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Influence of Wet Soya Waste on Nutrient Utilization by Red Sokoto Goats Fed Digitaria (*Digitaria smutsii)* Hay

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Target audience: Nutritionist, Extension specialists, livestock farmers, feed millers

Abstract

Trial was conducted to determine the influence of wet soya waste (WSW) on nutrient utilization in Red Sokoto goats fed Digitaria smutsii hay basal diet. Four mature bucks of 11.32kg body weight were allotted to four dietary treatments which were 0, 200, 400 and 600g levels of WSW in 4 X 4 Latin square design. There was a significant (P<0.05) difference in intake of Digitaria smutsii hay. The control group had higher intake (310g/day) and decrease with increase in the levels of WSW to (205g/day) in those fed 600g WSW. Total dry matter intake varied from 2.253.10% of body weight. The result of other nutrients followed similar pattern, with the exception of crude fiber, the control had significantly (P<0.05) higher crude fiber intake which decreases with increase in WSW supplementation. Experimental animals fed the 600g had significantly (P<0.05) lower water intake (240ml) compared to those fed control diet (575ml). Dry matter digestibility was significantly (P<0.05) affected by WSW supplementation. Animals that were fed the WSW had a high dry matter digestibility. The digestibility of other nutrients follows the same pattern. Goats fed the 600g had statistically (P<0.05) higher nitrogen intake (9.48g/day) and the least was in the control group (4.14g/day). Nitrogen balance significantly (P<0.05) differed across dietary treatment. Experimental animals fed high levels of WSW had high nitrogen retention, while those fed the control diet had low nitrogen retention. From the result of the study, it can be concluded that inclusion of WSW in the diet of goats influences nutrient intake and digestibility.

Key words: digestibility, goat, intake, wet soya waste, nutrient, hay

Description of Problem

Nigeria was estimated to have a population of 33,000,000 sheep, 52,000,000 goat and 16,000,000 cattle (1). Small ruminant rearing in Nigeria like in any other place are important in supporting the livelihoods of poor resource farmers throughout developing world. Valuable contribution of small ruminants; as income generating assets among small-holder livestock farmers (2). Sheep contribute enormously to the protein requirements of most developing countries (3). (4) observed that small ruminants constitute a good source of family income and livelihood, assets and

agricultural resources for smallholder farmers. Small ruminants play a significant role in the food chain and overall livelihoods of rural households, where they are reared largely by women and their children (5).

Daniel (6) reported problems of small ruminant producers were disease, feeding problem, accommodation constraint, inadequate capital, destructive habit of the animals and predators, among others. Also (7) reported that production of small ruminants is limited among other factors by inadequacy of year round feed availability. Scarcity of forage during the dry season is a common problem limiting goat production in tropical areas (8). (9) had stated that feed, whether purchased or produced on the farm; make up a large part of the expense incurred in ruminants production.

The available feeds resources are low on nutritive value. The major feed resources for these animals are crop residues from cultivated fields and natural pastures from rangelands. According to (10), natural pastures consist of a mixture of grasses such as Panicum maximum, *Imperata cylindrica*, *Andropogon gayanus*, *Pennisetum* spp and *Hyparrhenia* spp. These grasses grow rapidly during the wet season, becoming fibrous and coarse, and are undergrazed because of the large amounts that become rapidly available. Their quality declines further during the dry season when they become standing hay and are subject to overgrazing. Coupled with high cost of supplementary concentrate diets has guided to the search for non- competitive alternative feedstuffs (11).

Soya waste, like soybean meal, is a good protein source, which is a waste made from soybean following extraction of soya milk by filtration. The residues (waste products), have crude protein of 22-25% (12, 13, 14), which is high when compared to other agro-industrial by-products. It is cheaper in terms of cost compared to other agro-industrial by-products. (15) reported that soya wastes are a relatively cheap feed resource, considering their nutritive value. The major problem of soya waste is the high moisture content, which makes it difficult to handle. Some researchers have studied the possibility and the effect of soya cake as an additional feed in rabbit (16), Muscovy duck (17) and it is concluded that soya cake can influence the performance of growing period to be better. Meanwhile, investigation of the soya cake effect as an additional food on goats still lack in literature. The objectives of this study determine the chemical composition, nutrient intake, digestibility and balance in goats fed soya waste.

Materials and Methods

Site of the study

The study was conducted at the Department of Animal Science experimental farm, Ahmadu Bello University, Samaru Zaria, Nigeria. Zaria is located in the Northern Guinea Savannah on latitude $11^0$12'N and longitude $7^0$37'E at an altitude of about 610m above the sea level (18). The climate is relatively dry with a mean annual rainfall of 700-1400mm per annum, occurring between the months of April and September (19).

