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EFFECT OF FEEDING ENSILED GROUNDNUT (*Arachis hypogaea*) SHELL WITH YEAST (*Saccharomyces cerevisiae)* AND MOLASSES ON PERFORMANCE AND NUTRIENT DIGESTIBILITY OF YANKASA RAMS

[1]Adam, I. G., [2]Aruwayo, A. and [2]Garba M. G.

[1]Department of Animal Science, Faculty of Agriculture, Federal University of Agriculture, Zuru, Kebbi state

[2]Department of Animal Science, Faculty of Agriculture, Federal University Dutsin-Ma, Dutsin-Ma, Post Code 821221, Katsina State

*Corresponding author's e-mail address: aaruwayo@fududtsinma.edu.ng

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Abstract

This study investigated the effect of ensiled groundnut (*Arachis hypogaea***)** shell with fungi (*Saccharomyces cerevisiae*) and molasses on growth performance, nutrient digestibility and nitrogen utilization of twenty (20) Yankasa rams at Prof. Abdu Lawal Saulawa Livestock Teaching and Research Farm, Department of Animal Science, Federal University Dutsin-Ma, Katsina State. The experimental diets T1, T2, T3, and T4 contained Yeast (*Saccharomyces cerevisiae)* and Molasses ensiled groundnut shell (EGNS) at 0%, 5%, 10 and 15%. The EGNS was prepared by mixing 60g of *Sacchromyces cerevece* (Yeast) and 100ml of molasses with a kg of groundnut shell and dissolved 1000ml of water and then ensiled for a period of three (3) weeks. The animals were purchased from Dutsin-Ma market and quarantined for two (2) weeks during which they were given prophylactic treatment against infection and also treated against ecto and endoparasites. They were balanced for weight at the beginning of the study and then randomly allotted into four (4) dietary treatments. in a Completely Randomized Design (CRD). The experiment lasted for 84days, data collected during the experiment to evaluate the feed consumed, weight gain, feed efficiency, nutrient digestibility, nitrogen utilization and cost per liveweight gain. Data obtained were analyzed using SPSS Version 20 and means of the treatments were separated using Duncan multiple range test. Results showed significant variations (P<0.05) in all the parameters but T4 performed better than other ones. Based on the outcome of the study, *Sacchromyces cerevecea* ensiled groundnut shell inclusion level of 15% is recommended in the diets of sheep.

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INTRODUCTION

In Nigeria, livestock especially ruminant animals suffer from serious shortage of feeds and feeding stuffs, particularly during the long dry season, where the quantities available are limited, the quality of roughages is poor and nutrients are not enough to cover maintenance and productive requirements of animal species including sheep. Aruwayo *et al.* (2025) reported feed shortages, poor quality of available feed, slow feed digestibility, and inconsistent weight gain, all of which are exacerbated by seasonal feed imbalances. The situation is further aggravated by scarcity of feed, overgrazing of the available feed ingredient, farmers-herder's conflict and banditry activities. This reduction of feeding cost necessitated the search for non-conventional sources of feed for ruminant. Shortage of feeds and feeding stuff has also been recognized as one of the major challenges of improved animal production (Aruwayo *et al.,* 2016).

Roughages from crop residues and waste from processing of crops constitute a major source of feed during the periods of feed shortage. They are abundant and relatively cheap but with poor digestibility and nutrient utilization. There have been efforts to improve the utilization and nutrient composition of these roughages. Aruwayo and Muhammad (2018) reported that roughages with poor digestibility and utilization can be improved with treatments as shown in urea treatment of rice milling waste. Yeast supplementation in diets of ruminants is one option to increase utilization of poor-quality roughages, grains and by-product-based diets (Shriver-Munsch, 2011). Previous researchers (Moallem *et al.,* 2009) outlined some benefits of live yeast supplementation as increase in milk yield, milk protein, fibre digestion and stabilization of rumen pH in dairy cattle. Mosoni *et al.* (2007) also reported that live yeast addition may balance rumen ecosystem and increase cellulolytic bacteria numbers in cattle and sheep respectively. The study examined effect of ensiled groundnut (*Arachis hypogaea*) shell with fungi (*Saccharomyces cerevisiae*) and molasses on growth performance of Yankasa rams.

MATERIALS AND METHODS

Experimental Site

The venue of the research was Prof. Lawal Abdu Saulawa Livestock Teaching and Research Farm, Department of Animal Science, Federal University Dutsin-Ma, Katsina State which is sited within the latitude 2˚97 and longitude 17˚27 with an elevation of 600 meters above sea level with 700mm annual rainfall and falls within the Sudan savannah ecological zone (Garba *et al.,* 2024).

