QUALITY OF TROPICAL PERENNIAL GRASS HAYS

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SUMMARY

Twelve cultivars of tropical grasses cut at three or four stages of maturity were fed as hay to sheep. Wide ranges in digestibility and intake were observed, due to both cultivar and maturity effects. Quality declined with maturity and there was little difference among cultivars at 8 weeks regrowth. At that maturity, TDN intake of all cultivars was approximately equal to the maintenance energy requirement. Coastercross-1 bermudagrass and bahiagrasses were generally lower in overall quality than limpograss and X46-2, X124-4 and Transvala digitgrasses. Relative rankings among cultivars were similar for harvests made in two consecutive years. Enough variation existed, however, to demonstrate that few generalizations can be made. An accurate and rapid forage testing program would be of value in formulating rations and making management decisions.

INTRODUCTION

The forage improvement research program in Florida has provided a number of new tropical perennial grasses which may have potential as pasture or hay. It is important to know how these new grasses compare to those in common use. In the 1978 issue of this Report, we presented a comparison of the quality of several cultivars of bermudagrass, digitgrass and bahiagrass. Those results were affected, however, by leaf damage due to striped grass loopers. Harvests of most of the same cultivars and others were made the following year and the results of the evaluation experiment are reported here.

OBJECTIVE

The purpose of this study was to evaluate twelve cultivars of five grass species at four stages of maturity in terms of their quality (intake and digestibility) when fed to sheep. The results from two consecutive years are compared.

PROCEDURE

Harvests were made in 1976 from the same plots as those harvested in 1975 except that Slenderstem digitgrass was not harvested. In addition, Bigalta limpograss (Hemarthria altissima) and Ethiopian and Puerto Rican stargrasses (Cynodon sp.) were harvested. There was only one field replication. Harvests were earlier in the season than in 1975, starting in mid-July rather than August. Feeding methods were similar to those in 1975.
except hays were re-chopped prior to feeding. Each hay was fed to up to four different sheep. Recent publications show that sheep and cattle rank forages in a similar manner.

Animal responses included voluntary intake and digestibility of organic matter (OM). Organic matter is similar to dry matter except that organic matter does not include the ash which, in turn, could include sand. Hays were contaminated with sand because a flail harvester was used. From these data, estimates were made of total digestible nutrients (TDN) content of the hays and voluntary intake of TDN. TDN was assumed to be equivalent to digestible OM.

Intake of TDN is an overall measure of forage quality in that it combines intake and digestibility. When forages are fed alone and free choice, animal performance is closely related to intake of TDN. An index of forage quality was calculated by dividing the actual TDN intake by the reported maintenance requirement of sheep which is 29 g/kg MW (g/kg of metabolic weight where metabolic weight equals body weight). The resultant values are expressed as multiples of maintenance requirement. Quality levels are as follows:

<table>
<thead>
<tr>
<th>Quality level</th>
<th>TDN intake (times maintenance)</th>
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<tr>
<td>Excellent</td>
<td>more than 1.8</td>
</tr>
<tr>
<td>Good</td>
<td>1.4 to 1.8</td>
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<td>Fair</td>
<td>1.0 to 1.4</td>
</tr>
<tr>
<td>Low</td>
<td>less than 1.0</td>
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RESULTS

There was a wide variation of quality among hays (table 1): OM intake varied from 1.74 to 2.97 percent of body weight; TDN from 43.8 to 63.4 percent of dry matter; and TDN intake from 22.0 to 53.8 g/kg MW. Statistical analyses indicated that the effects of maturity on forage quality were not consistent among the cultivars. This means that generalizations should not be made with respect to the relative quality of the various forages. However, a few consistent trends were noted, as follows:

1. Intake of OM tended to decline with maturity except that the intake of some of the digitgrasses was less at 2 weeks regrowth than at 4 weeks. The cause of the low intake at 2 weeks is not known.

2. Transvala digitgrass had a consistently high OM intake at 2, 4 and 6 weeks regrowth.

3. All digitgrasses and limpgrass had higher OM intake at 4 weeks regrowth than did bahiagrasses, bermudagrasses and stargrasses.

4. The highest TDN contents were obtained with limpgrass and digitgrass and the lowest with bermudagrass. After 4 weeks regrowth, TDN content tended to decline in all cultivars but the pattern was not consistent.
5. Considering the overall quality (TDN intake) of 1976 hays after 4 weeks regrowth (table 1), the limpograss and the three digitgrasses (Transvala, X124-4 and X46-2) tended to be highest, the stargrasses and two of the digitgrasses (X50-1, X215-3) tended to be intermediate and Coastcross-1 bermudagrass and bahiagrasses were generally lowest. At 6 weeks regrowth, the comparisons were similar except that X215-3 and X50-1 digitgrasses were as low as the bahiagrasses.

6. At 8 weeks regrowth, TDN intakes of all cultivars were low; all were less than 35 g/kg MW and several were less than 29. The rate of decline of TDN intake with maturity was different among cultivars and was highest for those cultivars that had the highest quality at 4 weeks regrowth.

Comparisons between the results of both years are in table 2; values are in terms of TDN intake as a multiple of the maintenance TDN requirement. In general, the results of the two years were similar except for some unexplained low values at 2 weeks in 1976 and for the effect of insect damage on 4 week harvests in 1975. The cultivars with the most consistent high quality in both years were the Transvala and X124-4 digitgrasses. They also tended to maintain their quality through 6 weeks of regrowth. In general, the bahiagrasses and Coastcross-1 bermudagrass tended to have the lowest quality in both years at all stages of maturity. Although studied in only one year, the limpograss and two stargrasses indicated a potential for high quality.

There are two major conclusions from these studies: (1) quality varies widely among tropical perennial pasture grasses and because this variation is often inconsistent, a forage testing program is needed which will permit the rapid and accurate prediction of quality for each forage being considered; (2) the quality of tropical perennial grasses can be high enough (1.8 times maintenance TDN requirement) to achieve good rates of gain by growing cattle. However, quality declines rapidly with advancing maturity, and after 8 weeks of regrowth the voluntary intake of TDN may not meet maintenance requirements for energy.
### TABLE 1. DIGESTIBILITY AND INTAKE OF PERENNIAL GRASS HAYS (1976)

<table>
<thead>
<tr>
<th>Regrowth (weeks)</th>
<th>Grass</th>
<th>Cultivar</th>
<th>OMI&lt;sup&gt;a&lt;/sup&gt; (%BW)</th>
<th>TDN&lt;sup&gt;b&lt;/sup&gt; (%DM)</th>
<th>TDNI&lt;sup&gt;c&lt;/sup&gt; (g/MW)</th>
<th>Quality level&lt;sup&gt;d&lt;/sup&gt;</th>
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<sup>a</sup> OMI=organic matter intake as a percent of body weight (BW).

<sup>b</sup> TDN=total digestible nutrients (estimated), percent of forage dry matter (DM).

<sup>c</sup> TDNI=total digestible nutrient intake, g/kg metabolic weight (MW).

<sup>d</sup> Quality level (see text): E=excellent, G=good, F=fair, L=low.
<table>
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<tr>
<th>Grass</th>
<th>Cultivar</th>
<th>Maturity (regrowth interval)</th>
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<th>6 weeks</th>
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</table>

Values are Total Digestible Nutrient Intake as a multiple of maintenance (less than 1.0 = low; 1.0 to 1.4 = fair; 1.4 to 1.8 = good; more than 1.8 = excellent). Maintenance equals 29 g TDN/kg BM for sheep only. Hay severely damaged by striped grass looper in 1975 only.