Table 1; Proximate composition of the experimental feed ingredients

Parameters	*Digitaria smutsii*	WSW
Dry Matter	96.23	20.58
Analysis % of DM		
Organic Matter	91.64	82.76
Crude Protein	8.63	21.88
Crude Fiber	32.19	2.56
Ether Extract	2.62	4.87
Ash	4.59	10.36
NFE	56.97	60.33

DM =Dry Matter, WSW =Wet Soya Waste , NFE =Nitrogen Free Extract

Experimental Animals and management

Four (4) mature Red Sokoto bucks with an average body weight of 11.32kg were used in this experiment. The experimental animals were housed individually in metallic digestibility crates ideal for separate urine and feces collection, as described by (20). Prior to the commencement of the experiment, the animals were quarantined for 14 days, during this period, they were de-wormed and sprayed against internal and external parasites with 1 ml/10 kg BW of albendazole and 0.5 ml/10 kg BW of ivermectin (Ivomec®), respectively. The experimental animals were fed their respective treatment diets of (0, 200, 400 and 600 g of wet soya waste) and thereafter, approximately 500g of basal diet (*Digitaria smutsii* hay) were fed to each animal twice at 8:00am and 4:30pm daily.

Digestibility study

Daily collection of urine and faeces were made in the last 5days of each period. Urine of individual animals was collected in a container acidified with 100ml of H_2SO_4 to maintain the final pH of the urine lower than 3 all times in a container. It is essential to acidify the urine to prevent bacterial activity. Urine samples of 20ml were taken and stored at-20°C in the laboratory until analysis for the determination of urinary N. Daily faeces collects in each period at about 30g were collected. The samples of the faeces collected were oven dried at 105^0c for 48hours and weighed to determine the dry matter weight of the faeces, after then the faeces were bulked and a 5% sub sample was taken and ground (1 mm Screen) for laboratory analysis.

Chemical analyses

Feed samples Soya beans waste (wet soya waste), *Digitaria smutsii* hay and faeces were milled through a 1 mm sieve in a Laboratory hammer mill. Prior to milling, samples were oven-dried at 60 ^{o} C for 96 h while DM was determined by oven-drying at 100^{o} C to constant weight. Samples were mixed separately and sub sampled for analyses. The samples were later analyzed for crude protein (CP), ether extract (EE), ash, crude fiber (CF), according to standard methods of (21). Urine sample was analysed for nitrogen using the

Statistical analysis

The data collected on nutrient intake, digestibility and nitrogen balance were subjected to Analysis of Variance (ANOVA) procedure of (22) in a 4 X 4 Latin square design. Means that were significantly different, Duncan Multiple Range Test (DMRT) was used to compare them.

The following model was used:

$$\mathbf{Y_{ij} = \mu + A_i + P_j + S_k + \varepsilon_{ijkl}}$$

where:

Y_{ijkl} = observation,

μ = population mean,

A_i = Animal

P_j = Period

S_k = Soyabeans waste (0, 200, 400, 600),

ε_{ijkl} = residual error.

Results and Discussions

The result of the proximate composition of wet soya waste (WSW) and *Digitaria smutsii* hay are presented in Table 1.The crude protein content of the soya waste in this study (21.88%).The crude protein of the wet soya waste reported in this study is similar to 22.55% CP reported by (14), but lower than 25.0% CP reported by (12). The variation may be due to the processing method used. The soya waste has a lower dry matter content when it is going to be fed fresh.

The crude protein content of the *Digitaria smutsii* (8.63%) recorded in this study is higher than 5.44% reported by (23). The variation in the crude protein level of the Digitaria smutsii may be attributed to the stage of harvest and leaf stem ratio.

The result of the feed intake is presented in Table 2. All the animals consumed the supplementary WSW offered. This shows that WSW is palatable. There was a significant ($P<0.05$) difference in intake of *the Digitaria smutsii* hay. The control group had higher intake (310g/d) and decrease with increase in the level of WSW to 205g/d in those fed 600g WSW. The decrease in the Digitaria intake may be as a result of substitution effect. The animals fed on the WSW substituted the supplement for the basal diet of *Digitaria smutsii* hay. Total dry matter intake of the experimental animals in this study varied from 2.25 - 3.10 % of body weight. This falls within the range of 2.18 - 3.78 % reported by (24) for sheep fed maize and amaranth fodders but lower than 3.3 – 3.8 % obtained for West African dwarf goats fed maize offal and sorghum brewer's grains in a total diet (25). The result of the other nutrients intake follow similar pattern, with the exception of the crude fiber. The control had significantly ($P<0.05$) higher crude fiber intake, which decrease with increase in WSW supplementation. This is as a result of the intake WSW, which has low fiber content.

