African Journal of Agriculture and Food Science
Vol.1, No.1, pp.1-4, 2018
www.abjournals.org

VALUES OF MICROBIAL POPULATION IN WEST AFRICAN DWARF GOATS FED ON CORNCOB-BASED CONCENTRATE DIET WITH COBALT SUPPLEMENTATION

Olajide P.O and Adeloye A.A.

[1]Crop and soil laboratory, Landmark University
[2]Department of Animal Production, University of Ilorin

ABSTRACT: Inadequate feed supply and feeding is a major challenge in animal production. Corncob, an abundant by-product of maize production is seldom utilized for feeding purpose, though promising for ruminants. In a 90-day feeding trial conducted to study the response of West African Dwarf goats to corncob-based diet supplemented with varied levels of cobalt chloride. The study examined the effect of treatment on microbial population. Twelve West African Dwarf goats of similar body weights (8.42kg-8.51kg) and body conditions were allotted to three dietary treatment groups, of four replicates each in a randomized complete block design experiment. The goats were kept on corncob concentrate based diet with unrestricted access to clean drinking water throughout the period of the feeding trial. Results from the study showed that, diets supplemented with cobalt chloride caused an improvement ($P<0.05$) in microbial population and protozoa content, when compared with the control. It was concluded that supplementation at 0.75mg/kg DM in the present study, would be efficacious than at lower levels of 0.00 and 0.50mg/kg DM.

KEYWORDS: Microbial Population, Dwarf Goats, Corncob-Based Concentrate, Cobalt Supplementation

INTRODUCTION

Ruminant diets are generally based on fibrous feeds that have low digestibility and are deficient in protein, mineral and vitamins. These characteristics keep intake and productivity low, (Alemu Yami, 2008). several studies suggested that cobalt may improve fiber digestion in the rumen independent of its role as part of vitamin B12 synthesis by rumen or other bacteria is amazing, as it is one of the most complex non-polymeric natural products produced in nature. Ruminal synthesis of B12 is dramatically increased within hours of cobalt supplementation of a deficient diet (Suttle *et al*., 1989).

The rate of fiber digestion in the rumen is a major factor affecting voluntary intake on high forage diets. Supplementation above animal requirement may increase the ability of bacteria to digest fiber. Cobalt is a divalent cation, so may allow bacteria to attack plant cell walls (De Meyer 1981). Cellulose enzymes produced by bacteria are retained on the cell membrane and are not released into the environment. As a result of this, fiber particles are attached to by environment by bacteria for enzymes to digest the cellulose (Lopez-Guisa and Satter (1992)). In bacteriology, it is known that a negative bacterium may not easily attached to a negatively charged particle (e.g. fiber), but with cobalt carrying two positive charges, can act as a link for the two negative surfaces, this increases interaction between the bacteria and fiber particle leading to a faster rate of digestion.

Forages containing less than 0.07ppm cobalt require supplementation to increase bacteria multiplication and subsequently fiber digestion. It follows that source supplementation must be soluble in the rumen to allow bacteria to incorporate cobalt into vitamin B12. Examples of such cobalt compounds are those of inorganic sources like cobalt chloride, cobalt carbonate and cobalt sulfide.

MATERIALS AND METHODS

Study Location

The experiment was conducted at the ruminant unit, University of Ilorin Teaching and Research Farm.

Animals and Treatment

Twelve (12) West African Dwarf (WAD) goats weighing between 8.42kg and 8.51kg were used for the experiment. The animals were treated against ecto and endo-parasites using ivomec Long Acting-oxytetracycline as antibiotic. The animals were allotted to the experimental diets, in a completely randomized design model of three (3) dietary groups, made up of two treatments and a control each with four (4) replicates. The experiment lasted for twelve (12) weeks, with each group of animals housed in individual pens and fed the appropriate experimental diet at 4% body weight.

Preparation of Experimental Diet

Corncobs were gathered on the farm. The sun-dried cobs were bagged and taken to the feed mill where it was milled. Gliricidia tree leaves were dried in a well-ventilated room until it attained a constant weight. A concentrate diet made up of corncob (50%), gliricidia leaf meal (27%), maize bran (20%), urea (1%), bone meal (1%), and salt (1%) was prepared. The goats had unrestricted access to clean drinking water throughout the feeding trial. Treatments consisted dietary levels of cobalt as cobalt chloride at 0.00, 0.50, 0.75 mg/kg diet.

Collection of Samples and Analyses

Feed samples were analyzed for proximate composition. Rumen fluid was collected into thermos flask by straining contents collected through four layered cheese clothes and immediately taken to the laboratory for microbial analysis.

