NUTRIENT INTAKE, NITROGEN METABOLISM AND FEED GAIN RATIO OF WEST AFRICAN DWARF GOATS FED CASSAVA PEEL BASED DIETS SUPPLEMENTED WITH GRADED LEVEL OF *SACCHAROMYCES CEREVISIAE*

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ABSTRACT
*A-90 day study was conducted to evaluate the nutrient intake, nitrogen metabolism and feed gain ratio of West African Dwarf (WAD) goats fed cassava peel based diets supplemented with graded level of saccharomyces cerevisiae. Five concentrate diets were formulated such that yeast (***S. cerevisiae)** *were supplemented at diet A (control), diet B (0.25g), diet C (0.375g), diet D (0.50g) and diet E (0.625g) respectively. Fifteen WAD goats with an average live weight of 8.30±2.5kg were randomly allotted to the five dietary treatments, of three goats per replicate in a completely randomized design experiment. Parameters assessed included; nutrient composition, feed intake, nutrient digestibility, nitrogen utilization and weight gain. Results showed that inclusion of Saccharomyces cerevisiae significantly (P<0.05) influenced the dietary treatments. Dry matter (DM) contents ranged from 77.03±0.86% (Diet B) to 82.56±0.46% (Diet A). Crude protein (CP) content of the diets increased progressively with increased supplementation of Saccharomyces cerevisiae in the diets. Diet E of 0.625g level of S. cerevisiae had the highest CP content of 16.75±1.52%. The DMI was higher in the WAD goats fed the control diet (422.87±10.81) while the CPI was higher in the diet D of 0.5g level of Saccharomyces cerevisiae (78.19±6.95g/day). Highest nitrogen intake (10.70±0.12g/day) and highest nitrogen retained (72.47±2.16%) were obtained in WAD goats fed Diet A (control). However, yeast supplementation caused a better ruminal digestion, improved nitrogen balance and nutrient utilization; and at supplementation level up to 0.625g, no significant improvement was noticed on the weight gain.*

Key words: Ruminant farmers, goats, yeast, weight gain.

INTRODUCTION

Cassava peel is a rich source of energy and fibre in ruminant feeding (Baah *et al*., 1999) and it is readily acceptable by goats especially when fermented or dried to reduce its moisture and primarily hydrocyanic acid (HCN) content. Feeding concentrates to ruminants has proven to enact the activities of the rumen microbes for better feed utilization. To ensure continuous supply of adequate nutrients required by these animals, both in-season and off-season, the efficient use of alternative feed resources has earlier been and persistently be advocated (Adegbola, 2002). Although, most alternative feed materials are highly lignified and of low protein value, thereby limiting their intake and utilization by animals, this could possibly be surmounted by their combinations with feed materials of higher nutritive value as supplement. However, the yeast (***Saccharomyces cerevisiae***) has the potentials to improve the nutritional quality of fibrous feeds through fermentation and thus, enhance feed/nutrient intake by the animal. Thus, this study was conducted to assess the effect of feeding cassava peel-based concentrate diets supplemented with graded levels of ***Saccharomyces cerevisiae***.

MATERIALS AND METHODS

The experiment was conducted at the Ruminant Unit of the Teaching & Research Farm, Federal University of Technology, Akure, Ondo state, Nigeria. The concentrate diet (Table 1) was prepared using floor mixing method, and yeast (***S. cerevisiae)*** were supplemented at graded levels such that; diet A (control), diet B (0.25g), diet C (0.375g), diet D (0.50g) and

diet E (0.625g) respectively. Nutrients composition, nutrient intakes, weekly weight change week were evaluated. Ten percent of feaces collected each day were oven dried at 105^0C. The oven dried feed and feacal samples were milled and stored in air tight to containers until required for analysis. Daily urine samples from each goat was collected in sample bottles containing 10mls of 10% concentrated sulphuric acid to prevent loss of nitrogen and refrigerated until required for analysis. The experiment spanned for 90days. Nitrogen balance by the goats was calculated as the difference between nitrogen intake and nitrogen excreted from feaces and urine while nitrogen retention was computed from nitrogen balance expressed as a percentage of nitrogen intake. The air-dried samples of feed and faeces collected were analysed for proximate composition while the urine samples collected were analysed for nitrogen according to AOAC (2002) procedures while all data collected were subjected to statistical analysis using SAS (2008).

