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GROWTH AND FAECAL EGG COUNT RESPONSE OF VILLAGE MANAGED GOATS TO WILTED AND SUN-DRIED CASSAVA FOLIAGE

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ABSTRACT

The growth and faecal egg count response of village managed goats to wilted and sun-dried cassava foliage was evaluated in a 8-week experiment. Twenty-four goats of the West African dwarf breed with age ranging from 6 to 8months and average weight of 8.25kg were selected from the farmers herd and randomly allotted to three treatment groups according to receive wilted cassava foliage (WCF), sun-dried cassava foliage (SCF) and albendazole (control). The results showed that weight gain differed significantly ($P < 0.05$) among treatments (31.61 to 44.29g/day) with best ($P < 0.05$) growth rate observed in goats supplemented with WCF. All treatments reduced worm egg count with a reduction of 65.67 %, 67.13% and 69.96% in goats, supplemented with SCF, WCF and albendazole, respectively. In addition, faecal egg count (FEC) was low in all treatments after 4 week post treatment and remained low (FEC<465) in the goats till the end of the experiment. This study concluded that supplementing grazing goats with WCF was best in reducing faecal egg count and improving growth rate in goats, which could serve as a natural low-cost deworming agent in village managed goats.

Keywords: Cassava foliage, goats, growth, faecal egg count.

INTRODUCTION

Goats are an important component of smallholder farming systems in Nigeria with most of the herd mainly composed of local breed animals where most households keep an average of 10 goats, providing a means of livelihood for a large sector of the population (Fasae *et al.,* 2012). However, the major constraint to the productivity of these animals has been related to limitations caused by parasites, inadequate nutrition, unimproved genotypes and poor management (Devendra and Burns, 1983). Parasitic helminth infestation in goats has been one of the principal constraints to poor resource farmers due to its impact on animal health and productivity as well as associated costs of control measures. Clinical helminthiasis, which is characterized by loss of weight, abortion, pre-weaning mortality, lung destruction, and finally death (Ogunsusi, 1985), is a full-blown disease condition caused by numerous pathogenic helminthes, particularly nematodes in malnourished goats.

Over the years, goat keepers have been involved in the treatment of animal diseases through the conventional medicaments with variable success. However, the toxic effects of these chemicals on humans, the develop-

ment of resistance to it by target parasites as well as high cost of drugs have in recent times pave way for herbal remedies as reasonable alternative (Fasae and Ojelabi, 2012). These herbal therapies are natural products, and have been found to be environmentally friendly and cheap.

Cassava (*Manihot esculenta*, Crantz) is a highly productive tropical crop. Besides the root yield, each hectare of cassava can produce a large amount of leaves. Cassava foliage is readily available as under-utilized by-products after tuber harvest and found to be relatively rich in crude protein and condensed tannins (Wanapat *et al.,* 1997). Feeding cassava foliage in the form of sun-dried hay has been reported to reduce faecal egg count in grazing buffaloes (Granum *et al.,* 2003). However, wilting cassava foliage promises to be a simpler and more reliable procedure compared to sun-drying in livestock feeding (Chhay *et al.,* 2007). This study investigates into the effect of wilted and sundried cassava foliage supplementation on growth performance and parasitic infestation in goats managed under the smallholder system of production.

MATERIALS AND METHODS

The experiment was carried out at Idera Araromi community in Odeda Local Government area of Ogun State, south-west, Nigeria. Twenty - four goats of the West African dwarf breed with age ranging from 6 to 8months, managed on free grazing were randomly selected from the farmers herd. Records from goats owners confirmed that these animals have not been subjected to any antihelminthic treatment in the last six months. The goats were randomly allocated to three treatments of eight replicates each namely: wilted cassava foliage (WCF) sun-dried (SCF) and albendazole (control) administered at the onset and 30 days of the experiment. The animals were tagged individually for identification throughout the 56 days duration of the experiment.

Cassava foliage variety (TMS 30572) was defoliated at 6 months after planting from established plots as described (Fasae *et al.,* 2009). The leaves, petioles and young stems, were collected, and mechanically chopped with a cutlass into 3 - 5 cm pieces. Foliage of cassava to be fed as sun-dried was laid in the sun for 3 to 5 days, depending on the intensity of sun light, with the aim of reducing the moisture content to less than 12%. The sun-dried foliage was then stored in bags until needed. For the wilted cassava treatment, the foliage was harvested every morning and was wilted for 24 hours before feeding.