Statistical Analysis

All the parameters were subjected to statistical analysis using SAS (1999) where statistical differences were observed, means were compared using Duncan multiple range test of the same package

RESULTS AND DISCUSSION

Analyzed Composition	**%**
Dry Matter (DM)	88.85
Moisture Content (MC)	11.15
Crude Protein	12.46
Ether Extract	6.01
C rude Fiber	18.48
ASH	10.94
Acid Detergent Fiber (ADF)	15.83
Neutral Detergent Fiber (NDF)	23.25
Acid Detergent Lignin (ADL)	5.63
Energy (Calculated)	3426.764Kcal/kg

Table 1: Formulated and Analyzed Composition of The Experimental Diet

Ingredient	**%**
Corn cob	50
Gliricidia Leaf Meal(GLM)	27
Maize offal	20
Urea	1
Bone meal	1
Salt	1
TOTAL	100

M.E= k/cal/kg DM= (37×% CP) + (81.8×% CF) + (35.5 × % NFE). Pauzenga (1985)

Maize offal provided fermentable carbohydrates while urea furnished fermentable nitrogen, that are both required for metabolism by the rumen microorganisms. The use of gliricidia leaf meal at 27% inclusion level was meant to reduce the cost of feed formulation, provide additional fermentable organic matter to the rumen microbes and adoption of the study by the resource poor livestock farmer. The corncob-based diet, with crude protein and energy levels of 12.54% and 3426.764Kcal/kg DM respectively was considered adequate for productive performance in goats kept under intensive management (NRC1981).

Table 2: Influence of Cobalt Supplement on Rumen Microbial Population

Isolate/levels	**0.00**	**0.50**	**0.75**	**±SEM**
Total Viable Count (cfu/ml) $x10^8$	5.65^b	6.30^a	6.70^a	0.10
Coliform Count (cfu/ml) $x10^8$	3.80^b	3.80^b	4.75^a	0.28
Faecal Coliform Count (cfu/ml)$x10^8$	0.00	0.00	0.00	0.00
Fungal Count (cfu/ml) $x10^4$	6.85^c	8.20^b	9.45^a	0.24
Protozoa Count (cfu/ml) x10	4.25^c	5.10^b	6.55^a	0.14

a, b, c means within the same row not bearing a common superscript differ ($p<0.05$)

The result shows that the influence of supplementation on treatment 0.50mg, 0.75mg/head/kg DM Cobalt chloride on ruminal population were higher ($P<0.05$) compared with that of the control.

There were significant ($P < 0.05$) differences in the microbial population in the rumen fluid of the animals across the treatments. Supplementation with cobalt chloride resulted to increase in microbial population. The present study showed that protozoa counts were significantly increased ($P<0.05$) by supplementing with Cobalt. Protozoa, predominantly ciliates, appear to contribute substantially to rumen fermentation process (Williamson 1987). Several experiments have demonstrated that lambs and calves deprived of their ruminal protozoa show depressed growth rates and are relative "poor-doers" compared to controls with both bacteria and protozoa.

CONCLUSION

The low productivity in goats' results from inadequate nutrition in terms of the availability of feeds in the right quality and quantity. During the dry season, most pastures are either depleted by overgrazing or destroyed by bush burning. Therefore, fibrous agricultural residues like corncobs should be considered to reduce the cost of goats' production by livestock farmers.

The diet which was moderately consumed and digested but had no apparent adverse effect on the health of the animals can be suggested for dry season feeding of goats. The rate of intake was sufficient to produce positive weight balance over the 12 weeks.

REFERENCES

A.O.A.C: (1990). Association of analytical chemists. Official methods of analysis 15th edition. Washington, D.C.

Alemu yami & Merkel.R.C., (Ed) (2008). Sheep and Goat Production Handbook for Ethiopia. Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP)

De Meyer, D. (1981). Rumen Microbes and digestion of plant cell walls. Agriculture and Environment. 6:295-337

Goering, H.K. and P.J. Van Soest. (1970). Foragefiber analysis (apparatus, reagents, procedures and some application). USDA Agricultural Research Service. Handbook No. 379 as modified by D.R. Mertens (1992, Personal Communication).

Leng, R.A., (1997). Tree foliage in ruminant nutrition. FAO Animal Production and Health.Paper139.FAO,Rome.http//www.fao.org/WAICENT/FAOINFO.

Lopez-Guisa and Satter, (1992): From MicrobeWiki, the student-edited microbiology resource.

NRC, National Research Council (1985). In: Nutrient Requirements of Goats. Nutrient requirement of domestic animals, National Academy of Sciences, Washington D.C. New York.

Williamson, G. and W.J.A. Payne, (1987). An introduction to animal husbandry in tropics, 3rd Edn., ELBS series. Longman, London, 463-484.