

Impact of dry season supplementary feeding on performance of bull calves in a Fulani herd in derived savanna zone of Nigeria

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Abstract

Inadequate nutrition remains a major constraint to improved cattle production in the traditional agro-pastoral system of derived savanna in Nigeria. Consequently, a trial that studied effect of supplementary feeding of dried brewers spent grain to grazing cattle in the dry season was carried out in four selected Fulani herds located in the four axis of the derived savanna zone. In the trial, studies were carried out on eight N'Dama and eight Bunaji bull calves in a randomized complete block design. The supplement DBSG (24% CP) was fed at the rate of 1kg/calf /day for the period of three months. The calves on supplementation consumed an average of 0.80 kg/day. The average daily weight gains were higher for bull-calves on supplementary feeding (85g/day for N'Dama versus 56 g/day for Bunaji) than those without the supplement (17 g/day for N'Dama versus 11g/day for Bunaji). N'Dama cattle gained more weight than Bunaji. Financial analysis showed that the net benefit for the two breeds fed with or without supplementation was higher for N'Dama than for Bunaji. Supplementation had a significant ($P < 0.05$) effect on animal packed cell volume, red blood cells and haemoglobin values. The study showed that dietary protein supplementation had a significant influence on haematological parameters; body weight gains and the net economic returns. Thus dry season feed supplementation with dried brewers spent grain had a positive effect on Bunaji and N'Dama bull calves being raised in a traditional Fulani herd and could be encouraged as a strategy to boost cattle productivity during the critical dry season.

Keywords: Haematology, Bunaji, N'Dama, Bull calves, and Fulani herds.

Impact de l'alimentation complémentaire de saison sèche sur les performances des taurillons dans un troupeau peul dans une zone de savane dérivée du Nigéria



Résumé

Une nutrition inadéquate reste une contrainte majeure à l'amélioration de la production bovine dans le système agro-pastoral traditionnel de la savane dérivée au Nigéria. Par conséquent, un essai qui a étudié l'effet de l'alimentation complémentaire de drèches de bière séchées sur le bétail au pâturage pendant la saison sèche a été réalisé dans quatre troupeaux peuls sélectionnés situés dans les quatre axes de la zone de savane dérivée. Dans le cadre de l'essai, des études ont été menées sur huit taurillons N'Dama et huit taurillons Bunaji dans un schéma en blocs complets randomisés. Le supplément DBSG (24% CP) a été administré à raison de 1 kg/veau/jour pendant une période de trois mois. Les veaux supplémentés consommaient en moyenne 0,80 kg/jour. Les gains de poids quotidiens moyens étaient plus

élevés pour les taurillons recevant une alimentation complémentaire (85 g/jour pour le N'Dama contre 56 g/jour pour le Bunaji) que pour ceux sans complément (17 g/jour pour le N'Dama contre 11 g/jour pour le Bunaji). Les bovins N'Dama ont pris plus de poids que les Bunaji. L'analyse financière a montré que le bénéfice net pour les deux races nourries avec ou sans supplémentation était plus élevé pour les N'Dama que pour les Bunaji. La supplémentation a eu un effet significatif ($P < 0,05$) sur l'hématocrite animal, les globules rouges et les valeurs d'hémoglobine. L'étude a montré que la supplémentation en protéines alimentaires avait une influence significative sur les paramètres hématologiques ; les gains de poids corporel et les rendements économiques nets. Ainsi, la supplémentation alimentaire en saison sèche avec des drèches séchées de brasserie a eu un effet positif sur les taurillons Bunaji et N'Dama élevés dans un troupeau peul traditionnel et pourrait être encouragée comme stratégie pour augmenter la productivité du bétail pendant la saison sèche critique.

Mots-clés: Hématologie, Bunaji, N'Dama, taurillons et troupeaux peuls

Introduction

The importance of ruminants which are cattle, sheep and goat as source of income and animal protein supply is cardinal for livelihood. Cattle and to an extent sheep and goat production are generally associated with the pastoral Fulani, who are reported to own approximately 83% of the national herd (Ducrotoy *et al.*, 2016). Pastoralism is an age-old system of livestock husbandry, which entails global grazing of ruminants as practiced in the ecological stratification of West Africa (Moritz, 2012). Despite its dominance in the region, the system has begun to breakdown in the recent decades as a result of population explosion, draught, low rainfall and reduced fertile land (Jabbar *et al.*, 1995; Okoruwa *et al.*, 1996). Bunaji, a trypano-susceptible *Bos indicus* is still the dominant type of cattle breed being kept by agro-pastoralist in this zone (Jabbar *et al.*, 1998) and has increased rapidly as a result of large movement of Bunaji cattle into the region by Fulbe pastoralists who are in search for feed and water for animals (Ducrotoy *et al.*, 2016). However with increasing duration of settlements, a trend towards keeping more trypano-tolerant breed (N'Dama, Keteku) has been observed (Jabbar, 1993). N'Dama, a trypanotolerant *Bos taurus* was introduced into the zone through the National Breed improvement programme. N'Dama were imported from

