EFFECT OF UREA-MOLASSES MULTINUTRIENTS BLOCK SUPPLEMENTATION ON PERFORMANCE OF WEST AFRICAN DWARF BUCKS FED CASSAVA PEELS

[1]A.N. fajemisin, [2]G. S. Onyekachi, [1]G.A. Ibhaze, [2]D.E. Onyekachi, [1]A.J. Fajemisin and [1]J.A. Alokan

[1]Department of Animal Production and Health, Federal University of Technology, Akure, Nigeria.
[2]Department of Animal Nutrition, Federal University of Agriculture, Makurdi, Benue State, Nigeria,
debofajemisin@yahoo.co.uk +2348033746415

Abstract

The increasing shortage in forage for ruminant feeding, coupled with poor nutrients in crop residues to meet the nutrient requirements of ruminant during dry season and feed scarcity period have created serious challenge in ruminant nutrition. These problems have led to a renewed interest in ruminant nutrition. Hence, this study was conducted to evaluate performance of West African Dwarf (WAD) bucks fed cassava peels and urea-molasses multi-nutrients block (UMMB) supplements. Twenty WAD bucks that weighed 8.33±0.35 kg on average were assigned to each of the five experimental diets that contained cassava peels without UMMB supplement (Treatment 1) and with UMMB containing 0% urea (Treatment 2), 5% urea (Treatment 3), 10% urea (Treatment 4) and 15% urea (Treatment 5), in a completely randomized design (CRD). Results of the study revealed that the dry matter (DM) contents in the urea-molasses multi-nutrients blocks (UMMBs) ranged between 82.53% and 90.62% and the crude protein (CP) of cassava peels (5.35%) is lower compared to CP of UMMBs that ranged from 8.05% to 29.79%. The nutrients intake of the bucks were significantly ($P<0.05$) influenced by UMMB supplementation. The best dry matter (313.49 g/day) and crude protein (44.67 g/day) intakes were observed in bucks fed diet T_4. WAD bucks fed diets T_4 and T_5 have the average daily weight gain of 39.05 g/day and 30.48 g/day respectively. The bucks fed diet T_4 converted their feed to flesh (9.44) better than other bucks. Conclusively, the bucks fed diet T_4 performed better than other bucks hence, urea-molasses multi-nutrients block supplement contained 10% urea can offers a cheap but reliable source of protein for optimum utilisation of cassava peels or other crop residues by goats especially during dry season when quality feeds are scarce.

Introduction

Farm by-products could constitute an important feed resource during the dry season. However, most farm by-products are known to be particularly deficient in protein, minerals and vitamins; they are highly lignified and their digestibility is low. The principles for improving the use of these poor quality feed resource by ruminants according to Sansoucy *et al.* (1995) include; satisfying the requirements of the rumen micro-organisms to ensure efficient fermentation of fibre and increased production of microbial protein relative to volatile fatty acids, balancing the products of fermentative digestion with dietary nutrients (mainly through the use of bypass protein) to meet the needs of growth, milk, meat and wool production. Experiments with sheep and goats have shown that this can be achieved through protein supplementation (Rokomatu and Aregheore 2006). Protein supplementation is known to enhance utilisation of poor-quality feeds like crop residues as it maximises roughage degradation and optimises rumen microbial protein synthesis (Rokomatu and Aregheore 2006). However, most of the supplements used; such as soya beans, cotton seed cake and groundnut cake are expensive and not readily available. Urea offers a cheap and good alternative source of protein. When urea is fed as such to a ruminant, it is hydrolyzed instantly in the rumen and the ammonia released is utilized efficiently for microbial protein synthesis (Nisha, *et al.*, 2005). Urea-molasses blocks or multi-nutrients blocks (UMMB) have been used to salvage the deficiency of energy, nitrogen, vitamins and minerals lacking in fibrous feeds (FAO, 2007).

