EFFECT OF SORREL SEED (*HIBISCUS SABDARIFFA)* SUPPLEMENTATION ON THE PERFORMANCE OF YANKASA RAMS FED *BRACHIARIA DECUMBENS* AS BASAL DIET

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ABSTRACT

An eight-week feeding trial was conducted to determine the performance of Yankasa rams fed raw and differently processed Sorrel Seed Meal (SSM) as protein supplement. Sixteen (16) growing Yankasa Rams aged between 6-7 months were randomly allocated to 4 dietary treatments replicated 4 times in a complete randomized block design. The treatment groups were control diet, raw SSM, soaked SSM and toasted SSM as T_1 - T_4 respectively. The rams were offered basal diet (*Bracharia decumbens)* and water *ad-libitum*. Sorrel seed meal was given at 300g daily (twice daily i.e 150g/meal). The parameters used to evaluate the performance were feed intake, body weight gain and feed conversion ratio. The daily feed intakes (F1) were 295.87, 234.10, 232.15 and 214.45g for T_1, T_2, T_3 and T_4 respectively. The corresponding daily weight gains (ADWG) were 109.32, 127.22, 124.35 and 160.67g for T_1, T_2, T_3 and T_4 respectively. The daily F.I, ADWG and FCR differ significantly ($P<0.05$) among the treatment groups. The control performed better in terms of feed intake while sorrel seeds in its toasted forms did significantly better in mean weight gain and FCR. Therefore, toasted and raw sorrel seed meals could be use as protein supplement for Yankasa rams without adverse effect on their productive and blood parameters.

Keyword: Sorrel Seed, Yankasa Ram, Protein Supplementation, Tannin, Experimental Diet

INTRODUCTION

The majority of ruminant animals in Nigeria are raised on natural pastures which decline rapidly in quality during the dry season. Changes in nutritional status results in very irregular growth and marked fluctuations in seasonal weights in small ruminants (Reed *et aI*; 1998). Small scale farmers cannot afford the investments required to establish improved pasture and feed concentrate supplements to alleviate dry season growth checks. Small scale farmers are increasingly relying on crop residues, browse and Agro industrial by products to supplement roadside grazing during the dry season. Some of these materials are potentially good feed resources which degrade readily in the rumen (Melaku *et aI*., 2004). Others have shown poor degradability so that they require some treatments before they can contribute to animal nutrition (Smith *et aI*., 1997, Osakwe *et aI*., 2004).

In small ruminants, the amount of protein consumed is more important than the quality of protein. When protein supplementation is the primary objective, the cost (#) per kg of protein is the most important consideration (Diego, 1994).

Since the 1970's, livestock production in developing countries has been growing steadily. In fact, growth rate in recent years appears to be as spectacular as the cereal growth achieved during the green revolution (Nordblom and Shomo, 1995).

In Nigeria, the main constraint to increase output of livestock is the inability of producers to feed animals adequately throughout the year. Yet opportunities exist to enhance small ruminants feed supply by using Agro industrial by products and crop residues such as sorrel seed, legume haulms, cereal straw etc.

Crop residues are crop by - products which are left aside when the primary crop products have been harvested. In Nigeria, cereals are the most important quantitatively. Leguminous or oil seeds residues are produced in smaller quantities though depending on location and environments. They include groundnut, cowpea, soybean, lab - lab haulms etc. Root crop residues such as cassava peels and sweet potato are also useful crop by products in the country (Bosman *et aI,* 1995). However, most of the available residues are used as feed for animals' especially ruminant live stocks (Smith *et aI.*, 1997).

The major sources of forage for the grazing stock are the natural rangeland, crop residues and to a lesser degree established pastures. Available data shows that the rangelands can no longer support livestock species that depend on it while most of the crop residues available are of poor quality. There is therefore, a growing demand among ruminants livestock owners to provide feed for their animals especially during the "hungry months" (Gefu and Amodu, 2004).

The 22 million sheep and 35 million goats (FLDPCS, 1992) still suffer seasonal weight losses as a result of inadequate feeding. There is no systematic scheme/programme for the feeding of indigenous livestock which are still mostly scavengers.

The animal protein intake in Nigeria is one of the lowest in the world which indicates the seriousness of the animal protein problem (World Bank, 2003).

