EFFECT OF *FICUS THONNINGII* (STRANGLER FIG) LEAF EXTRACT ON RUMEN FERMENTATION PARAMETERS AND MICROBIAL COUNT OF WEST AFRICAN DWARF GOATS

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ABSTRACT
The study was conducted to investigate the effects of Ficus thoningii leaf extract (FLE) on rumen fermentation parameters and microbial count of West African dwarf goats fed total mixed ration in an 84-day feeding trial. Twenty-four West African dwarf goats were divided into four treatment groups and FLE were administered orally via syringe every morning at four varying levels (0, 5, 10 and 15mL) per animal per day for each of the four treatments respectively. The phytochemical composition of FLE was determined. Rumen fluid of the goats was collected at the end of the study and the pH, total volatile fatty acids (TVFA), ammonia-nitrogen, and microbial population were also determined. The study revealed that FLE contains tannins, cyanogenicglycosides, total phenol, flavonoid, trypsin inhibitor, phytate oxalate, alkaloids and saponin . TVFA was higher ($p<0.05$) in goats administered 15mL dosage (101.70mM) while ammonia-nitrogen was higher ($p<0.05$) at 10 and 15mL doses. FLE increased ($p<0.05$) fungi count in goats administered the various doses of FLE. Bacteria and protozoa counts were not significantly ($p>0.05$) influenced by administration of FLE. However, the values obtained for bacteria count increased while that of protozoa count reduced by the end of the study. It was therefore concluded that FLE can be used up to 15 mL dosage to manipulate rumen fermentation to increase TVFA and ammonia nitrogen production.
Keywords: Rumem fermentation, microbial counts, Leaf Extract

INTRODUCTION

The Restriction or ban on the use of in-feed antibiotics in many countries has fueled the interest in alternative products. A group of natural products known as photogenic has been the focus of several studies in recent years (Windisch *et al*., 2008). The ruminant section is not exempted as the use of herbal plants as phytogenics feed additives has gained increased attention in ruminant production. Phytogenic feed additives which are mainly plant secondary compounds, have been shown to modulate rumen microflora and change rumen fermentation dynamics leading to enhanced animal performance (Hassan, 2020). *Ficus thoningii* (Strangler fig) is a medicinal plant that contains various secondary metabolites which include alkaloids, terpenoids, flavonoids, tannins and active proteins (Dangarembizi *et al*., 2013). *Ficus thoningii* leaf meal has been evaluated (Berhe and Tanga, 2013) and used as protein supplement for ruminants (Bamikole and Ikhatua, 2010). However, there is dearth of information on the use of its leaf extract in livestock nutrition. Thus, this study aims at investigating the effect of *Ficus thonningii* leaf extract on rumen fermentation parameters and microbial count of West African dwarf goats.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Directorate of University farms and Animal Nutrition Laboratory, Federal University of Agriculture, Abeokuta, Ogun state, Nigeria.

Processing of the Extract

The leaves of *Ficus thonningii* was sourced within the University environment. About 50g 0f freshly plucked leaves of *Ficus thonningii* was measured out and blended with 100ml of water using a blender. This was sieved using a muslin cloth, the filtrate was collected in 500ml beaker. The extract obtained were prepared weekly and kept under refrigeration at 4^{o}C for daily use.

Experimental Animals and Management

Twenty-four West African dwarf bucks were used for the study. The animals were divided into four treatment groups of four goats with six replicates in a completely randomized design. Total mixed ration (approximately 16% CP) was fed at 5% of their body weight. *Ficus thonningii* leaf extract (FLE) was administered orally via syringe every morning at four varying levels (0, 5, 10 and 15mL) per animal per day before offering the feed. The experiment lasted for 84 days.

Determination of rumen fermentation parameters

Rumen fluid was collected on the last day of the study to determine total volatile fatty acid production and ammonia nitrogen concentration. Approximately 30 ml of rumen fluid was collected from each goat before feeding (pre-feeding) and 6 hours after morning feeding (post-feeding) and immediately after collection pH was measured using a portable pH meter (HANNA instruments HI 98153) and thereafter the fluid was freed from coarse particles by filtration through four-layers of cheese cloth. One-half of the fluid was acidified with a few drops of concentrated H_2SO_4 and stored frozen at -20 °C for the determination of ammonia nitrogen concentration using steam distillation procedures (Ogubai and Sereke, 1997). The second half was stored frozen at -20 °C for the determination of total volatile fatty acid (TVFA) concentration using Markham apparatus as described by Barnett and Reid (1956). This was carried out by adding 2 ml of rumen fluid together with 1 ml 10% potassium oxalate buffer and 1 ml oxalic acid injected into the Markham apparatus, where a distillate of 100 ml was collected. This was then titrated against a standard 0.01N NaOH with 2 drops of phenolphthalein as indicator. Concentration of TVFA was then calculated using the following equation:

$$\text{TVFA (mM)} = \frac{NAOH\ volume\ x\ NAOH\ normality\ x\ 1000}{rumen\ inoculum\ volume}$$

Determination of Microbial count

Rumen Fluid was collected with the use of a stomach tube before and at the end of the feeding trial, from four animals. Samples of unstrained rumen fluid collected from each animal was immediately fixed with 10% formalin solution (1:9 v/v, rumen fluid: 10% formalin solution) and taken to the laboratory for the determination of bacteria, fungi and protozoa population according to Galyean *et al*. (1989).