Urea-molasses multi-nutrient blocks (UMMB) offers several advantages: ease of transport, storage and use, and reduced risks compared with other approaches, such as giving a small amount of urea in drinking water, sprinkling of urea solution on fibrous feeds before feeding, or urea-ammonization of crop residues. This study therefore aimed at examine the effect of urea-molasses multi-nutrients block supplementation on nutrients intake, nitrogen retention, weight gain and feed gain ratio of WAD bucks fed sun-dried cassava peels.

Materials and Methods

This experiment was conducted at the Teaching and Research Farm and laboratory analysis was carried out at the nutrition laboratory of Department of Animal Production and Health of The Federal University of Technology, Akure. Five types of Urea-molasses multi-nutrients blocks (UMMB) were prepared using sugarcane molasses, urea, common salt, vitamin/mineral premix, brewer's dried grain and cement (Table 1). Molasses was the source of fermentable substrate and various minerals and trace elements. Urea provided fermentable nitrogen. Cement was used as the binding agent. Brewer's dried grain acts as an absorbent for the moisture contained in molasses and gives structure to the block. The various raw materials were weighed accurately before mixing manually in a bucket. Mixing the molasses with the urea was the first step. The cement powder was introduced next. The bran was added to this mixture and finally, water (with the salt and mineral premix dissolved in it) was added in sufficient quantity to ensure homogenous mixture. Plastic containers with dimension of about 14cm x 14cm x 8cm were used as moulds. Once the mixture was placed in the mould, it was left in a well-ventilated room for 6-8 days to air-dry and set before feeding. Twenty West African Dwarf bucks weighed 8.33±0.55 kg on average and aged 9-12 months were used for the study. The study lasted for 70 days (excluding one month adjustment period). Four (4) bucks were randomly assigned to each of the five experimental diets that contained dried cassava peels without urea-molasses multi-nutrients block (UMMB) supplement (Treatment 1) and with UMMB supplements containing varying levels of urea (0%, 5% 10% and 15% for treatments 2, 3, 4 and 5 respectively) in a completely randomized design (CRD). Daily records of feed intake as well as weekly weight gain of each buck were obtained. The multi-nutrients blocks, feed and faecal samples were analyzed for proximate composition and fibre fractions while urine samples were analyzed for nitrogen using methods of AOAC (1995). All data generated were subjected to the one-way analysis of variance (ANOVA) using the general linear model procedure of SAS (2008). Where significant differences are observed, Duncan's Multiple Range Test (Duncan, 1955) was employed to compared the means.

Results and Discussion

The proximate composition and fibre fractions of the cassava peels and multi-nutrient blocks are presented in Table 2. The dry matter (DM) contents in the urea-molasses multi-nutrients blocks (UMMBs) ranged between 82.53% and 90.62%, these values were comparable to 83.13 – 88.21% reported by Onwuka (1999) for molasses-urea multi-nutrients blocks, but higher than 71.18 – 78.55% reported by Aye and Adegun (2010) for *Gliricidia* molasses-urea multi-nutrients blocks.. The high DM recorded in UMMB-A may be due to the high percentage of rice bran (55%DM content) and absence of molasses in the diet. The CP of the cassava peels was 5.35% and comparable to 5.48% reported by Akpabio *et al.* (2012). The crude protein (8.05% to 29.79%) of the UMMBs increased with increased urea contents and the CP values of UMMBs B, C and D were higher than the values of 11-15% reported by Matal and Cambellas (1992) when crop residue was fed with UMMB supplement to sheep. However, the observed CP values compared favourably to the reported values of 17-33% by Aye and Adegun (2010). The crude fibre (CF) content was higher in UMMB-A than the others, this observation might be due to rice bran content (55%) however, the CF content fell within the range values (7 – 13%) reported by Onwuka (1999). The high nitrogen free extracts (NFE) of the UMMB supplements might be due to the molasses contents of the supplements. The nutrients intake (g/day), digestibility coefficient, average daily weight gain, nitrogen retention and feed gain ratio of WAD bucks fed cassava peels and UMMB supplements are shown in Table 4. The dry matter intake of bucks fed diet T_5 was lower (300.03 g/day) compared to those fed diet T_4 (313.49 g/day). Similar observation was made by Sansoucy (1995) when lambs were fed straw with UMMB containing 15% urea. The author further stated that at 20% urea level in UMMB, none of the lambs licked the blocks. The decrease in DM intake by bucks fed diet T_5 could be attributed to the high level of urea in the diet which might be unpalatable to the goats (Sansoucy 1995). The crude protein (CP) intake was highest in bucks fed diet T_4, this observation reveals that UMMB supplementation enhances protein intake. The observation is in line with the report of McDonald *et al.*, (2010) that ruminants show higher nitrogen intake when offered high protein diets. Crude fibre, Neutral detergent fibre and Acid detergent fibre intake was significantly ($P<0.05$) influenced by UMMB supplementation. The reason being that, protein supplementation maximises roughage degradation by supplying the needed nitrogen (N) for rumen microbial multiplication (Rokomatu and Areghore, 2006). Average daily weight gain of WAD bucks was improved by UMMB supplementation and observed values ranged from 3.86 g/day (diet T_1) to 39.05 g/day (diet T_4). Similar observations were made when sheep were fed crop residue with multi-nutrients block supplements (Aye and Adegun, 2010). This could be attributed to improved nitrogen contents of the diets which might have improved rumen microbial population, improved nitrogen-energy ratio and consequently improved growth of the bucks. Bucks fed diet T_4 had the best feed gain ratio (9.44). This observation might be attributed to the improved feed intake and protein quality of the diet.

