NUTRITION — FEEDLOT

The Effect of Location on the Nutritive Characteristics of Several Grain Sorghum Hybrids

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Story in Brief

Four grain sorghum hybrids obtained from three different locations were evaluated for nutrient composition and *in vitro* dry matter disappearance (IVDMD). Crude protein content was highly influenced by both hybrid and location. Hybrid appeared to contribute more to variation in starch content than location, although no significant differences were observed. *In vitro* dry matter disappearance studies showed the non-bird resistant sorghums to be generally similar and superior to the bird resistant hybrid. A significant ($P < .05$) hybrid by location interaction, however, indicates that both of these factors are responsible for IVDMD performance. These studies suggest that location as well as hybrid or variety may affect the nutrient content and subsequent digestibility of grain sorghum.

Introduction

The potential for increased grain sorghum production in Oklahoma and surrounding states has increased steadily due to drought conditions and increasing cost of corn production (especially irrigation costs). Increased grain sorghum production would provide an opportunity for livestock producers to increase the utilization of this cereal grain in beef cattle rations. Commonly, highly variable feeding quality has caused producers to discriminate against grain sorghum. Research has shown that variety or endosperm type contributes to the variability of grain sorghum, i.e., bird resistant sorghums often have extremely depressed *in vitro* digestibilities in comparison to other sorghum types. In addition, environmental factors such as moisture conditions, soil type or fertilization rates could also affect the feeding quality of grain sorghum. Consequently, this study was initiated to evaluate the effect of environmental conditions primarily related to location on the relative nutritive characteristics of several types of grain sorghum.

Materials and Methods

Grain sorghum hybrids were obtained from the 1978 Sorghum Performance Test plots located in Perkins, Cimarron and Texas counties in Oklahoma. The Perkins and Cimarron plots were both dryland, whereas the Texas plot received a total of 18 inches

of irrigation during the course of the growing season. The Perkins and Cimarron plots averaged 3.3 and 2.7 inches of rainfall per month, respectively, during May through August. Management practices were similar at all locations and fertilization rates were dependent on soil condition and anticipated yield.

Four grain sorghum hybrids were obtained from each test plot (Table 1). Three hybrids differed primarily in endosperm color (white, yellow and hetero-yellow), whereas the fourth hybrid carried the brown seed coat indicating bird resistance in addition to a yellow endosperm. A random sample of each hybrid was divided and ground either in a Udy mill for compositional analysis or a Wiley mill (20-mesh screen) for digestibility comparisons. Total starch was determined as α -linked glucose polymers utilizing an enzymatic method, and crude protein was measured by the Kjeldahl procedure. The relative digestibility of the grain sorghum hybrids was evaluated by an *in vitro* dry matter disappearance procedure. Thirty ml of inoculum (15 ml strained rumen fluid plus 15 ml buffer) were added to a 0.4 g sample in 50 ml centrifuge tubes. After 24 hours of incubation, the tubes were centrifuged, dried and dry matter disappearance was calculated by difference. Statistical analysis was performed using a model which accounted for the effects of hybrid, location, run and the associated interactions. Significant differences between hybrid by location means were detected using Tukey's HSD test.

Results and Discussion

Crude protein content was somewhat similar for the White, Yellow and Yellow-BR (BR = bird resistant) hybrids but depressed for the Hetero-yellow at the Perkins and Cimarron locations (Table 2). Although some significant differences in crude protein were observed at the Texas location, the hybrids were more uniform than at the other locations. A highly significant ($P > .0001$) hybrid by location interaction was noted, suggesting that crude protein content was dependent on location as well as hybrid. The crude protein values observed for the Hetero-yellow are an excellent example of this effect. Starch content was not significantly affected by hybrid or location (Table 3). Although the difference in starch content between the Hetero-yellow and Yellow-BR at the Cimarron location was fairly large, statistical significance was not observed.

The *in vitro* dry matter disappearance (IVDMD) studies show that the White, Hetero-yellow and Yellow hybrids were more digestible than the Yellow-BR at all three locations. Only the Hetero-yellow hybrid at the Cimarron location was not signifi-

Table 1. Descriptive characteristics of grain sorghum hybrids grown at three locations.