Prior to the commencement of the experiment, a preliminary supplementary feeding period of 14 days was allowed for the animals to adapt to the feed. The foliage was offered to the animals' at 4% of the body weight, individually in feeding troughs after the goats were confined until the following morning. Intake of supplements was recorded every morning before releasing the animals to graze and samples retained for analysis. Albendazole were administered at 2 ml/10 kg body weight to each animal, dozed by mouth orally using the barrel of syringe on day zero according to body weight as recommended by the manufacturers. Individual weights of goats were taken at the onset of the experiment and weekly thereafter with the aid of a spring balance.

Faecal samples were collected directly from the rectum of each goat using glycerine lubricated gloves at the start of the experiment

and on weekly basis thereafter to check the level of parasite infestation. The samples were stored in a cooler box at 4^{0}C before being transported to the laboratory for analysis. Samples were analyzed using the Modified McMaster counting technique for the faecal egg count to determine the efficacy of the treatments used. The chemical composition of the wilted and sun-dried cassava foliage was determined (AOAC, 1995), tannin content (Makkar *et al.,* 1993) and hydrocyanic content (Bradbury *et al.*, 1999). Data collected were subjected to analysis of variance using completely randomized design (SAS, 1999) and significant means were separated using Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of wilted cassava foliage (WCF) and sundried cassava foliage (SCF) used as supplements to village goats are shown in Table 1. The crude protein (CP) content of WCF and SCF in this study which is lower than some values reported in literature (Chhay *et al.,* 2007) might be due to the exposure of cassava foliage to the sun which has been found to affect the protein content of sun-dried cassava foliage when compared to the fresh foliage. The hydrocyanic content (HCN) of SCF was lower than WCF which suggests that sun-drying was more effective than wilting in reducing the HCN content of cassava foliage. Wanapat (2002) showed that cassava foliage contains hydrogen cyanide and because of its toxicity, it is seldom used fresh and is usually processed by combining sun-drying with chopping and wilting, until the level of HCN in the hay or dried meal (80-92% DM) is safe for animals. However, the variation in the HCN content in this study compared to literature could be attributed to difference in variety (Chhay *et al.,* 2007).

The tannin content of WCF and SCF agreed with earlier studies (Wanapat *et al.,* 1997), confirming that cassava foliage is relatively rich in condensed tannins. However, there was no significant difference in the content of tannin in both WCF and SCF. This corroborates the findings of Fasuyi (2005) that while sun-drying and shredding reduced cyanide level of cassava leaf to innocuous levels, the processing techniques were less efficient with regard to tannin and phytin removal.

Table1: Chemical composition of wilted and sun-dried cassava foliage supplemented to goats

Constituents	WCF	SCF
Dry matter (%)	40.32	85.80
Crude protein (%)	22.64	21.87
Crude fibre (%)	11.51	12.12
Hydrocyanic acid (mg/kg)	18.62	13.23
Tannin (%)	3.11	2.98

WCF- Wilted cassava foliage; SCF- Sun- dried cassava foliage

Figure 1 shows the differences (P<0.05) in the feed intake of the goats fed WCF and SCF supplementary foliage. Goats fed WCF had a higher intake compared to those on SCF. The intake pattern of the supplementary cassava foliage could be a reflection of the relative acceptability and palatability of these supplements. Masufu (2006) described feed intake as a measure of diet appreciation, selection and consumption by the animal. However, feed intake had also been observed to be governed by some other factors apart from dietary crude protein and palatability. These include gut fill, body fat and changes in the body weight gain values of the goats (Ukanwoko, 2007).

