



**RESPONSE OF KANO BROWN GOATS FED *GMELINA ARBOREA* LEAVES AND
SUPPLEMENTED WITH DIETS CONTAINING WATER SOAKED SWEET ORANGE (*Citrus
sinensis*) PEELS**

Oloche, J., Waalawa, Y.G and Wuave, J.M.

Department of Animal Production, University of Agriculture Makurdi, Nigeria

Email address: julianaolocheo82@gmail.com

Telephone: +2348 037 694 142

Abstract

Twenty male grower Kano brown goats of weights 6.750 kg - 9.000 kg, and age between 5 - 8 months were used in a completely randomized design to assess the performance of Kano brown goats fed *Gmelina arborea* leaves and supplemented with concentrate diets containing different level of water soaked sweet orange peel meal (WSSOPM). Four dietary treatments were formulated and compounded to contain 0%, 50%, 60% and 70% FSOPM, and were designated T1, T2, T3 and T4 respectively in a forty-two day feeding trial. Results showed that there were no treatment effects ($P>0.05$) on mean daily weight gain, total forage intake and feed conversion ratio. However, treatment effect was apparent ($p<0.05$) on the total concentrate intake, total feed intake and mean daily feed intake. The wholesale cuts showed treatment effects on the shoulder values. T1 (11.21) was significantly higher ($P>0.05$) than all the other treatments, while T3 (8.54) had the lowest value. However, other wholesale cuts values such as chest, loin, back, thigh, rib and neck were all similar ($P>0.05$) across the treatments. Water soaked sweet orange peel meal can replace up to 70% of maize offal in goat diets without adverse effects on the performance and wholesale cuts.

Key words: Performance, Wholesale cuts, Kano brown goats, *Gmelina arborea* leaves, Water soaked sweet orange peels

Introduction

The potential of small ruminant production in alleviating the low animal protein intake by man in developing nations such as Nigeria needs no emphasis (Olukotun and Nwaosuibe, 2008). However, meeting the nutritional needs of ruminant animals throughout the year has been a major challenge facing livestock farmers in the tropics due to the seasonality of forages (Babayemi *et al.*, 2009). This has necessitated the use of concentrate supplements to enable the animals go through the long dry periods without the adverse effects of inadequate feeding such as decreased productivity and death in severe cases. Conventional feed ingredients, particularly those that supply energy such as maize, sorghum, and millet are expensive. Unconventional feedstuffs are cheap, viable and available and of low demand by man and other livestock and can be harnessed and used in ruminant diets. More so, increased production levels of food crops in Nigeria has brought about an unprecedented amount of crop residues and by products (straws, haulms, stover cobs, vines, peels, brans, leaves, chaff etc.) as left over after crop harvest (Kalio *et al.*, 2013) and sweet orange fruit peels which can be used for feeding of goats. Sweet orange peels are available throughout the year and have been used in the diets of West African dwarf goats at lower levels without deleterious effects (Oloche *et al.*, 2012). This study was therefore designed to evaluate the growth performance and wholesale cuts of Kano brown goats fed diets containing graded levels of water soaked sweet orange peel meal.



Materials and methods

The experiment was carried out at the Teaching and Research Farm, University of Agriculture, Makurdi. The sweet orange peels were collected from sweet orange retailers within Makurdi metropolis. The collected peels were turned into large plastic containers and soaked in water for 24 hours. Thereafter, the peels were drained using baskets and sun-dried on concrete slabs for 48 hours. The dried peels were packed and crushed into a meal using a cereal milling machine and subsequently stored in synthetic sacks until used. Four diets were formulated and compounded to contain 0%, 50%, 60% and 70% water soaked sweet orange peel meal (WSSOPM) and designated T1, T2, T3 and T4 respectively.

A total of twenty Kano-brown goats weighing between 6.750 - 9.000kg and aged between 7 – 10 months were bought from Northbank market and used for the experiments. The animals were randomly distributed into four treatment groups (n=5) in a completely randomized design. The bucks were housed individually, and each animal was fed 200g of the concentrate at 8:00hr daily while the forages were served *ad libitum* at 10.00 hour and 14.00 hour respectively. The feed intake was calculated by subtracting the remnants from the initial quantity of feed that was fed to each animal on daily basis. The animals were weighed weekly to assess changes in weights. The experiment lasted for 42 days. At the end of the study, twelve animals were slaughtered, three animals per treatment to evaluate the wholesale cuts.

Results and discussions

Table 1 presents the dietary composition of the experimental diets fed to the goats. The result for the performance of the Kano brown goats fed the experimental diets is presented in Table 2. The mean daily weight gain values were 64.76g, 46.67g, 42.63g and 44.28g for T1, T2, T3, and T4 and there were no significant difference ($P>0.05$) among the treatments. This imply that replacing maize offal with WSSOPM up to 70% level also support weight gains of the animals and did not cause weight losses. Observed values of mean daily weight gain in this study were higher than the 18-30g/day reported by Nwakpu and Uchewa (2014) for WAD goats fed *Gmelina arborea* leaves supplemented with *Aspergillus* treated rice husk. Hassan *et al.* (2016) reported mean daily weight gains of 20.22 - 44.22g/day for red Sokoto bucks fed graded levels of Lablab (*Lablab purpureus*) hay as supplement to maize stover basal diet. The total concentrate intake was 2.675 - 4.466 kg with T1 significantly higher ($P<0.05$) than the rest of the treatments. But there were no differences in total concentrate intake between T2, T3, and T4. Although total concentrate intake was lower for T2 - T4, the forage intake of the animals in the treatments containing the test ingredient was not affected. Forbes (1995) reported that if the voluntary intake of feed by animals is too low, rate of production will be depressed. This was not the case as voluntary feed intake of the basal diets in particular was not depressed in any way.