One of such feed ingredient that can be used as protein supplement with little or no cost is the sorrel seed (*Hibiscus sabdariffa*) seed. The leaves are used as vegetables, while the stem produces fibre. The seeds on the other hand, are widely eaten by scavenging livestock.

In spite of the numerous advantages of Sorrel seed, the raw seed are known to have a bitter taste, which is attributed to anti-nutritional factors, most probably "Tannins". In view of the above, this study is aimed at, determining the proximate composition and anti nutritional factors in sorrel seed (raw and processed) and the effect of sorrel seed processing on feed intake, growth rate and feed conversion efficiency.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Federal University of Technology, Teaching and Research Livestock Farms, Yola which is located at latitude 7° 11' north and longitude 11° 14' east and at an elevation of 364m above sea level in the north eastern part of Nigeria. The mean relative humidity ranges from 30 - 50% with a minimum in February to March when it drops to as low as 10% and a maximum of about 90% in August (Adebayo, 1997).

EXPERIMENTAL STOCK AND MANAGEMENT

Sixteen (16) growing Yankasa rams (6-7 months of age) purchased from Ngurore market in Adamawa State were used. Each ram was identified with a numbered ear tag and individually confined. All animals were given prophylactic treatments for endo and ecto parasites. They were given 14 days for adaptation to respective diets before the commencement of data collection.

SOURCES AND PROCESSING OF THE SORREL SEEDS

The sorrel seeds used for this study were procured locally around Zing in Taraba state and processed as follows:

i. Raw sorrel seed were cleaned and milled and given as diet (T_2) at the specified (g)
ii. Sorrel seeds were soaked for 12 hours in a plastic basin, dried and milled as diet (T_3).
iii. Sorrel seeds were toasted for 10 - 12 minutes, and milled as diet (T_4)

EXPERIMENTAL DESIGN AND TREATMENTS

The rams were randomly divided into four groups of four rams each. Each group was randomly assigned to one of the four dietary treatments in a Completely Randomized lock Design (CRBD). Treatments were offered as:

The supplementation were given at 300g at 8am and 4pm (i.e. twice daily). The treatments were

T_1 =*Brachiaria decumbens Ad-libitum* (Control)

T_2 = *Brachiaria decumbens Ad-libitum* + 300g of Raw sorrel seed meal per animal per day

T_3= *Brachiaria decumbens Ad-libitum* + 300g of Soaked sorrel seed meal per animal per day

T_4= *Brachiaria decumbens Ad-libitum* +300g of Toasted sorrel seed meal per animal per day

The study lasted for 8 weeks (56 days)

DATA COLLECTION

Performance data

a. Feed intake; here known amount of feeds were given twice daily. The feed leftover were weighed to determine the feed consumed through subtracting left over from the quantity given. The amount consumed per rams was then calculated for each treatment. The weekly feed consumption per ram was calculated after every week for each of the treatments.
b. Weight Gain; each ram was weighed at the beginning of the experiment and every successive seven days thereafter. Average daily gains (g/d) were calculated as difference between final and initial body weights divided by number of days of feeding.
c. Feed Efficiency; This were calculated as the ratio of weekly feed intake to weekly body weight gain as follows

$$\text{Feed Efficiency (FE)} = \frac{\text{feed consumed (g)}}{\text{Body weight gain (g)}}$$

STATISTICAL ANALYSIS

Data collected were subjected to statistical package for social sciences (SPSS) version 10 and means were separated using Least Significant Difference (LSD).

RESULTS AND DISCUSSION

TABLE 1: Proximate Composition of the Experimental Diets

Nutrients (%)	Raw		Soaked		Toasted	
	SSM		SSM		SSM	
Dry matter	92.00		91.00		94.00	
Crude Protein		21.40		24.41		23.90
Crude Fibre	15.00		14.00		15.00	
Ether Extract	16.00		16.00		19.00	
Ash	7.00		9.00		8.00	
Nitrogen free Extract		39.80		36.59		34.69
Tannin Levels		2.50		2.00		1.30
% reduction of tannin		-		20.0		48.0

KEY

SS = Sorrel Seed Soaked = 12 hours soaking

Raw = unprocessed Toasted = 10 – 12 minutes.