Gambia to Nigeria as a breeding stock which were multiplied and disseminated in five government ranches in southern Nigeria to the farmers (Jabbar *et al.*, 1995). Ruminant livestock in most of sub-Saharan Africa countries depend on forage from natural pasture as a major feed resource (Ndlovu, 1992). Inadequate quantity and quality nutrition for cattle from rangeland especially during the dry season is considered one of the major limitations to cattle productivity. Protein is usually the limiting factor but energy and mineral deficiency can be critical in certain period. Full diet concentrate feeding is rarely practiced due to its non-availability and exorbitant cost. However there is the need to supplement the usually coarse, lignified feeds from range natural pasture and farm crop residues with cheaply and readily available feed that is rich in protein in the dry season. This seeks to improve the performance of cattle on natural pastures, to ensure a year round livestock production, and to satisfy the growing demand for meat and milk in Nigeria. The timing of feeding strategy has been based on the availability of feeds (grazing on natural pasture and crop residues). The period from December to mid-March represents a period when quantity and quality of grasses and crop residues were poor thus the need for supplementation. This study was therefore

undertaken to evaluate the influence of dry season natural pasture grazing with or without dried brewers spent grain (DBSG) (24% CP) supplementation on Bunaji and Ndama bull calves; body weight changes, haematology, and economic returns.

Materials and methods

Production environment and animal management

The study was carried out during the critical dry season (January to March) in four Fulani herds located within Ogbomoso community, Nigeria. The area is characterized by an annual rainfall of 1500mm – 2000 mm and followed a bimodal distribution (NASA, 2016). A total of four herds were randomly selected around the four axes of the derived savanna, south Western Nigeria. The herds consisted of Bunaji and N'Dama cattle. The four herds were allotted to two experimental treatments in a complete randomized block design. Sixteen calves with a pre-experimental weight (80 kg) and age (9 months) were selected for the treatments group. The allocation process resulted in the structure below:

Treatment 1: Farmer's practice of grazing of animal on natural pastures without dried brewer's spent grain (DBSG) supplementary feeding (control) with eight calves (4N'Dama + 4Bunaji calves).

Treatment 2: Farmer's practice of grazing on natural pastures and protein supplementary feeding of dried brewer's spent (DBSG; 24% crude protein) fed prior to daily grazing at 1 kg /calf/day with eight calves (4N'Dama + 4Bunaji calves)

Data collection

Feed intake

Intake was estimated for individual animals by feeding them on a known quantity (1kg) of brewer's spent grain daily. The difference between the quantity offered and the leftover was estimated as intake. The feed intake was calculated on dry matter basis,

by multiplying total intake (as fed) of individual animals by dry matter percentage of the supplement.

Weight response

This was determined in terms of weigh change for all animals. The weights of all animals were taken at the beginning of the experiment and monthly throughout the period before feeding for the day.

Blood sample collection

Blood samples were collected at the beginning and end of the study thorough the calves' jugular vein using vacutainer needles and monoject tube (sterilized with EDTA). The point of collection was cleaned with cotton wool soaked in 75% alcohol in order to sterilize the skin. Sample tubes with blood were stored in the box laced with ice for preservation for about 20 minutes before getting to the laboratory for analysis. Haematology indices of interest included Packed Cell Volume (PCV), Red Blood Cell (Erythrocyte) count($\text{RBC} \times 10^6/\text{cm}^3$), White Blood Cell (WBC) (leukocyte $\times 10^3/\text{cm}^3$) Count and haemoglobin concentration (g/dl), and analysis was done using haemo-autoanalyzer model B1110.

Economical analysis of feeding cost

The market price of dry brewer's spent grain as at the time of the study was used to calculate the cost of feed consumed by each animal and the net benefit in Naira during the experimental period. This is to assess the cost of supplemental feeding using DBSG for calves during the dry season.

Chemical analysis

The DBSG sample was analyzed for dry matter (DM) crude protein (CP), crude fibre (CF) and ether extract (EE) according to A.O.A.C. (1990) procedure.

Experimental design and statistical analysis

The experimental design was completely randomized block design. The data collected were analysed using the two-way analysis of the General Linear Model of SAS (2000) statistical package. The means

were separated using least square difference ($P < 0.05$) of the same statistical package.

Results and discussion

The chemical composition of feed supplement is presented in (Table 1). The

result showed that the feed was rich in crude protein although the fibre content was slightly high. The crude protein content (24%) was far above the 7-8% minimum CP requirement as reported by NRC (2006) below the level of which the feed intake and digestibility becomes poor.

Table 1: Chemical composition of the dried brewer's spent grain (%)

Parameters	Quantity(%)
Dry matter	90.40
Crude protein	24.44
Ether extract	7.25
Crude fibre	20.51
Ash	3.32

The mean daily weight gains were higher in calves supplemented with dried brewer's spent grain than those that were grazed on natural pasture alone. The supplemented N'Dama calves gained 85 g/day; Bunaji gained 56 g/day while N'Dama calves without supplementation gained 17 g/day Bunaji calves 11 g/day (figure 1). The two breeds performed better than their controls and N'Dama performed better than Bunaji (Figure 1). This confirmed earlier reports that there is significant association between plane of nutrition and body condition scored in cattle (Kenyon *et al.*, 2014).