Table 1: Dietary composition of the experimental diets fed to the goats

Ingredients (%)	Experimental diets			
	T1	T2	T3	T4
Brewer dried grains	10.00	10.00	10.00	10.00
Maize offal	72.67	36.335	29.47	21.80
Sweet orange peel meal	0.00	36.335	43.20	50.87
Soybean meal	14.33	14.33	14.33	14.33
Bone ash	2.00	2.00	2.00	2.00



Common salt	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00

T1 = 0% water soaked sweet orange peel meal, T2 = 50% water soaked sweet orange peel meal, T3 = 60% water soaked sweet orange peel meal, T4 = 70% water soaked sweet orange peel meal

Table 2: Performance of the goats fed the experimental diets

Indices	Experimental diets				SEM
	T1	T2	T3	T4	
Initial weight (kg)	7.700	7.700	7.700	7.710	0.30 ^{ns}
Final weight (kg)	10.420	9.660	9.490	9.570	0.37 ^{ns}
Total weight gain (kg)	2.720	1.960	1.790	1.860	0.31 ^{ns}
Mean daily weight gain (g)	64.76	46.67	42.63	44.28	7.31 ^{ns}
Total forage intake (kg)	15.78	16.32	15.71	16.04	0.31 ^{ns}
Total concentrate intake (kg)	4.466 ^a	2.937 ^b	2.826 ^b	2.675 ^b	0.31 [*]
Total feed intake (kg)	20.246 ^a	19.259 ^b	18.533 ^b	18.712 ^b	0.40 [*]
Mean daily feed intake (g)	482.00 ^a	458.60 ^b	441.40 ^b	445.60 ^b	9.63 [*]
Feed conversion ratio	8.02	9.83	10.35	10.06	1.79 ^{ns}

a,b = means on same rows having different super script are significantly different ($P > 0.05$), ns = not significant ($P < 0.05$), SEM = standard error of mean, T1 = 0% water soaked sweet orange peel meal, T2 = 50% water soaked sweet orange peel meal, T3 = 60% water soaked sweet orange peel meal, T4 = 70% water soaked weet orange peel meal

Mean daily feed intake showed difference ($P < 0.05$) among the treatments, and the values were between 441.40g - 482.00g, and T1 was significantly higher ($P < 0.05$) than T3 and T4, but T2, T3 and T4 were similar ($P > 0.05$). Although obtained values were within normal values of mean daily feed intake for goats, however, higher values in T1 may be because of the high concentrate in the diet T1. Observed values were comparable with 462.81 - 485.84g/day reported by Enilorunda and Rowaiye (2008) for Yankasa sheep fed corn husk supplemented with cassava leaf meal and *leuceana* leaf meal and 473.93 - 503.40g/day reported by Hassan *et al.* (2016) for red Sokoto bucks fed graded levels of Lablab (*Lablab purpureus*) hay as supplement to maize stover basal diet.

The feed conversion ratio values were 8.02 - 12.33. There was no significant difference ($P > 0.05$) among the treatments. Observed values were similar with 9.22-11.53 reported by Ibhaze (2015) for WAD goats fed quality fermented cob based diets, but better than 14.70 - 19.09 reported Oloche *et al.* (2018) for West African dwarf goats fed graded level of orange peel meal and Hassan *et al.*, (2016) for red Sokoto bucks fed graded levels of Lablab (*Lablab purpureus*) hay as supplement to maize stover basal diet.

The result of the whole sale cuts of the experimental goats is presented in Table 3. None of the whole sale cuts values were significantly different ($P > 0.05$) among the treatments, except the shoulder values. For the shoulder values, T1 (11.21) was higher ($P < 0.05$) than the rest treatments, while T2 (9.34) T3 (8.54) and T4 (9.39) were similar. This indicates that the presence of the WSSOPM up to 70% in the diets of the experimental animals did not adversely affect wholesale cuts. This result was consistent with those of Oloche *et al.* (2012) who reported significant differences ($P < 0.05$) in shoulder values for West African



dwarf goats feed diets containing sweet orange meal, and also observed similarities ($P>0.05$) among the treatments in neck, back, loin and thigh values.

Table 3: Wholesale cuts of Kano brown goats fed water soaked sweet orange peel

Parameters (% slaughter)	Experimental diets				SEM
	T1	T2	T3	T4	
Chest	2.66	2.28	2.51	2.89	0.22 ^{ns}
Loin	6.79	5.87	5.69	4.33	0.63 ^{ns}
Back	3.62	3.31	2.87	3.51	0.33 ^{ns}
Thigh	10.20	12.4	9.49	8.08	11.33 ^{ns}
Rib	4.85	3.17	3.16	4.35	0.66 ^{ns}
Neck	4.70	3.85	3.91	4.14	0.26 ^{ns}
Shoulder	11.21 ^a	9.34 ^b	8.54 ^c	9.39 ^b	0.37 ^{ns}

a,b = means on same rows having different super script are significantly different ($P>0.05$),
 ns = not significant ($P<0.05$), SEM = standard error of mean, T1 = 0% water soaked sweet orange peel meal, T2 = 50% water soaked sweet orange peel meal, T3 = 60% water soaked sweet orange peel meal, T4 = 70% water soaked weet orange peel meal.

Conclusion

The result from this study has shown that performance parameters and wholesale cuts were not affected negatively as a result of the presence of the test ingredient in the diets of the experimental animals. Therefore WSSOPM can be used to replace maize offal at up to 70% level in the diets of goats particularly during the long dry period.

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