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Formulation and Effects of Three Varieties of Protein Lick Block Supplements on the Performance of Yan Kasa Rams in Adamawa State

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Abstract: *The study was carried out in Adamawa state, North-east region of Nigeria. The experiment was conducted to substitute the conventional molasses with non-conventional local resources. Three varieties of protein lick blocks were formulated using conventional molasses and non-conventional products like sweet potatoes and wasted mangoes as alternative to molasses. In order to compare and assess the effects of the formulated protein lick blocks on the performance of Yankasa rams, 16 rams were used in the experiment for the period of 90 days. The experimental rams were randomly grouped into four treatment units. Treatment 1 served as control group while treatment 2 was given basal feeds with molasses protein lick block as supplement. Treatment 3 was given basal feeds with sweet potatoes protein lick block and treatment 4 was also given the same quantity of basal feeds with mangoes protein lick block as supplement. During the experiment, the following parameters were asses; Daily weight gain, daily basal feed intake, daily protein lick block intake and daily water intake. The experiment indicated that the average daily weigh gain was highly significant (P< 0.001) when compared with that of control group but the figures were similar within the treatments. The average basal feed intake was slightly higher with significant (P< 0.05) different when compared with control group. The average protein lick intake was higher in treatment 2 with significant (P< 0.05) different but the average water intake was higher in treatment 3 of potatoes protein lick block with significant (P< 0.05) different. From the experiment, it was concluded that the molasses can be replace with non-conventional products like sweet potatoes or mangoes pulp in making protein lick block without any adverse effects.*

Keywords: *Molasses, Mango, Potatoes, Yankasa, Supplement.*

1. INTRODUCTION

Nutrition is about the most important consideration in livestock management due to its high contribution to the total cost of production and its importance in determining the success of the enterprise, but bioavailability of nutrient fed is even more important. A major contributing factor to cost of nutrition is the competition between animals and human for the same feedstuff. Feedstuffs that are supplying appreciable and quality protein such as oil seeds are in many cases not available or are too expensive for the small-scale farmer to buy (Akinola *et al*, 2020), there is need for alternative feeds which will bring about lower feed price. Therefore, strong justification for research and development investment into a number of very promising alternative protein feed source is needed (Ajayi and Ajao, 2020). The availability of folder trees, particularly legumes with leaves rich in good quality protein which could be a cheap and suitable solution are insufficient to cover needs (Amaefule and Okereke 2019), planting and growing such trees is a long-term objective. A shorter-term solution is to provide supplements containing nitrogen, essential mineral and vitamins as part of the diet (Sastry and Thomas, 2015). One of the cheapest sources of non-protein nitrogen is Urea (A common crops fertilizer). It is widely available at reasonable price in most farming areas. Urea is a good and cheap source of nitrogen for ruminant; however, if eaten in excess, it could be very toxic, rapidly causing death. Inorder to supply urea in a safe way, several methods have been tried; mixing urea and molasses in drinking water, sprinkling of urea solution on fibrous feeds, feeding Urea and molasses mixtures given in feeding troughs, but all are difficult and dangerous due to the risks of urea toxicity and problems of distribution, handling and storage of the treated crop residues. (Ben Salem *et al*,

2011) solidifying urea and molasses inform of lick block present many advantages as it makes transport, storage and distribution easy and reduces risk. During the early periods, lick-blocks included only urea and salt, but recent incorporation of conventional by-products (Molasses) had increase the utilization and intake of roughages (Sastry and Thomas, 2015) the replacement of molasses in blocks by wasted or non-conventional local resources are also needed to reduce the cost of the lick blocks. In many cases molasses are not found or difficult to handle or are too expensive for traditional livestock sector. This trail wants to attempt to formulate some protein lick block supplements without using convectional molasses. Although it is usually preferable to include some molasses because it makes the block easier to manufacture, improve the palatability and supplies some useful elements such as sulphur. The inclusion of wasted mangoes or sweet potatoes may serve as an alternative to adopt in helping to solve the problems of livestock owners in various areas in Adamawa state and other neighboring states that are lacking the by-product (Molasses).