Chemical analyses

Phytochemical screening of Ficus extract was done according to the standard scientific procedures (AOAC, 2000).

Statistical analysis

Data obtained from the experiment were subjected to one-way analysis of variance (ANOVA) using SAS (1999). Significant differences among means were separated using Duncan multiple range test of the same software. at 5% level of significance.

RESULTS AND DISCUSSION

Table 1 shows the phytochemical composition of *Ficus thoningii* leaf extract (FLE). Results shows that *Ficus thoningii* leaf extract is rich in phytochemicals like tannin, trypsin inhibitor, saponin, alkaloids, oxalate. Ahur *et al.* (2010) also reported the presence of these phytochemicals. Tannin is the highest compound in *ficus thoningii* leaf extract as obtained in this study. Aganga and Tshwenyane (2003) suggested that condensed tannin concentration in the feed less than 40% is beneficial by promoting by-pass protein and suppressing bloat in ruminants.

Ficus thonningii leaf extract increased the TVFA and ammonia-nitrogen production after 6 hours of feeding at 15mL dosage (Table 2). This is similar to the report of Adebayo *et al.* (2017) who reported a significant increase in total volatile fatty acids concentration in goats fed total mixedration. It is an indication of proper digestibility of feed as the secondary metabolites in FLE did not interefere with feed digestion in the rumen. Adequate energy and protein are essential for microbial protein production. However, production of ammonia-nitrogen in excess of the microbe's requirement leads to nutrient loss.

The result shows that the microbial count of WAD goats before the start of the study were not significantly ($P>0.05$) affected across the treatment groups, while the result at the end of the study shows that the total fungi count was significantly ($P<0.05$) affected. Bacteria count increased after the experiment while protozoa count reduced, though there was no significant ($p>0.05$) difference across

the treatments. This suggested that FLE may not be antibacterial and antifungal but may be antiprotozoal (though not significant) According to Preston and Leng (1986) fungi are the first to colonize feed after ingestion thereby exposing them to further breakdown by bacteria.

Table 1: Phytochemical composition of *Ficus thoningii* leaf extract (FLE)

Parameters	(mg/100mL)
Tannins	104.00
Phenol	74.00
Flavonoids	40.00
Phytates	4.290
Oxalates	14.740
Alkaloids %	1.50
Saponins %	0.24

Table 2: Rumen environment parameters of West African dwarf goats administered *Ficus thoningii* leaf extract (FLE)

	Treatment					
Parameters	**0**	**5ml**	**10ml**	**15ml**	**SEM**	**P-value**
TVFA(mM) (0hr)	61.80	55.30	52.70	56.60	1.55	0.266
TVFA(mM) (6hr)	59.20^{c}	63.00^{c}	85.70^{b}	101.70^{a}	10.58	0.007
NH_3-N(mg/dL) (0hr)	54.43^{c}	62.94^{b}	64.64^{b}	72.28^{a}	3.39	0.006
NH_3-N(mg/dL) (6hr)	63.63^{b}	63.77^{b}	71.45^{a}	67.19^{a}	2.03	0.008
pH	6.21	6.24	6.45	6.30	0.08	0.91

Means on the same row with different superscripts are significantly different (p<0.05)

Table 3: Microbial count of West African dwarf goats administered oral doses of *Ficus thonningii* LEAF extract (FLE)

	BEFORE						AFTER					
Parameters	**T1 (0ml)**	**T2 (5ml)**	**T3 (10ml)**	**T4 (15ml)**	SEM	P-value	**T1 (0ml)**	**T2 (5ml)**	**T3 (10ml)**	T4 (15ml)	SEM	P-value
Total Bacterial count ($X10^6$cfu/mL)	2.40	2.00	2.15	2.25	0.08	0.452	3.55	3.15	3.15	3.25	0.17	0.5904
Total Fungi count ($X10^6$cfu/mL)	1.20	1.65	1.35	1.50	0.13	0.740	0.45^{b}	1.25^{ab}	1.95^{a}	1.25^{ab}	0.22	0.0029
Total protozoan ($X10^3$cell/mL)	0.40	0.85	**0.65**	0.70	0.76	0.806	**1.00**	**0.60**	**0.60**	**0.55**	**0.15**	0.7027

a,b and c;means with different superscript on the same row are significantly($p<0.05$)different

CONCLUSION

Ficus thonningii leaf extract can be used to improve the total volatile fatty acids and ammonia nitrogen production of West African dwarf goats up to 15ml dosage/ animal/day

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