

Digestibility of Hays from Improved Selections of Old World Bluestems

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Story in Brief

The digestibility of various nutrient components of hay from four selections of Old World bluestems was compared in a feeding trial with lambs. Digestibilities of all four varieties, WW-506, WW-573 (WW Spar), WW-474 and WW-517, were similar and relatively high considering that the hays were obtained after seed had been harvested from the grasses.

Introduction

Development of improved types of grasses that are well adapted to the climatic conditions and soils of this area is very important to the economy of Oklahoma. From a collection of over 750 accessions of Old World bluestems mainly by Harlan et al. (1958, 1961), several varieties have been developed that have potential as productive pasture grasses in the semi-arid regions of the Southern Great Plains. With proper management, these can be used to renovate deteriorated native range and marginal cropland areas.

Characteristics considered in selection of ecotypes for potential use include adaptability to soil type, drought resistance, winter hardiness, disease and pest resistance, ease of establishment, yield and quality of forage produced. Horn and Taliaferro (1979) made an assessment of the seasonal changes in the nutritive value of five selected varieties of Old World bluestems, including "Plains" and "Caucasian." There was a downward trend in *in vitro* dry matter digestibility as the season progressed, but not as great as is seen in most grasses. Crude protein declined with season, yet was high enough that protein supplementation of grazing cattle would rarely be needed during the growing season. Digestibilities of dry matter in hays made from the same varieties were similar, although differences among cuts during the growing season were sizeable (Horn and Jackson, 1979). All the hays were relatively high-quality forages.

During the last few years, information has been obtained at the Southern Plains Range Research Station at Woodward, Oklahoma, indicating considerable potential for some selections of Old World bluestems which are being considered for release to seed producers. Included in the comparisons on yield, voluntary consumption by cattle and weight gains by grazing cattle are "Caucasian" and WW Spar bluestem, a selection within the group of accessions used to develop "Plains" bluestem (Dewald et al., 1981). Weight gains of steers grazing WW Spar were equal or higher than those of steers grazing other varieties being tested. Gains of steers fed hay from stands harvested for seed were higher than for other varieties, indicating forage of relatively high nutritive value. However, the nutritional characteristics of such forage have not been studied extensively, especially with respect to relatively mature forage from which seed has been harvested.

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Old World bluestem seed is in great demand; therefore, one can expect that considerable forage residue or hay made after seed harvest will be available. Little is known about the nutritional characteristics of such material and the differences that might exist among genetic lines of these forages. Therefore, the objective of this study was to evaluate the *in vivo* digestibility of four varieties of Old World bluestem hay baled after seed had been harvested, using lambs as test animals.

Materials and Methods

Mature hay was made from four varieties of Old World bluestem after seed was harvested in July of 1980 at the Southern Plains Range Research Station at Woodward, Oklahoma. The varieties compared in a digestibility trial using young lambs were:

| Variety | Scientific name |
|------------------|---|
| WW-506 | <i>Bothriochloa ischaemum</i> var. <i>sengarica</i> |
| WW-573 (WW Spar) | <i>Bothriochloa ischaemum</i> var. <i>ischaemum</i> |
| WW-477 | <i>Bothriochloa ischaemum</i> var. <i>sengarica</i> |
| WW-517 | <i>Bothriochloa intermedia</i> var. <i>indica</i> |

Each hay was chopped and fed to each of 16 lambs in sequences of a replicated 4X4 Latin Square design. Experimental periods were 2 weeks, with 8 days for adjustment to rations and 6 days for collection. Hay was fed twice daily in sufficient quantity to allow some feed refusal in most instances. Soybean meal (75g per head per day) was added to assure adequate protein intake for maintenance. A mineral supplement containing 13-15 percent calcium, 7 percent phosphorus, and 30-36 percent salt was fed (10g per head per day) to assure adequate intake of these minerals. In addition, a trace mineral supplement was available for *ad libitum* consumption.

Feed refusals and total feces collections were made once daily. Representative samples of all feed, feed refusals and feces were analyzed for dry matter, crude protein, acid detergent fiber (ADF) and neutral detergent fiber (NDF).