Table 1. Gross composition of experimental diets fed to the WAD goats

Ingredients	Diet 1 (0)	Diet 2 (0.25)	Diet 3 (0.375)	Diet 4 (0.50)	Diet 5 (0.625)
Cassava peel meals	51.00	51.00	51.00	51.00	51.00
Cocoa bean shell	7.00	7.00	7.00	7.00	7.00
Wheat offal	13.00	13.00	13.00	13.00	13.00
Palm kernel cake	22.50	22.50	22.50	22.50	22.50
Molasses	1.50	1.50	1.50	1.50	1.50
Urea	1.00	1.00	1.00	1.00	1.00
Bone meal	1.50	1.50	1.50	1.50	1.50
Salt	1.50	1.50	1.50	1.50	1.50
Vitamin-mineral premix	1.00	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00	100.00
Analyzed composition					
Dry matter	82.56 ± 0.55^{a}	77.03 ± 0.86^{b}	80.55 ± 0.44^{b}	82.55 ± 0.40^{a}	80.69 ± 0.46^{ab}
Crude protein	9.58 ± 0.51^{d}	11.33 ± 1.51^{cd}	1308 ± 0.51^{bc}	15.67 ± 1.01^{ab}	16.75 ± 1.52^{a}
Crude fibre	11.32 ± 0.23^{a}	11.22 ± 0.06^{a}	10.66 ± 0.02^{b}	10.62 ± 0.02^{b}	8.75 ± 0.03^{c}
Ether extract	1.87 ± 0.04^{e}	6.02 ± 0.02^{d}	7.12 ± 0.08^{c}	5.03 ± 0.03^{b}	8.58 ± 0.05^{a}
Ash	4.67 ± 0.07^{c}	5.29 ± 0.01^{a}	5.14 ± 0.02^{b}	2.54 ± 0.03^{e}	4.19 ± 0.02^{d}

0g, 0.25g, 0.375g, 0.50g and 0.625g are levels of yeast supplementation in the diets

RESULTS AND DISCUSSION

The results revealed that all parameters observed were significantly ($P<0.05$) influenced by the dietary treatment. The dry matter intake (DMI) ranged from 312.08±39.42g/day (goats fed diet E) to 422.87±10.81g/day (goats fed diet A). This implies that yeast supplementation does not affect the dry matter intake of the animals which was according to Hasunuma ***et al.*** (2016) who discovered that DMI was not affected by yeast supplementation to dairy cattle. Also, Whitley ***et al***. (2009) reported that DMI was not impacted by yeast supplementation due to the limited involvement of yeast with ruminal microbes, which is required for improving ruminal fermentation and increasing intake. This study negates the result of Mutsvangwa *et al*. (1992) and Salama *et al*. (2002) who observed that supplementation of yeast in the diet of bulls and dairy goats improved dry matter intake. The crude protein intake (CPI) increases as the level of yeast supplementation increases (Table 2). This might be attributed to the stabilization of ruminal fermentation and activity (Jouany and Morgavi, 2007). More so, age and status of the goats could also be a factor for increased protein intake. The highest nitrogen intake (10.98g/day) was obtained in animals fed diet B. The nitrogen intake observed in this study was slightly higher than 8.75g/day obtained by Ibhaze and

Fajemisin (2015) for WAD goats fed naturally fermented maize cob-based diets. The result suggests that the diets were able to meet the animals' requirements for nitrogen. This could also be attributed to the protein concentration in the diet as well as the nitrogen intake by the animal. The observed live weight gains by the goats were statistically (P>0.05) similar. This affirm the report of several authors that yeast culture supplementation has no effect on growth but reported an increased digestibility of nutrients (Kawas *et al*., 2007; Titti *et al*., 2008). But all these negates the observation of Haddad and Goussous (2004), who reported improved weight gain after supplementing yeast to finishing sheep diets. However, it is evident that yeast can have beneficial effects on the general performance under some circumstances, but there seems to be a considerable unexplained variability in response this could be due to factors such as basal diet, viable cell numbers, the amount of yeast supplemented, type of forage fed and feeding strategy.