CHEMICAL COMPOSITION OF SORREL SEED MEAL

The chemical composition of raw and differently processed sorrel seed are shown in Table 2 The crude protein (CP) content of the raw, soaked and toasted sorrel seeds were 22.20, 24.41 and 23.90% respectively. The higher crude protein (CP) levels of the toasted sorrel seeds may be attributed to heating. Similar results were observed by Akinmutimi, (2001) who subjected legume seeds to heating and reported a slight increase in the CP level of the feed. The crude fibre (CF) levels were 15.00, 14.00 and 15.00% respectively. This shows that the CF for the soaked was lower than the rest. The ether extract (EE) levels were between 16.00 and 23.00% which falls within the range given by FAO (1982). The higher level in the toasted sorrel seeds could be attributed to the decrease in non-lipid components of the sorrel seeds during toasting.

The Ash levels are 7.0, 9.0, and 7.05. The nitrogen free extract (NFE) were 39.80, 36.59 and 34.68 respectively. The lower levels of NFE during toasting were also reported by Graham (1991). Similarly, the higher levels of protein and ash in the processed sorrel seeds may confirm the loss of the more soluble components of the seeds in favour of the protein and Ash.

TANNIN CONTENT

Tannin values for raw, soaked and toasted sorrel seeds are 2.5%, 2.0% and 1.3% respectively (Table 1). The reduction in the levels of tannins in the processed sorrel seeds is due to the processing methods adopted. This is in agreement with the report of Price *et. al.*,

(1979) who stated that soaking in water tends to eliminate the anti-nutritional factors in feedstuff and makes them (tannin) nutritionally less active.
Bressani *et. al.*, (1982) also stated that humid dry or moist heating reduces tannin contents of feedstuffs. The decrease in the tannin content of legumes during soaking may be due to the leaching out of the tannins into the water.

Processing therefore resulted in marginal decrease in the levels of tannin, with soaking and toasting accounting for 20% and 48% reduction in tannin levels respectively.

TABLE 2: Effect of Sorrel Seed Meal (SSM) on the Performance of Yankasa Rams

Parameters	**Diets/Treatments**				
	T_1 BD	**T_2 RSSM**	**T_3 SSSM**	**T_4 TSSM**	**SEM**
Feed intake (g/d)	295.87^{a}	234.10^{b}	232.15^{b}	214.45^{b}	10.46^{***}
Average daily Weight gain (g/d)	109.32^{b}	127.22^{b}	124.35^{b}	160.67^{a}	9.46^{**}
Feed Conversion Ratio	2.70^{b}	1.84^{a}	1.86^{a}	1.33^{a}	0.82^{**}
Mortality (No.)	-	-	-	-	-

a, b, …… means within the same row bearing different superscripts differ significantly (P< 0.05)

SEM – Standard Error of means
* Significant difference (P< 0.05)
BD - Brachiaria decumbens - T_1 SSSM – Soaked sorrel seed meal - T_3
RSSM – Raw sorrel seed meal - T_2 TSSM – Toasted sorrel seed meal - T_4

AVERAGE DAILY FEED INTAKE.

The results of feed intake are presented in Table 3. There are significant (P. < 0.05) differences in supplementary feed intake between the control diet and the sorrel seed supplemented treatments. The overall means are 295.87, 234.10, 232.15 and 214.45g for T_1, T_2, T_3, and T_4, respectively.

The result showed that feeding sorrel seed meals (raw and processed) had slight effect on feed intake compared with control treatment. The values for feed intake of sorrel seed meal (SSM) in this study did not compare favourably with the report of Reddy, (2001) who stated that feed intake on growing rams should be around 250 – 300g /ram/ day. The difference in feed intake could be attributed to the presence of tannin in the test materials (Sorrel seed meals) as observed by Silanikove *et. al.*, (1997) who confirmed that the tannin contents in feed negatively affects intake and utilization of protein in supplementary feed; and that the principal negative effect of tannins is on protein utilization (Silanikove *et al.*, 2001). (Ernst and Sekhwela, 1987) also confirmed that Tannins in feed affects feed intake, digestibility and

animal performance by reducing degradation of fibre and protein by rumen micro-organisms, in spite of the difference in feed intake between the controlled diet and sorrel seed meals.