	Seed Coat	Endosperm		
Endosperm type	Color	Color	Hardness	Starch
White	Red	White	Intermediate	Normal[a]
Hetero-yellow	Red	Hetero-yellow	Intermediate	Normal[a]
Yellow	Colorless	Yellow	Intermediate	Normal[a]
Yellow-BR[b]	Brown	Yellow	Intermediate	Normal[a]

[a]Normal = 75% amylopectin + 25% amylose.
[b]BR = bird resistant.

Table 2. Crude protein content (%) of grain sorghum hybrids grown at three locations.[1]

Endosperm Type	Location		
	Perkins	Cimarron	Texas
White	15.4[a,b]	15.1[a,b]	12.3[d]
Hetero-yellow	13.6[c]	8.9[f]	12.1[d]
Yellow	15.7[a]	15.3[a,b]	10.8[e,f]
Yellow-BR[2]	14.5[b,c]	14.5[b,c]	11.0[d,e]

[1]SEM= 0.2.
[2]BR= bird resistant
[a,b,c,d,e,f]Means with different superscripts are significantly different within rows and columns (P<.05).

Table 3. Starch content (%) of grain sorghum hybrids grown at three locations.[1,2]

Endosperm Type	Location		
	Perkins	Cimarron	Texas
White	66.4	66.8	66.3
Hetero-yellow	66.4	70.5	67.1
Yellow	66.5	63.3	66.4
Yellow-BR[3]	62.5	61.8	66.2

[1]SEM= 1.5.
[2]No significant differences in starch content (P>.05).
[3]BR= bird resistant.

Table 4. Twenty-four hour *in vitro* dry matter disappearance (%) of grain sorghum hybrids grown at three locations.[1]

Endosperm Type	Location		
	Perkins	Cimarron	Texas
White	56.2[a,b]	57.5[a]	55.2[a,b]
Hetero-yellow	52.6[a,b]	45.3[b,c]	54.9[a,b]
Yellow	53.5[a,b]	57.8[a]	57.7[a]
Yellow-BR[2]	40.4[c,d]	32.7[d]	39.9[c,d]

[1]SEM= 2.3.
[2]BR= bird resistant
[a,b,c,d]Means with different superscripts are significantly different within rows and columns (P<.05).

cantly different from the Yellow-BR. The hybrid by location interaction was significant ($P < .05$), suggesting that both hybrid and location may affect the relative digestibility of these grain sorghums. Large differences between hybrids, however, may account for a major portion of this interaction.

These studies suggest that location as well as hybrid is important in determining the nutritive value of grain sorghum. This effect was especially pronounced for crude protein but was also observed to a lesser degree for IVDMD. The significant ($P < .05$) hybrid by location interactions indicate that both of these factors affect the nutritive characteristics of grain sorghum. Consequently, in order to predict the nutritive value of grain sorghum, these studies suggest that location, in addition to hybrid, must be considered.

Chemical Composition of Cattle Finished on Different Production Systems

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Story in Brief

Hereford x Angus crossbred steers were finished on a grazing system of small grain-interseeded bermudagrass (SG/B) pasture or a conventional 68.6 percent ground corn ration. Carcasses were examined for chemical composition of the intramuscular tissue. Following a stocker phase of predominantly wheat pasture, steers were randomly assigned to: 1) a grazing system of small grains-interseeded bermudagrass (SG/B) pasture for 180 days, or 2) a grazing system of SG/B pastures for 63 days in the spring prior to being finished on a conventional 68.6 percent ground corn ration (85 days). Live animal performance, carcass characteristics, crude protein, detailed lipid composition and fatty acid profile of the intramuscular tissue were examined. Final weights (897 and 1051 lb) and average daily gains (1.46 and 2.76 lb) were lower ($P<.05$) for the group on SG/B pastures than the feedlot group. Carcass characteristics were also lower for the steers finished on the SG/B pasture than the feedlot treatment. Crude protein content of the muscle tissue was slightly lower (21.7 *vs* 22.4 percent) while total lipid content was slightly higher (5.2 *vs* 4.7 percent) for the steers finished in drylot as compared to the SG/B finished group. Phospholipid content expressed in mg per 100 g of tissue was higher ($P<.05$) in the intramuscular fat tissue of feedlot finished cattle than SG/B finished steers. As for fatty acid profiles of the intramuscular fat tissue, linolenic acid ($P<.04$) and lauric acid ($P<.08$) were higher in steers grazed on SG/B pastures than cattle finished in the feedlot.