Table 2 shows the values of DM intake and weight changes in village managed goats supplemented with WCF, SCF and albendazole. Weight gain (g/day) of goats differed significantly (P < 0.05) among treatments. Goats supplemented with WCF however, had a better (P < 0.05) growth rate compared to that of SCF and the control which may indicate better foliage acceptability as well as protein and energy contribution of the diet (Anigbogu, 2007). The improved performance in goats fed WCF and SCF over the control could be attributed to the supplemental effect of these foliages that contains good quality protein with condensed tannins. The CP intake of cassava foliage by ruminants has been reported to stimulate the bacterial population in the rumen, thereby increasing the availability of fermentable nitrogen, and later contributing to an improved digestion of fibre in the rumen (Khang and Wiktorsson, 2004).

However, there is a wide range of recent literature showing the beneficial effects of cassava foliage on growth rates and feed conversion in goats. Cassava foliage fed in different forms have been reported to provide good source of protein, improve digestibility and reduce intestinal parasites in goats (Ho and Preston, 2004; Phengvichith and Ledin, 2007). Also, Preston and Leng (2009) found out that the presence of low levels of condensed tannins act to protect the proteins in the cassava leaves from being fermented in the rumen, thus conferring "bypass protein" characteristics to this forage and in so doing enhancing its value as a supplement in ruminant diets low in true protein.

Table 2: Mean DM intake and weight changes of goats supplemented with wilted and sun-dried cassava foliage.

Parameters	WCF	SCF	Control	SEM
Cassava foliage intake (g/DM/day)	252.61	231.50	-	11.7
Initial weight (kg)	8.17	8.51	8.07	0.09
Final weight (kg)	10.93	10.84	9.84	0.11
Weight gain (kg)	2.76a	2.33b	1.77c	0.02
Weight gain(g/day)	44.29a	41.61b	31.61c	4.87

abc mean across rows with different superscripts are significantly different (P<0.05)
WCF- Wilted cassava foliage; SCF- Sun- dried cassava foliage; Control- Natural grazing + Albendazole

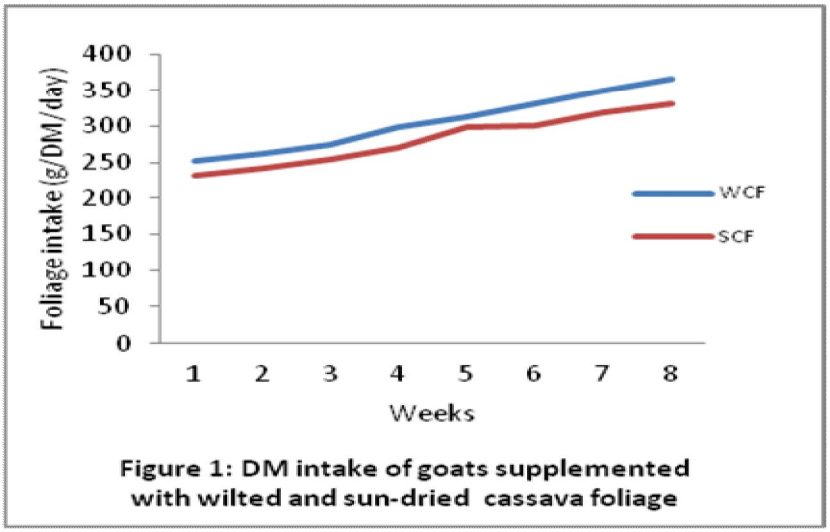

Figure 1: DM intake of goats supplemented with wilted and sun-dried cassava foliage

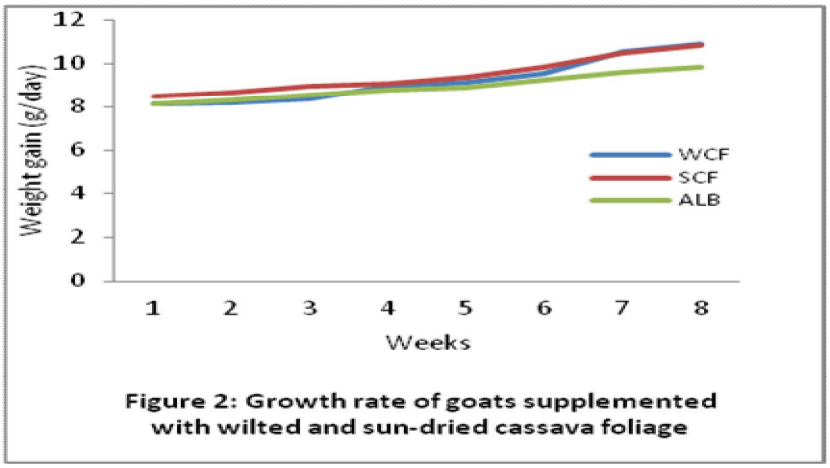

Figure 2: Growth rate of goats supplemented with wilted and sun-dried cassava foliage

