WEIGHT RESPONSES OF BUNAJI CATTLE GRAZING NATIVE RANGELANDS STRIP-SOWN TO THREE DIFFERENT FORAGE LEGUMES IN THE NORTHERN GUINEA SAVANNA OF NIGERIA

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ABSTRACT

Three forage legumes, *Stylosanthes hamata*, *Chamaecrista rotundifolia* and *Centrosema pascuorum* were strip-sown into a native rangeland in the National Animal Production Research Institute (NAPRI), Shika. Two years following the establishment of the forage legumes, Bunaji bulls aged between 18 and 24 months were introduced into the range at the stocking rate of 4 young bulls/ha in a randomized complete block design. The animals grazed for 8 hrs daily (9:00 am to 5:00 pm) over a one year grazing cycle. Animals were provided with water and mineral salt blocks in the paddocks *ad lib*. The animals were weighed fortnightly while body condition scores were recorded monthly. From an average initial weight of 130 kg per head across treatments, mean final weight of the animals across treatments ranged from 147.34±6.9 kg in the native range to 150.25±6.9 kg in *C. rotundifolia*. The highest weight gain of 13.22±1.64kg was in animals on *S. hamata*, while the lowest, 11.44±1.6kg, that was recorded in animals on *C. pascuorum* treatment. Body condition scores ranged between 3.30±0.09 kg in *C. rotundifolia* to 3.53 ± 0.09 kg in *S. hamata*, however, they were not significantly different (P>0.05). The results showed that although animals on *S. hamata* treatment gained more weight than those on *C. rotundifolia*, *C. pascuorum* or native range treatments, the difference was not statistically significant (P>0.05). It is, therefore, recommended that longer term evaluation of these legumes in the native range be further carried out.

Key words: Bunaji bulls, rangeland, weight gains, Chamecrista rotundifolia, Stylosanthes hamata, Centrosema pascuorum

INTRODUCTION

Livestock probably constitute the most valuable asset of the rural population in Tropical Africa apart from land (Jahnke, 1982). According to Newman *et. al.* (2007), livestock constitute an investment unaffected by inflation that pays a significant dividend not only in terms of low cost production but also in terms of growth. Livestock furnish between 25 - 50% of the world’s total value of agricultural products (Brumby, 1987). Rangeland with its diversity of forage species is the overwhelming feed resource used in the extensive system of production. In Nigeria over 85% of ruminant livestock population is raised under the traditional extensive system (Tewe and Bohanga, 2001) where they obtain 90-100% of their nourishment from the natural rangeland with little or no supplementation (ILRI 1998). Pastoralists rely mainly in movement of stock across a diverse landscape, taking advantage of small patches of wetlands and the interface with cropping systems (Newman *et. al.*, 2007). The variation in rainfall
quantity and its seasonal distribution determines the availability of feed resources over time and space. The variability of feed availability is not only caused by climatic factors, but is compounded by uncontrolled human activities culminating in over utilization. The consequence of this is limitation on the optimal performance of the animals grazing in the open access grazing lands which is evidenced by the loss of weight of the grazing animals (Thomas et al. 1992; Seré et al. 1995). This makes managing the production risk caused by the variability of feed availability the central issue in the open access system.

Pasture improvements or supplementation play a limited role for solving this bottleneck because the economics of such practices are not attractive enough for the livestock producers (Thomas et al. 1992). The alternative is introduction of productive, nutritious, persistent plant species into the range which is a cheaper means of making up for the shortfall in both quantity and quality of the range feed resource. Legumes have shown promise in the improvement of both dry matter yield and nutritive content of the rangeland feed resource in addition to a wide scope for restoring stability of feed resources in degraded landscape (Conner et al. 1998). Native pastures augmented by legumes have been reported to make significant improvements on animal health and production parameters as well as improved calf crop (Edye and Gillard, 1985; Crowder and Chheda, 1982, Koger et al. 1961, Warnick et al. 1965).

This study was conducted to evaluate the weight responses of young Bunaji bulls grazing native rangeland strip-sown with three different forage legumes. The aim of the study was to identify the most suitable legume that is capable of sustainable improvement of the rangeland feed resource and eliminate or reduce, to the barest minimum, dry season weight loses in cattle grazing the native range lands in the Northern Guinea Savanna of Nigeria.