2. MATERIALS AND METHODS

2.1. Location of the Study Area

The study was carried out in Adamawa state, North East region of Nigeria. Adamawa state has 21 Local Government, with the state capital at Yola. The state occupies about 36,917 kilometers square, located at Longitude 12^{o}30’ 00” E and Latitude 9^{o}20’00” N.The state has a tropical climate marked by rainy and dry season; Maximum temperature can reach up to 40^{o}c particularly in April, while minimum temperature can be as low as 16^{o}c between December and January. The mean annual rainfall is less than 1,000mm. The major occupation of the people is crop and livestock farming as reflected in their two notable vegetation zones title Sub-Sudan and Northern Guinea savannah zones (Canback global income distribution database, 2012).

2.2. Materials and Ingredients

Molasses – it is the material remaining after sugar had been crystallized from a mash of cane in water, it is palatable and contains numerous trace minerals, it is the major source of readily fermentable energy to ruminants. It is dark brown viscous and sticky. It is use to encourage stock to lick the block.

Clay – (Fine and smooth texture of soil) its serve as filler, nutrients carrier and anti-nutrients binder.

Fish meal (offal) – serve as a source of animal “by-pass” protein.

Soya beans waste – waste/ shaft obtained during processing of soya bean cake (awara cake) served as protein “by pass protein”.

Sweet potatoes – served as appetizer (sweetener), filler, binder, and also as a source of vitamin A and C, potassium, antioxidant (Beta-carotene) to substitute molasses in the lick block.

Common salt – Common salt is a source of sodium and chloride. It also acts as preservatives, attractant and limiter (Salt restricts free intake of the block)

Urea Fertilizer – serves as source of non-protein nitrogen which ruminants can convert to usable protein.

Wasted Mango fruits– it replaced molasses as sweetener, attractant and appetizer. Also as a source of vitamins, minerals and anti-oxidants.

Egg Shells –serve as filler, sources of calcium and phosphorous.

Maize flour– serves as source of energy and other trace minerals.

Maize bran– acts as fillers and source of energy.

Equipment’s– the equipment include: Shovel, bucket, open container (half drum), metal mould block, mat and stirring stick.

2.3. Methods

2.3.1. Procedure for Compounding of Molasses Protein Lick Block

The ingredients and proportions used in compounding the protein lick block supplementsare as follows: Molasses 30kg, Urea 10kg, Common salt 7kg, Fish meal (offal) 8kg, Soya beans waste 10kg, Crushed egg shell 5kg, Clay 15kg, Maize flour 5kg and Maize bran 10kg.

Step one:10kg of urea and 7kg of common salt were added into 10 liters of hot water and stirred thoroughly with stirring stick till urea and salt dissolved completely in the hot water and the solution added to 30kg of molasses in an open container and stirred thoroughly.

Step two: The mixture was then added on the dry ingredients (clay, maize flour, maize bran, soya bean waste, fish meal, and crushed egg shells) on a concrete floor and were mixed thoroughly with a shovel to form homogenous mixture.

Step three: A fabricated rectangular steel mould of 24cm by 12cm by 15cm was used to mould 2 blocks of 5kg each at a time. When the resulted paste was ready for moulding, the metal mould was coated with some vegetable oil for easy removal of the blocks.

Step four: The paste was loaded using shovel to fill in the 2 chambers of steel mould box and covered with a thick metal sheet tightly fitting the frame and pressed for 20-30 seconds using hand pressure.

Step five: The metal cover was then removed; the protein lick blocks were removed by lifting the metal box and pushing the protein lick block gently.

Step six: The metal mould was lightly washed before it was reassembled for the next batch of the blocks. The protein lick blocks were sundried for 7 days and packed for feeding and the remaining were kept in polythene bags for storage. The proximate composition of formulated protein lick block was also analyzed as presented in table 1. The moulding room was well ventilated and protected from the sun, rain and free from vermin.

2.3.2. Procedure for Making Potatoes Protein Lick Block

The ingredients and proportion used in compounding the protein lick block supplement were presented as follows: Sweet Potatoes 30kg, Urea 10kg, Common salt 7kg, Fish meal (offal) 8kg, Soya beans waste 10kg, Crushed egg shell 5kg, Clay 15kg, Maize flour 5kg and Maize bran 10kg.