Conclusion

Strategic UMMB supplementation, manufactured from locally available raw materials and with formulation taking into account local ecosystem and animal physiological requirements is an effective means of correcting nutrient deficits in poor quality fibrous feed resources. Its use as a supplement improved the nutrients intake as well as weight gain of WAD bucks fed cassava peels-based diets. Therefore, high-cost concentrates can be replaced by UMMB licks.

References

Akpabio, U. D., Akpakpan, A. E., Udo, I. E. and Nwokocha, G. C. (2012). Comparative study on physiochemical properties of two varieties of cassava peels. *Int, J. Environment 2(1): 19-32*

AO.A.C. (1995). Association of Official Analytical Chemistry. *Official methods of analysis 15th ed.* Washington D. C. U.S.A

Aye, P. A. and Adegun, M. K. (2010) Digestibility and growth in west african dwarf sheep fed *gliricidia*-based multinutrient block supplements. *Journal of Environmental Issues and Agriculture in Developing Countries 2: (2 and 3), pp54-56.*

Duncan, D.B. (1955). Multiple Range and Multiple F- tests. Biometrics, 11: 1-42.

FAO (2007). Feed Supplementation Blocks. Editors: Makkar, H. P. S. and Manuel, S. FAO Italy. Pp252

McDonald, P., Edwards, R. A., Greenhaugh, J. F. D., Morgan, C. A., Sinclair, B. A. and Wilkinson, R. G. (2010). Animal nutrition. Pearson pub. Co. UK. Pp 714.

Nisha, J., Tiwari, P. S. and Singh, P. (2005) Effect of urea molasses mineral granules (UMMG) on rumen fermentation pattern and blood biochemical constituents in goat kids fd sola (Aeschonomene indica Linn) grass-based diet. *Veterinarski Arhiv 75* (6), 521-530, 2005

Onwuka, C. F. I. (1999). Molasses blocks as supplementary feed resources for ruminants. *Archive Zootech.* 48: 89 - 94.

Rokomatu, I. and Aregheore, E.M., (2006). Effect of supplementation on voluntary dry matter intake, growth and nutrient digestibility of Fiji Fantastic sheep on basal diet of Guinea grass (*Panicum maximum*). *Livestock Science.* 100: 132-141

Sansoucy, R. (1995). New development in the manufacture and utilization of multinutrient blocks. *World Animal Review*, 82: 78–83.

SAS, (2008). Statistical Analysis System. SAS User Guide: Release 9.2. SAS Institute Inc, Cary NC, USA.

