = % amylose - 100.

Table 3. Digestibility of Nine Hybrid Sorghum Grain Rations Fed to Steers, Winter 1971-72 Determined by Chromic Oxide

Hybrid	Endosperm[a]	Feed/day, lbs. (D.M. basis)	% Digestibilities: Crude protein	Crude fiber	Ether extract	NFE	Dry matter	Gross energy	% TDN
G-766W	Y	16.62	55.21^{1,2}	16.51	35.98	70.67^{1,2}	63.90$^{1-3}$	61.25^{2,3}	63.05$^{1-3}$
R-109	Y	17.59	57.87^{2,3}	21.09	30.20	72.08^{1}	65.68^{2,3}	63.02^{2,3}	64.47^{2,3}
NK-275	W, 1/4X	17.20	55.42^{2,3}	18.65	40.85	69.04^{1,2}	65.16^{2,3}	60.06$^{1-3}$	62.05$^{1-3}$
NK-280	W, 1/4X	17.54	47.33^{1}	10.23	30.20	65.24^{1,2}	58.17^{1,2}	55.19^{1,2}	57.44^{1,2}
RS-671	W	18.60	54.31^{1,2}	13.26	52.54	68.62^{1,2}	62.96$^{1-3}$	60.75$^{1-3}$	62.43$^{1-3}$
CP-622	W, AX	19.03	62,12^{3}	15.32	37.98	75.74^{2}	68.34^{3}	66.60^{3}	67.65^{3}
G-522	Y	15.60	56.09^{2,3}	22.24	39.40	74.96^{2}	67.40^{3}	65.47^{3}	66.99^{3}
X-4087	Y	19.03	50.53^{1,2}	18.97	40.02	59.97^{1}	55.20^{1}	52.10^{1}	54.51^{1}
3135	W, 2/3X	17.99	56.10^{2,3}	7.86	27.05	68.06^{1,2}	61.60^{1,2}	57.69^{1,2}	59.91$^{1-3}$

[a]Y = hetero-yellow, W = white, AX = all-waxy, 1/4X, 2/3X = waxy genotype from parents.

[1,2,3]Means with different superscripts in same columns are significantly (P<.05) different.