Step one: 30kg of sweet potatoes were chopped and cooked with about 10 liters of water for 50 minutes in a medium container. 10kg of urea and 7kg of salt were added to the hot potatoes and were stirred thoroughly till urea and salt dissolved completely in the cooked potatoes porridge.

Step two – Step Six were followed as described in the procedure for molasses protein lick block formulation above.

2.3.3. Procedure for Making Mango Fruits Protein Lick Block

The ingredients and proportion used in compounding the protein lick block supplement were presented as follows: Mangoes pulp 30kg, Urea 10kg, Common salt 7kg, Fish meal (offal) 8kg, Soya beans waste 10kg, Crushed egg shell 5kg, Clay 15kg, Maize flour 5kg and Maize bran10kg

Step one: Mango fruits were peeled and the seeds were removed, 30kg of the pilled flesh (pulp) were grinded using grinding machine. 10kg of urea and 7kg of salt were add in to about 10 liters of hot water and mixed thoroughly and were added in the mangoes juice in an open container and were stirred thoroughly. The mixtures were added with the remaining ingredients on a concrete floor

Step two – Step Six were followed as described in the procedure for molasses protein lick block formulation above.

3. EXPERIMENTAL DESIGN AND MANAGEMENT

The study was carried out for 90 days with a total number of 16 Rams. The rams were randomly placed into 4 treatments and were maintained under similar environmental and management conditions. After fifteen days of acclimatization, to evaluate the effect of compounded protein lick blocks on the performance of Yankasa Rams**.** The initial weight of each ram was taken and recorded using flat Weighing scale, 2012 model. The rams in treatment one served as control group and were given a known quantity of groundnut straw and cowpea husks freely without protein lick block supplement. Treatment two was given the same quantity of basal feed with 5kg of molasses protein lick block freely. Treatment three was given the known quantity of basal diets with 5kg of potatoes protein lick block. Treatment four was also given the same quantity of basal feeds of groundnut straw and cowpea husks and supplemented with mangoes protein lick block. Feeding of protein lick blocks were done by presenting the protein lick blocks directly to the Rams in a box and the animals had only limited access to one surface of the block. Fresh water was given to them freely.

4. Result

Table1. *Proximate composition of the compounded protein lick block supplement*

Parameters	Molasses lick block	Potatoes lick block	Mangoes lick block
Dry matter	92.9	96.1	95.3
Crude protein	16.3	16.0	15.6
Crude fibre	82.3	84.8	84.2
Ash	66.3	68.1	67.2
Ether extract	9.8	9.6	9.2
Nitrogen free extract	76.2	77.8	75.9
Neutral detergent fibre	66.7	67.1	66.8
Acid detergent fibre	58.4	59.3	60.2

Table2. *Effect of protein lick block supplement on Yankasa Rams*

Parameters	T1	T2	T3	T4	SEM
Initial Average weight of Ram (kg)	35.25	36.5	36.1	35.75	1.59N
Average Daily weight gain of Ram (kg)	0.11^{b}	0.24^{a}	0.23^{a}	0.22^{a}	0.12***
Average Daily Basal feet intake per Ram (kg)	1.70^{b}	1.72^{ab}	1.79^{a}	1.78^{a}	0.03*
Average Daily protein lick block intake per Ram (kg)	0^{c}	0.11^{a}	0.075^{b}	0.083^{b}	0.004*
Average Daily water intake per Ram (liters)	3.00^{c}	3.21^{b}	3.30^{a}	3.17^{b}	0.004*

Keys: Abc = Within the same raw bearing different superscript differ significantly.
** = Significant (P<0.05) ** = Significant (P<0.01) *** = Significant (P<0.001)*
NS = Not Significant (P>0.005) SEM = Standard Error Mean.

4.1. To Evaluate the Protein Lick Intake

The weight of the lick block was measured and the present weight was subtracted from the initial weight daily.

4.2. To Evaluate the Effect of Formulated Protein Lick Blocks on Body Weight of Yan Kasa Rams

Weekly weight of each experimental ram was determined by using flat weight scale of 2012 model. The initial weight of the ram was subtracted from the present weight gained.