Table 1: Gross composition (%) of urea-molasses multi-nutrient blocks

Ingredients	A	B	C	D
Urea	-	5.00	10.00	15.00
Molasses	-	45.00	40.00	35.00
Common salt	5.00	5.00	5.00	5.00
Cement	15.00	15.00	15.00	15.00
Brewer's dried grain	29.00	29.00	29.00	29.00
Rice bran	55.00	-	-	-
Premix	0.50	0.50	0.50	0.50
Sulphur	0.50	0.50	0.50	0.50

UMMB A (0% urea, 0% molasses); UMMB B (5% urea, 45% molasses); UMMB C (10% urea, 40% molasses); UMMB D (15% urea, 35% molasses)

Table 2 Chemical composition (%) of cassava peels and urea-molasses multi-nutrient blocks

Parameters	Cassava peels	Urea-molasses multinutrient blocks				
		A	B	C	D	CV(%)
Dry matter	86.57	90.62	82.53	84.88	85.16	3.10
Crude protein	5.35	8.05	17.94	22.93	29.79	14.32
Crude fibre	11.83	15.29	9.95	7.47	7.30	50.42
Nitrogen free extract	63.6	61.7	61.07	59.00	50.93	5.57
Neutral detergent fibre	52.12	57.04	44.20	43.93	43.74	71.76
Acid detergent fibre	46.06	44.65	36.35	35.89	36.18	57.84

UMMB A (0% urea, 0% molasses); UMMB B (5% urea, 45% molasses); UMMB C (10% urea, 40% molasses); UMMB D (15% urea, 35% molasses) n=3

Table 3. Nutrients intake (g/day) of WAD bucks fed cassava peels with UMMB supplements

Parameters	Diets					SEM
	1	2	3	4	5	
Dry matter intake	180.00^{c}	234.43^{b}	259.47^{b}	313.49^{a}	300.03^{a}	10.47
Crude protein	12.16^{c}	16.57^{c}	30.47^{b}	44.67^{a}	40.37^{a}	3.46
Crude fibre	26.90^{c}	61.90^{b}	74.01^{ab}	85.05^{a}	81.25^{a}	5.92
Nitrogen free extract	144.61^{b}	159.11^{b}	203.95^{ab}	251.78^{a}	235.38^{a}	12.42
Neutral detergent fibre	116.51^{c}	140.03^{c}	177.67^{b}	231.44^{a}	232.55^{a}	13.09
Acid detergent fibre	81.99^{c}	97.10^{bc}	120.26^{b}	156.75^{a}	158.01^{a}	8.71

abc = Means with different superscripts in the same row are significantly different (P<0.05).

Table 4: Nutrients digestibility coefficients (%), daily weight gain, feed/gain ratio and nitrogen retention of WAD bucks fed cassava peels with UMMB supplements

Parameters	Diets					SEM
	1	2	3	4	5	
Dry matter (%)	60.98^{c}	70.39^{b}	75.90^{ab}	83.05^{a}	80.43^{a}	2.34
Crude protein (%)	50.28^{d}	52.08^{b}	59.25^{ab}	71.97^{a}	67.58^{a}	3.81
Crude fibre (%)	52.62^{c}	54.87^{b}	59.20^{ab}	67.64^{a}	63.50^{ab}	2.73
Nitrogen free extract (%)	59.44^{b}	66.13^{a}	68.35^{a}	71.34^{a}	69.31^{a}	1.43
Neutral detergent fibre (%)	62.18^{b}	61.37^{b}	59.55^{b}	76.17^{a}	71.39^{a}	2.05
Acid detergent fibre (%)	52.67^{b}	55.90^{b}	61.29^{b}	77.06^{a}	71.98^{a}	3.42
Avg. daily weight gain (gday^{-1})	3.86^{d}	6.76^{d}	13.63^{c}	39.05^{a}	30.48^{b}	3.94
Nitrogen retention (gday^{-1})	0.75^{b}	1.38^{d}	3.45^{c}	5.23^{b}	6.07^{a}	0.15
Feed gain ratio	53.59^{a}	38.11^{b}	22.94^{c}	9.44^{d}	11.87^{d}	7.48

abcd = Means with different superscripts in the same row are significantly different (P<0.05).