However, those fed raw and soaked sorrel seed meals numerically recorded higher feed intake (234.10, and 232.15g for T_2 and T_3 respectively). The slight difference could be attributed to the effects of the different processing methods adopted for the sorrel seed meals.

WEIGHT GAIN

The results of weight gain are presented in Table 3. The overall average daily weight gains were 109.32, 127.22, 124.35 and 160.67g for T_1, T_2, T_3, and T_4 respectively. The results indicate significant ($P< 0.05$) difference in daily weight gain between rams in the control diet and those on the test diets (sorrel seed meals)

The mean weight gain in the toasted diet compared favourably with that reported by Reddy (2001) and did better than the result obtained by Archimede *et.al*. (1995) who recorded 132g /ram/ day.

The result obtained by the rams under the raw, soaked, and control diet. Though performed below the toasted diet; it compared better than the results obtained by Reynolds (1989), Ademosun *et.al*., (1985) and Wilson (1958) who recorded significantly lower growth rates of 30.1g, 40.4g and 90g/d respectively.

The difference in average daily weight gains among the test diets (sorrel seed meals) could be attributed to the presence of condensed tannin and processing methods as observed by (Makkar, 2003) who stated that many non-conventional concentrate feed contain various levels of antinutritional factors such as tannins which have affinity for carbohydrates, amino acids and minerals rendering them unavailable for rumen micro flora and the host animal, (Waghorn *et. al*., 1999) thereby decreasing their production and reproductive performance. (Karim *et. al*., 2004) also observed that growing – finishing rams supplemented with 250g unconventional concentrates in addition to grazing in semi-arid regions do not usually optimize their growth performance. And since between the raw and soaked (Sorrel seed meal) there are physical difference in average daily weight gain which is not being observed statistically, these difference could be attributed to processing methods used as observed by (Adebowale, 1988) and (Alhassan, 1985). Although, the effect of soaking is not clearly known, it could be that soaking enhances the solubilization of some nutrients into the soaking water. This could have interfered with the biological values of the feed which may be the reason for the poor performance in T_3 (soaked sorrel seed meal) in terms of weight gain, feed intake and FCR

FEED CONVERSION RATIO.

The data on the feed conversion ratio are presented in Table 3. The average feed conversion ratio for the treatment groups are 2.70, 1.84, 1,86 and 1.33 for T_1, T_2, T_3, and T_4 respectively. The feed conversion ratio (FCR) which is the feed consumed per unit weight

gain differ (P< 0.05) significantly among all the treatment groups (Table 3). Since FCR is a measure of the efficiency of the rams to convert feed consumed into meat (mutton), the lower the value, the better the FCR.

The result of the study indicates that there is significant (P> 0.05) difference in terms of FCR between the treatment groups. According to the result, the test diet in treatment 4 (Toasted sorrel seed meal) did better than the remaining diets, which also is the reason why it performed better in terms of average daily weight gain and could be attributed to the method of processing (heating) which makes urea and total protein readily available thus influencing nutrient density and quality of nutrients available for utilization as observed by Tripathi *et al.*, (2006). Tambuwal *et.al.*, (2002), Oduye and Adadevoh, (1976) and Silanikove (2000) further stressed that higher digestible organic matter fermented in rumen (DOMR) availability, greater microbial protein yield and proportionate nitrogen (N) intake in relation to blood urea level together positively contributed to daily gains, nitrogen utilization through improved feed conversion ratio (FCR).

The treatment that performed poorly among the four treatment groups is T_1 control diet, and this could also be attributed to lack of supplementation, as tropical grasses alone cannot meet-up the animal nutritional requirements as observed by (Makkar, 2003)

SUMMARY, CONCLUSION AND RECOMMENDATION

The results of this study indicates that sorrel seed meals (raw and processed) can be use as supplementary diets in feeding of Yankasa rams without adverse effect on their productive performance. Therefore, diets containing sorrel seed meals could be recommended for growing-finishing Yankasa rams, even though, the control diet performed better in terms of feed intake. Sorrel seed meal in its toasted and raw forms did considerably well in term of weight gain and feed conversion ratio especially the toasted diet. However, the raw and toasted have an edge over soaked sorrel seed meal in terms of intake, daily gain and feed conversion efficiency. In view of these, further studies are needed to evaluate other processing methods and possibly increase the levels of inclusion or fed on graded levels; these aspect were not covered in this study.

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