4.3. To Evaluate the Feed Intake

Each treatment was given a known quantity of basal diet of groundnut straw and cowpea husk by 7:30am daily. The leftover feeds in each treatment was measured before providing fresh feeds

4.4. To Evaluate the Water Intake

A known quantity of fresh water was given regularly. The leftover quantity was measured before providing the fresh one.

4.5. Data Generated

All raw data generated were statistically analyzed using the SPSS software version 13.0. Differences between treatment means were separated using the Least Significant Difference (LSD) procedures at 5% Significance level (P< 0.05).

5. Discussion

Protein lick blocks can be made with variety of feed resources, depending on their availability, nutrient value, cost and the facilities available. This trial offers a means of making use of agro-industrial by-products and waste not fully utilized by domestic livestock. In this trial, three varieties of protein lick blocks were compounded. Molasses is the basic component for making a convectional protein lick block which serves as sweetener, binder and as urea carrier. The other two unconventional sweeteners, binders and other sources of vitamins and minerals were sweet potatoes *Ipomoea batatas*and mangoes *Magnifera indica* which replaced the conventional molasses. All the remaining ingredients in the Compounded protein lick blocks were similar in percentage of inclusion. The procedures for the block lick making were followed as designed by Chen et al., (1993). The blocks were free from mould and also maintained their shapes when they were exposed to sunshine and did not varied in colour and odour during storage. Although, during the upset of the raining season when the humidity was high about 60 percent, there was a slight changed in texture in all the three varieties of the protein lick blocks. Malik *et al.*, (1993) also observed some changes and had suggested wrapping blocks in polythene sheets to avoid moisture and contamination especially during the rainy season.

5.1. Evaluation of the Basal Feed Intake

The daily basal feed intake per ram in each treatment group was indicated as follows:

Treatment 1, 1.70kg; treatment 2, 1.72kg; treatment 3, 1.79kg and treatment 4, 178kg per ram per day respectively. The differences between the highest 1.79kg in treatment 3 of mangoes protein lick block and the lowest basal diet intake 1.70kg of controlled group was significant ($p< 0.05$) difference but the figures didnot show any significance ($p> 0.05$) difference within the rest of the treatment groups as presented in table 2.

5.2. Evaluation of the Water Intake

The average daily water intake per ram had shown that in treatment 1: each ram consumed 3.0 litres of water, treatment 2: 3.12 litres, treatment 3: 3.30 litres and treatment 4: 3.17 litres respectively. The data indicated that in treatment 3 of potatoes protein lick blocks, water intake was higher with significant ($p< 0.05$)difference when compared with that of treatment 1 of controlled group but the figures were similar within the other treatment groups as in table 2.

5.3. Evaluation of the Protein Lick Block Intake

The daily protein lick block intake in treatment 2, 3 and 4 were molasses lick block 0.11kg, sweet potatoes protein lick block 0.075kg and mangoes protein lick block 0.083kg respectively.

The data indicated that there was a higher intake of molasses protein lick block in treatment 2 with significant ($p< 0.05$) difference.

5.4. Evaluation of Body Weight Gained

The daily body weight gained of 0.11kg per ram was obtained in treatment 1: 0.24kg per ram in treatment 2: 0.23kg per ram in treatment 3 and 0.22kg per ram in treatment 4. The daily body weight gained were significantly ($p< 0.001$) different when compared with control group but did not show any significant ($p< 0.05$) difference within the remaining treatments as indicated in table 2.

6. CONCLUSION

From the studies, it was shown that. High cost of molasses lick block can be replaced with sweet potatoes lick block or mangoes lick block without any adverse effect. It is therefore recommended that sweet potatoes (*ipomoea* batatas*)* or wasted mango pulp (*magnifera indica)* could comfortably replace the use of molasses in compounding the protein lick block.

RECOMMENDATIONS FOR FURTHER STUDIES

There is need to incorporate locally available herbal anthelmintics that are cheaper than imported drugs that could potentially be incorporated in the protein lick block for diworming rams and other ruminants. Feeding protein lick block fortified with minerals can effectively control specific minerals deficiencies in small and large ruminants.

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