MATERIALS AND METHODS

Study Site
The study was carried out in the native rangeland of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria. The trial site is located within latitude 11°12’59”N and longitude 07°33’40”E at an elevation of 702m above sea level (Google Earth 2012). Shika has a unimodal pattern of rainfall which peaks in August with a long term average annual rainfall of 1,100 mm, most of which falls between the months of May and October. Mean relative humidity during the rainy season is 72% while the daily mean temperature within the season is 24.8°C. During the harmattan period (December to February) the relative humidity and daily mean temperature drops to 21% and 14°C respectively. The soil at the study site is mainly the tropical ferruginous type, with the presence of a few iron concretions of lateritic iron stones. Soils have good drainage and are exposed to high nutrient losses through leaching and soil erosion. Nitrogen and phosphorus are the critical limiting elements (Kowal and Kassam, 1978).

A total area of 8 hectares of fenced native rangeland was divided into 4 equal blocks of two hectares. Each block was further sub-divided into four paddocks of 0.5 ha each. In each paddock, five strips each measuring 2.5 m by 100 m were ploughed-up and harrowed using a tractor and seeded to the different forage legumes. The legumes were seeded at the rates of 30 kg/ha for S. hamata, 16 kg/ha for C. pascuorum, and 15 kg/ha for C. rotundifolia. Single super phosphate fertilizer was applied at the rate of 100kg/ha to all the strips at sowing. Two year after the establishment of the three legumes (Stylosanthes hamata, Chamaecrista
rotundifolia and Centrosema pascuorum) in the native rangeland, Bunaji bulls aged between 1½ and 2 years were introduced into the paddocks in a completely randomized block design. The animals were balanced for weight across treatments with mean live weight of 130.5 kg, equivalent to a stocking rate of 1.04 Tropical Livestock Unit (the equivalence of 250 kg animal with a daily requirement of 6.25 kg of feed on dry matter basis) per hectare (TLU/ha). Animals were grazed for 8hrs daily (between 9:00 – 17:00 hrs) and kraaled overnight for a one-year cycle. Live weights were recorded fortnightly in the morning before they go out for grazing using the Avery walk-through scale while body condition scores were taken on a monthly basis in accordance with standards described by Pullan (1978), using the 0-5 scale. Water and mineral salt blocks were supplied ad lib while grazing on pastures. Animals were dipped against ectoparasites twice a week during the rainy season and once during the dry season. They were also given prophylactic treatment against any disease that occurred during the study period.

**STATISTICAL ANALYSIS**

Data generated during the study were subjected to Analysis of Variance (ANOVA) using the general linear model of SAS (1994) package and the means separated using the Duncan’s Multiple Range Test (DMRT) in the SAS package.

**RESULTS**

**Effects of legume type on performance of Bunaji bulls**

Although there were no significant differences (P>0.05) in the body weights of animals on the different treatments imposed, Fig. 1 presents the general trend of weight gains in the different treatments. However, animals on C. rotundifolia attained the highest absolute body weight of 150.25±6.89 kg while those on unimproved native pasture (control) had the least body weights of 147.34±6.89 kg (Fig. 1). The weight gains ranged between 11.44±1.64 kg in C. pascuorum treatment to 13.22±1.64 kg in S. hamata but the differences were not significant (P>0.05). Body condition scores (BCS) were also not significantly different (P>0.05) in all the treatments. The body condition scores ranged from 3.30±0.09 in animals grazing C. rotundifolia treatment to 3.53±0.09 in animals on S. hamata. Seasonal variations in body weight changes and body condition scores were however, significant across treatments.
Effect of Season on Animal Performance
Pattern of body weights and weight gains of the young bulls grazing the pastures in the different seasons of the year are presented in Fig. 2. Season had significant effects on body weights and weight gains (P<0.05). During the late dry and early rainy seasons body weights were not significantly different (P>0.05), but were significantly (P<0.05) lower than during the late rain and early dry seasons.