Table 2.Voluntary feed and nutrient intake of Red Sokoto goats fed different levels of WSW

Parameters	WCS levels				SEM
	T1 (0g)	T2 (200g)	T3 (400g)	T4 (600g)	
WSW	0.00	200	400	600	-
Digitaria smutsii	310[a]	220[b]	214[b]	205[b]	36.12
Total feed intake (g/d)	310[d]	420c	614[b]	805[a]	47.23
Dry matter intake (g/d)	256.5[a]	288.70[c]	320.50[b]	384.50[a]	11.32
Organic matter intake (g/d)	242.60[c]	277.90[c]	300.00[b]	357.40[a]	14.45
Crude protein intake (g/d)	25.90[d]	47.70[c]	78.10[b]	108.60[a]	17.34
Crude fiber intake (g/d)	96.57[a]	66.02[b]	67.66[b]	69.30[c]	1.23
Water intake (l/d)	575[a]	367[b]	315[c]	240[d]	23.56

a,b,c: Means in the same row with different superscript are significantly different. SEM = standard error of Means WSW = Wet Soya Waste

The result of the water intake presented in Table 1, showed that experimental animals fed the 600g per head per day had significantly (P<0.05) lower water intake (240ml) compared to those fed control diet (575ml). The result obtained in this study is in agreement with (15), who concluded that feeding soya as additional feed for local rams gives a significant decrease in the water consumption. The decrease in the water intake may be attributed to the nature of the material fed to the animals. Soya waste is characterized by being high in moisture content (Table 1), and as such animals fed on it will meet its water requirement due to its high moisture content.

Nutrient digestibility result is presented in Table 3. Dry matter digestibility was significantly (P<0.05) affected WSW supplementation. Animals that were fed the WSW had a high dry matter digestibility. The digestibility of other nutrients follow similar pattern. This is in agreement with (26) who affirmed that digestibility of nutrients varies with nutrient composition.

Table 3. Nutrient digestibility in Red Sokoto goats fed different levels of WSW

Parameters	WSW levels				SEM
	T1 (0g)	T2 (200g)	T3 (400g)	T4 (600g)	
Dry matter digestibility	57.79[d]	60.76[c]	69.76[b]	78.51[a]	2.93
Organic matter digestibility	58.35[c]	61.39[b]	62.04[b]	68.54[a]	2.81
Crude protein digestibility	61.41[d]	69.12[c]	73.40[b]	79.86[a]	1.21
Crude fiber digestibility	51.81[d]	62.01[c]	67.45[b]	78.09[a]	2.33

a,b,c: Means in the same row with different superscript are significantly different. SEM standard error of means WSW Wet Soya Waste

Table 4 shows the result of the nitrogen balance. Goats fed the 600g had statistically (P<0.05) higher nitrogen intake (9.48g/d) and the least was in the control group (4.14g/d). Nitrogen balance significantly (P<0.05) differed across dietary treatments. Experimental animals fed high level of WSW had high nitrogen retention; while those fed the control diet had lower nitrogen retention. This is as result of the high N intake (table 2).

Table 4. Nitrogen balance in Red Sokoto goats offered different levels of Wet Soya Waste

Parameters	WSW levels				SEM
	T1 (0g)	T2 (200g)	T3 (400g)	T4 (600g)	
N intake	4.14 [d]	5.00 [c]	7.24 [b]	9.48 [a]	0.33
Urine N	0.37	0.40	0.42	0.51	0.017
Fecal N	0.77	0.83	0.83	0.89	0.01
N out go	1.17	1.19	1.25	1.39	0.02
N retaintion	2.96 [d]	3.75 [c]	6.04 [b]	8.08 [a]	0.12
N observed	3.37 [d]	4.17 [c]	6.41 [b]	8.59 [a]	0.66
N as % of Intake	28.45	25.01	16.50	14.75	2.68

[a,b,c:] Means in the same row with different superscript are significantly different. SEM standard error of means WSW Wet Soya Waste

Conclusion and Application

From the result of this study, it can be concluded that

1. Wet soya waste supplementation to Red Sokoto goats fed a basal diet of *Digitaria smutsii* hay influenced their nutrient intake and digestibility.
2. Feeding wet soya waste to goat has no any deleterious effect. WSW can be fed up to 600g as sole supplementary diet to goat without any adverse effect.
3. This study recommended feeding of 600g/h/d and also further studies to be conducted on the feeding of WSW with other fed ingredients.

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