The effect of WCF and SCF on the growth rate of goats is depicted in Figure 2. Weight gain increased ($P<0.05$) from the first to eighth week supplementation period of WCF and SCF. The range for growth rate (g/day) 41.61 and 44.29 recorded in this study for goats fed SCF and WCF, respectively were similar to earlier reports in goats fed cassava foliage (Ho Bunyeth and Preston 2004; Kounnavongsa *et al.,* 2010) suggesting the potential of cassava foliage as a supplement in improving growth rate of goats on natural pastures. Wanapat *et al.* (2000) also reported that by supplementing cassava hay that had 3.21% of condensed tannin increased protein input in the duodenum which ultimately improved protein fraction absorbed, hence animals' growth is improved.

The effect of the supplementary treatments on parasitic eggs per g of fresh faeces in goats is shown in Table 3. The rate of parasitic eggs in goats reduced from the first week to the last 8 week of the experiment with WCF and SCF supplementation. The

rate of decline was similar to the control treatment, suggesting the potential of both SCF and WCF as an antihelminthic. The reduction in parasitic eggs in goats supplemented with WCF and SCF in this study could be attributed to the presence of tannins in cassava foliage. Tannins containing forages has been found to react directly by interfering with parasite egg hatching and development to infective stage larvae. Butter *et al.* (2000) reported that direct effects of parasite eggs might be mediated through condensed tannins nematode interactions, thereby affecting physiological functioning in the gastro-intestinal parasite.

Table 3: Effects of wilted and sundried cassava foliage supplementation on faecal egg count (egg per g) in goats

Weeks	WCF	SCF	ALB	SEM
0	897.0	877.0	902.0	17.55
1	681.0	701.0	672.0	12.09
2	634.0	644.0	614.0	11.11
3	572.0	555.0	597.0	10.02
4	501.0	495.0	521.0	8.87
5	465.0	455.0	444.0	8.02
6	387.0	376.0	398.0	7.89
7	348.0	351.0	304.0	7.16
8	295.0	301.0	271.0	6.22
Mean	531.11	527.2	524.78	8.71
Reduction (%)	67.13	65.67	69.96	2.11

WCF- Wilted cassava foliage; SCF- Sun- dried cassava foliage

Faecal egg count (FEC) of goats in all treatments after 4 weeks remained low (FEC < 465) till the end of the experiment. A reduction in parasitic eggs of 65.67%, 67.13% and 69.96% were observed in goats supplemented with SCF, WCF and albendazole, respectively after the 8 week post treatment. The reduction in parasitic eggs in goats supplemented with WCF and SCF corroborates the findings of Seng and Rodriguez (2001) that eggs per gram counted in goats fed cassava and cassava + grass treatments steadily declined during the experiment from about 4000-5000 eggs/g of fresh faeces in the first 30 days to about 1500 eggs/g after 70 days. Also, in more detailed studies (Seng *et al.*, 2009), it was shown that goats fed both fresh and ensiled cassava foliage had reduced

worm fecundity.

On the other hand, there is increasing evidence to support the view that protein supplementation can reduce the level of gastrointestinal nematodes in growing small ruminants, particularly if given to otherwise malnourished animals during the later stages of infection (Coop and Kyriazakis, 1999). The supplementation of WCF and SCF in this study which increased the protein intake of the naturally grazing goat could also have led to reduced FEC in goat.

CONCLUSION

In conclusion, supplementing grazing goats with both wilted and sun-dried cassava foliage can play an important role in improving the nutritional status, growth rate and reducing faecal egg count in goats. However, wilted cassava foliage was better utilized, improved growth rate and reduced faecal egg counts of sheep compared to the sun-dried cassava foliage. This would be worthwhile in improving sheep growth rate as well as serving as a natural low-cost deworming agent alternative to the chemical anthelmintics in village managed goats.

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