Weight gains were highest (30.4 kg) during the early rainy season which was significantly higher (P<0.05) than during the three other seasons which were not significantly (P>0.05) different.
Effects of interaction between season and legume type on animal performance

Body weights of the Bunaji bulls grazing native pastures, strip-sown with different legumes, across seasons is presented in Table 1. Within season comparison across the treatments showed no significant differences (P>0.05). However, when weights were compared across the seasons in the treatments, the results showed that season had significant (P<0.05) effect across all treatments. In all the treatments, the grazing animals attained their highest weights during the early dry season with animals on *C. rotundifolia* recording the highest weights.
Table 1: Effects of interaction between legume type and seasons on the body weight changes (kg) of grazing Bunaji bulls.

<table>
<thead>
<tr>
<th>Season</th>
<th>Late dry</th>
<th>Early rain</th>
<th>Late rain</th>
<th>Early dry</th>
<th>SEM</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. hamata</em></td>
<td>130.13(^b)</td>
<td>133.25(^b)</td>
<td>162.00(^a)</td>
<td>173.63(^a)</td>
<td>13.78 *</td>
<td></td>
</tr>
<tr>
<td><em>C. rorundifolia</em></td>
<td>130.38(^b)</td>
<td>127.88(^b)</td>
<td>167.38(^a)</td>
<td>175.38(^a)</td>
<td>13.78 *</td>
<td></td>
</tr>
<tr>
<td><em>C. pascuorum</em></td>
<td>130.25(^b)</td>
<td>133.50(^b)</td>
<td>159.25(^a)</td>
<td>170.00(^a)</td>
<td>13.78 *</td>
<td></td>
</tr>
<tr>
<td>Native pasture</td>
<td>130.25(^b)</td>
<td>130.88(^b)</td>
<td>158.50(^a)</td>
<td>169.75(^a)</td>
<td>13.78 *</td>
<td></td>
</tr>
</tbody>
</table>

Means in columns bearing different superscripts are significantly different (P<0.05); LOS= Level of Significance
* Significant at P<0.05

DISCUSSIONS

Animal Liveweight Changes

Weight responses to treatments showed that during the late dry and the early rainy seasons, animals on *C. pascuorum* and native pasture treatments lost weight while animals on *S. hamata* and *C. rotundifolia* treatments gained weight even into the late dry season. The result obtained in this study followed the established pattern of weight changes in free range grazing animals on tropical rangelands which is a reflection of both the quality and quantity of available feed as reported by McCown *et al.* (1981), McLennan *et al.* (1988) and Holechek *et al.* (2004). The extension of the grazing period recorded for *S. hamata* and *C. rotundifolia*, showed that the two legumes were able to sustain weight gains longer than *C. pascuorum* or the native pasture. This response is because *S. hamata* and *C. rotundifolia* remain green longer into the dry season and are readily consumed in the dry season.

With the onset of the rains, a rapid increase in weight gain of the animals was recorded. This is perhaps a reflection of the quality of the forage and the principle of compensatory growth following a period of weight loss due to feed shortage. It has been reported that cattle that had experienced a period of under-nutrition have higher than normal rates of weight gain when realimented (Richardson, 2009; Dixon, 2012). The amount of compensation when re-alimentation occurs, which is normally after the onset of the next rains, is dependent on the length of the underfeeding, the severity of the underfeeding and the amount of forage available in the re-alimentation period (O’Donovan 1984, Ryan 1990, Freking *et al.* 2000). The rains resulted in a new flush of herbaceous vegetation which is usually higher in nutritive quality than what was available in the dry season. During the rainy season, liveweight gains of animals grazing over-sown natural pastures or natural pasture alone usually do not differ (CSIRO, 1996) Kusekwa, *et al.* (1990) however reported a higher weight gain of 10% for animals on the oversown native pasture over those on the natural pasture alone. In this study it is shown that during the rainy season (period of active vegetative growth of forages) animals grazing the native pastures alone compared favourably with those on legume strip-sown native pastures. Nonetheless, higher values were recorded for animals on the legume strip-sown than those on the native range pastures.
CONCLUSION

From the foregoing, it is evident that if *C. rotundifolia* is adopted for the rehabilitation of the degraded rangelands in savanna ecological zones, the weight losses usually experienced in grazing stock during the dry season could be reduced. *C. rotundifolia* is therefore recommended for rangeland improvement in the Northern Guinea Savanna.

REFERENCES


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