The result of haematological parameters is presented in Table 2. The haematological parameter values obtained in the study were within the normal range as reported for tropical breeds (Olayemi and Oyewale, 2002; Aro, 2019). The result in this study showed that a reduction in protein intake in dry season reduced packed cell volume, haemoglobin concentration, and red blood cell counts (Table 2). There were significant differences ($P < 0.05$) between those fed with DBSG and without DBSG. For all the

parameters among the breeds there were no significant differences except for haemoglobin which was significant. These observations were in agreement with some findings which have shown that haemoglobin and packed cell volume were influenced by feeding level and by protein contents in zebu cattle (Vallianou *et al.*, 2013) and even in rabbit (Ahamefule *et al.*, 2006).

The economic net benefit was enormous for calf supplemented with DBSG than non-supplemented group. This was consistently higher for N'Dama calves than Bunaji calves. For supplemented N'Dama calves –8000 was realized as net benefit for 3 months per animal and –5800 for Bunaji calves for the same period, while their controls had a net benefit of N3000 and N2000 respectively (Table 3). This was in line with the observation of Little *et al.* (1991b, 1994b) who reported a net value of more than 20-fold the cost of supplementation for N'Dama cattle in Gambia.

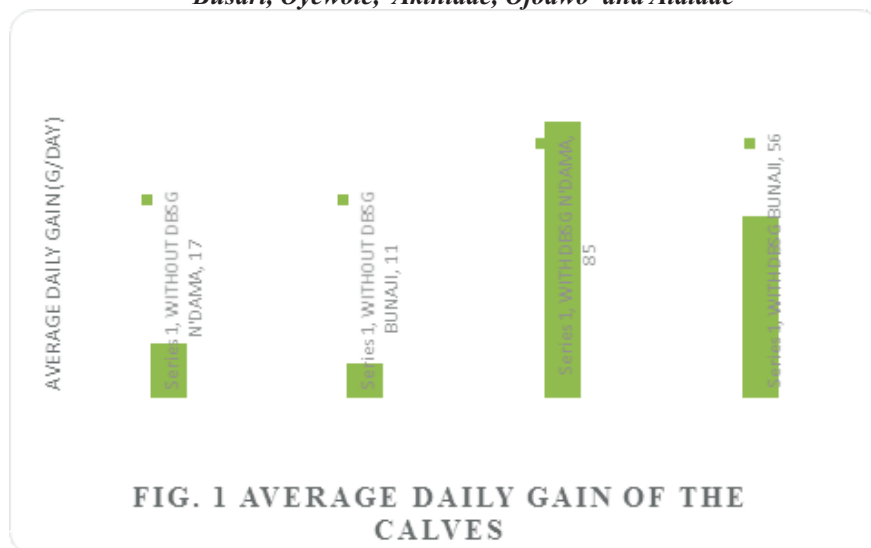


FIG. 1 AVERAGE DAILY GAIN OF THE CALVES

Table 2: Haematological responses of N'Dama and Bunaji calves to dry season protein supplementary feeding (DBSG)

Parameters	Without DBSG		With DBSG		SEM	SF	P-values	
	N'Dama	Bunaji	N'Dama	Bunaji			B	B* SF
Packed cell volume (%)	29.50	26.50	35.55	33.70	0.92	0.04	0.74	0.26
Haemoglobin (g/dL)	7.89	7.63	9.63	9.02	0.21	0.03	0.04	0.35
Red blood cell (x 10 ⁶ /cm)	4.43	4.20	8.46	7.21	0.17	0.01	0.59	0.27
White blood cell (x 10 ³ /cm)	8.27	7.96	10.96	9.27	0.19	0.03	0.78	0.10

B-breeds of cattle, SF - Supplementary feeding, DBSG- Dried brewer's spent grain, SEM - Standard error of mean

Table 3: Cost benefit analysis of the dry season protein supplementary feeding (DBSG)

Treatment	Breed	No of calves	Cost of feeding (₦) 90 days	Calf growth ₦ (90 days)	Net benefit ₦ (90 days)
Without DBSG	N'Dama	4	-	3000	3000
	Bunaji	4	-	2000	2000
With DBSG	N'Dama	4	7200	15200	8000
	Bunaji	4	7200	13000	5800

1 kg dried brewer's spent grain – 25.00
 1 kg live weight of cattle – 500.00

Conclusion

This study demonstrated that dry season supplementary feeding with dried brewer's spent grain improved animal body weight gain and haematological parameters. Farmers will benefit from extension package that includes dry season supplementary feeding with natural

pasture. Thus any limitation in protein content of diet would easily be expressed by loss of weight and poor haematological profile. Thus, information of haematological parameters and growth rate may provide a useful tool in setting material for evaluating the production potentials of indigenous cattle.

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