Results and Discussion

As expected, the crude protein content of the hays was somewhat low because they were harvested after seed harvest (Table 1). In comparison, protein content of hays harvested three times during the growing season from Old World bluestem plots at the Southwestern Livestock and Forage Research Station (SLAFRS) at El Reno, Oklahoma, was substantially higher in most instances (Horn and Jackson, 1979). Nevertheless, cows fed hay with a crude protein content of 6.1 to

Table 1. Chemical composition of Old World bluestem hays^a

| Variety | Crude protein | Acid detergent fiber | Neutral detergent fiber |
|---------------------|---------------|----------------------|-------------------------|
| | | (%) | |
| WW-506 | 6.7 | 45.6 | 74.0 |
| WW-573 ^b | 6.6 | 44.0 | 72.8 |
| WW-474 | 7.0 | 43.6 | 70.8 |
| WW-517 | 6.1 | 44.3 | 73.4 |

^aDry matter basis.

^bThis variety released as WW Spar Old World bluestem.

7.0 percent, as observed in this study, would not require as much protein supplementation as those consuming some other types of dry forage available during the wintering period in Oklahoma.

Intake of the hays by the sheep was relatively low, being less than the amount needed to meet their energy requirements of maintenance (Table 2). During the 8-wk trial, average weight loss was 1.5 lb per lamb. Intake of dry matter averaged only 1.75 percent of body weight, probably due to its advanced stage of maturity. This was reflected in ADF values ranging from 44.0 to 45.6 percent.

Since the most likely use for hay of this type would be as an energy source under conditions where a protein supplement would be provided, digestibility of the hays was determined under similar conditions. Thus, sufficient protein, as SBM, was provided to complete protein requirements of the lambs for maintenance. This must be taken into account in interpretation of the values obtained since it has been demonstrated in other trials that supplemental protein does enhance both intake and digestibility of relatively low quality forage by ruminant animals.

Table 2. Intake by sheep during digestion trial

| Variety | Dry matter | Crude protein ^a |
|---------------------|------------|----------------------------|
| | (g/day) | |
| WW-506 | 585 | 66.3 |
| WW-573 ^b | 612 | 66.1 |
| WW-474 | 601 | 68.4 |
| WW-517 | 600 | 63.5 |

^aValues include about 34 g/day from soybean meal supplement.

^bReleased as WW Spar Old World bluestem.

Digestibility values (Table 3) of various components of the Old World bluestem hays ranged from 59.0 to 61.4 percent for dry matter, 68.7 to 71.4 percent for crude protein, 50.9 to 54.6 percent for ADF and 58.4 to 61.0 percent for NDF. In general, all four varieties of hay were similar and relatively high in digestibility of the various nutrient components, considering the stage of maturity at harvest. The somewhat higher values for digestibility of dry matter than previously observed by scientists at the SLAFRS may be attributed to the associative effect of

Table 3. Digestibility of various components of Old World bluestem hays

| Variety | Dry matter | Crude protein ^a | Neutral detergent fiber | Acid detergent fiber |
|---------------------|------------|----------------------------|-------------------------|----------------------|
| | (%) | | | |
| WW-506 | 61.1 | 70.2 | 61.0 | 54.6 |
| WW-573 ^b | 60.7 | 69.6 | 60.3 | 53.5 |
| WW-474 | 61.4 | 71.4 | 60.3 | 52.0 |
| WW-517 ^c | 59.0 | 68.7 | 58.4 | 50.9 |

^aValues reflect high digestibility of SBM supplement; see text.

^bReleased as WW Spar Old World bluestem.

^cDigestibility of WW-506, WW-573 and WW-474 vs WW-517 significantly different ($P < .002$ for DM, $< .01$ for protein and $< .02$ for ADF and NDF).

adding supplemental protein as noted above and to the fact that sheep rather than steers were used as test animals. Digestibility of Variety WW-517 was slightly and consistently lower than that of the other three varieties; however, the differences were probably not of sufficient magnitude to be of practical significance.

The high digestibility of protein (Table 3) reflects the fact that approximately one-half of the daily crude protein intake by the sheep was from soybean meal. Assuming a digestibility coefficient of 80 percent for SBM, it can be calculated that 27g of the digestible protein in the daily ration was derived from this source. Total intake of digestible protein minus that from SBM gives an estimate of 19g as the average amount of digestible protein from the hay. Thus, digestibility of protein in the forage could be estimated to be approximately 59 percent. Since SBM contributed only a small proportion of the other nutrient components in the diet, its effect on overall digestibility of those components, if any, would probably be via an associative effect.

Literature Cited

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