Table 2: Response of WAD goat to the test diets

Parameters	A	B	C	D	E
Nutrients Intake					
Dry matter	422.87 ± 10.81^{a}	338.13 ± 45.38^{ab}	403.88 ± 9.20^{ab}	412.71±28.86^{ab}	312.08 ± 39.42^{b}
Crude protein	48.95 ± 1.21^{b}	49.98 ± 8.02^{b}	65.55 ± 2.20^{ab}	78.19 ± 6.75^{a}	64.19 ± 8.17^{ab}
Crude fibre	57.94 ± 0.53^{a}	49.24 ± 6.62^{a}	53.47 ± 1.67^{a}	53.11 ± 3.74	33.79 ± 4.11^{b}
Ether extract	9.59 ± 0.27^{c}	26.46 ± 3.62^{b}	35.70 ± 0.74^{a}	25.14 ± 1.70^{b}	33.18 ± 4.21^{ab}
Ash	23.93± 0.53^{a}	23.25 ± 3.23^{a}	25.79 ± 0.58^{a}	12.69 ± 0.76^{b}	16.17 ± 1.93^{b}
N_2 utilization					
N_2 intake (g/d)	7.83±0.61	8.00±0.52	10.48±0.12	12.51±1.55	10.27±1.31
Faecal N_2	2.93±0.23	3.57±0.53	4.06±0.35	2.87±0.19	3.03±0.60
Urine N_2	0.02±0.00ab	0.02±0.00a	0.02±0.00ab	0.01±0.00bc	0.01±0.00c
N_2 balance	4.88±0.80de	4.41±0.57d	6.40±1.03c	9.62±0.24a	7.23±0.71b
Growth indices					
Initial weight (kg)	8.33±0.48	8.33±0.59	8.33±0.75	8.33±1.11	8.13±1.57
Final weight (kg)	12.87±0.89	12.63±0.63	13.30±0.42	12.97±1.22	12.20±1.27
Weight gain (kg)	4.53±0.39	4.30±0.32	4.97±0.35	4.63±0.15	4.07±0.76
Daily weight gain (g/day)	50.37±4.37	47.78±3.58	55.18±3.92	51.48±1.61	45.19±8.47
Feed gain ratio	8.52±0.82	7.18±1.24	7.39±0.52	8.05±0.53	7.47±1.97

abc - Means bearing different superscripts along the same row are significantly different (P < 0.05).

CONCLUSION AND RECOMMENDATION

Yeast supplementation caused a better ruminal digestion, improved nitrogen balance and nutrient utilization. However, at supplementation up to 0.625g, no significant improvement was noticed on the weight gain.

REFERENCES

Adegbola, T. A. (2002). Nutrient intake, digestibility and rumen metabolites in bulls fed rice straws with or without supplements. Nigeria Journal of Animal Production.29 (1):40-46.

AOAC. (2002). Association of Official Analytical Chemists. Official methods of analysis, 16th edition, Washington D.C., U.S.A.

Baah, J., Tait, R. M. and Tuah, A. K. (1999). The effect of supplementation with Fiscus leaves on the utilization of cassava peels in sheep. Bioresource Technology, 67: 47-51.

Haddad, S. G. and Goussous, S. N. (2004): Effects of yeast culture supplementation on nutrient intake digestibility and growth performance of Awassi lambs. Animal Feed Science Technology 118, 343-348.

Hasunuma, T., Uyeno, Y., Akiyama, K., Hashimura, S., Yamamoto, H., Yokokawa, H., Yamaguchi, T., Itoh, M., Mizuguchi, H., Sato, S., Hirako, M. and Kishibiki, S. (2016) Consecutive reticular pH monitoring in dairy cows fed diets supplemented with active dry yeast during the transition and mid-lactation periods. Animal Feed Science Technology; 221:215-225

Ibhaze, G.A and Fajemisin, A.N. (2015). Feed intake and nitrogen metabolism by West African dwarf does fed naturally fermented maize cob based diets. World Journal of Animal Science Research, 3(2):1-8.

Jouany, J. P. and Morgavi, D. P. (2007). Use of natural products as alternatives to antibiotic feed additives in ruminant production. Journal of Animal Science, 1: 1443-1466.

Kawas, J. R., García-castillo, R. F., Garza-cazares, R., Fimbres-durazo, E., Olivares-sáenz, G. and Hernández-vidal, C. D. (2007). Effects of sodium bicarbonate and yeast on nutrient intake, digestibility, and ruminal fermentation of light-weight lambs fed finishing diets. Small Ruminant Research. 67, 149-156.

Mutsvangwa, T, Edwards, I. E., Topps, J. H. and Paterson, G. F. M. (1992). The effect of dietary inclusion of yeast culture (yea-Sacc) on patterns of rumen fermentation, food intake and growth of intensively fed bulls. Animal Production, 55: 35 - 40.

Salama, A.A.K., Caja, G., Garin, D., Albanell, E., Such, X. and Casals, R. (2002).Effects of adding a mixture of malate and yeast culture (Saccharomyces cerevisiae) on milk production of Murciano-Granadiana dairy goats. Animal Research, 51: 295 – 303.

SAS. (2008). Statistical Analysis System Institute Inc., SAS/STAT Programme, Carry, NC: SAS Institute Inc.

Titti, H. H., Dmour, R. O. and Abdullah, A.Y. (2008): Growth performance and carcass characteristics of awassi lambs and shami goat kids fed yeast culture in their finishing diet. Animal Feed Science and Technology, 142:33-43.

Whitley N. C., Cazac, D., Rude, B. J., Jackson-O'Brien D. and Parveen, S. (2009). Use of commercial probiotics supplement in meat goat. Journal of Animal Science, 87:723-728.