Preparation of Test Ingredient and Diets

Groundnut shell was acquired from Dawanau groundnut threshing center. The foreign materials (stones, irons, plastic and polyethene) were removed. The groundnut shells were milled separately through 8mm mash in a hammer mill. The milled groundnut shells were ensiled by treating the shells with *Saccharomyces cerevisiea* and molasses at a rate of 20, 40 and 60g of *Saccharomyces cerevisiae* /kg and 100ml of molasses/kg and then dissolved in 1000mls of water/kg, thoroughly mixed, filled and compressed in plastic tank. The content was compacted as fast as possible to expel trapped air from the ensilage and kept in that state for 21 days. Masking tape was used for further sealing the tank. At the expiration of the ensiling period, the fermentation tank was opened and the topmost 5cm material was scooped off to avoid contamination with partially ensiled materials. These ensiled materials were dried for two (2) weeks and then constituted the test ingredients used in the research at graded levels of 0, 5%, 10% and 15% as treatments 1, 2, 3 and 4 respectively. Other ingredients are maize offal, cotton seed cake, groundnut hay, groundnut shell, wheat meal, bone meal and salt. The gross composition is shown in Table 1.

Table 1: Ingredient Composition of the Experimental diets

Ingredient %	Treatments			
	T1	T2	T3	T4
Maize offal	45.00	42.5	37.50	33.75
Cotton seed cake	25.00	23.75	22.50	21.25
Groundnut hay	2.00	2.00	2.00	2.00
Groundnut shell	0	5.00	10.00	15.00
Wheat meal	25.00	25.00	25.00	25.00
Bone meal	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00
Total	100	100	100	100

Experimental Animal and Treatment

Twenty (20) Yankasa rams were utilized in the study. They were procured from local markets in Dutsin-Ma and were in good condition of health. The animals were quarantined for two (2) weeks prior to the starting of the investigation during which prophylactic treatment was given with the use of broad-spectrum antibiotics and albendazole against the possible infection and parasitic infestation. They were fed *ad libitum* with groundnut hay, wheat offal, cotton seed cake, salt and bone meal in a mixture. Sufficient water was offered to them.

Experimental Design and Management

Yankasa rams that summed up to twenty (20) and obviously wholesome were used for the experiment. They were balanced for weight and then apportioned randomly to the four (4) dietary treatments in a Completely Randomized

Design (CRD). Each treatment contained five (5) animals and each one constituted a replicate. They were accommodated individually in pens with dimension of 2m x 1m. They were fed the experimental diets for 84 days. The feed was increased when the feed served is completely consumed. They were given sufficient water.

Determination of ensiled proximate composition and crude fibre fraction

A sub samples of the treatments diets and the test ingredient were taken, and oven dried at 60ºC for 48 hours for dry matter determination. The proximate composition comprising of dry matter, crude fiber, crude protein, ash, ether extract and nitrogen free extract was determined by AOAC (2000) while the crude fibre fraction were done by the method of Van Soest (1994).

Growth Performance parameters

The experimental animals were fed the experimental diets *ad libitum* twice in a day, morning, and afternoon to avoid waste. The leftover was measured the following morning by 7am before being fed. The feed intake was measurement by subtracting feed left over from feed given the proceeding day.

The weight was measured by deducting the final weight from the initial weight. The initial weight was obtained by weighing the animals at the beginning of the study while the final weight was taken at termination of the 84 days growth trial.

Weight gain (kg) = Final Weight- Initial Weight

Feed Intake = Feed given to the animal - left over

$$\text{Feed efficiency} = \frac{\text{Weight gain}}{\text{Feed intake}}$$

Statistical Analysis

The data obtained were analysed using analysis of variance (ANOVA) in a Completely Randomized Design (CRD) according to Steel and Torrie (1980). Significant variations between treatment means were separated using Duncan Multiple Range Test (DMRT) (Duncan, 1955). SPSS was utilized to run the statistical data analysis.

RESULTS AND DISCUSSION

Chemical Composition of the Experimental Diets and Test Ingredients

The chemical composition of the test ingredient and the experimental diets used in the study are shown in Tables 2.

Table 2: Chemical Composition of the Experimental Diets and Test Ingredient

Parameters	Treatments				
	T1(0%)	T2 (5%)	T3(10%)	T4 (15%)	EGNS
DM (%)	90.20	90.36	91.1	90.41	93.08
CP (%)	16.88	16.95	17.18	17.50	1.00
CF (%)	11.52	11.48	12.25	11.36	49.45
EE (%)	3.56	2.98	2.87	2.88	0.40
ASH (%)	5.36	5.40	4.89	4.95	2.46
NFE (%)	63.73	63.19	62.81	63.31	46.69
LIG (%)	17.90	16.80	17.80	17.68	28.00
ADF (%)	29.84	28.81	28.42	29.44	27.31
NDF (%)	52.26	54.39	53.78	52.88	44.69

DM= Dry Matter, CP = Crude Protein, EE = Ether Extract, NFE=Nitrogen Free Extract, LIG = Lignin, ADF = Aid Detergent Fibre, NDF=Nitrogen Free Extract

The results show that both the ensiled (EGNS) and groundnut shell had high dry matter (DM) content with a range of 90.2 to 90.41%. For crude fibre, treatments T3 and T4 also had higher crude protein content of 17.18% and 17.50% respectively. Ether extract and ash values were higher in treatment T1 which is un-ensiled. Nitrogen free extract ranged from 62.81 to 63.73%. Nitrogen free extract, acid detergent fibre and ligin values ranged from 52.26 to 54.39%, 28.42 to 29.44% and 16.80 to 17.90% respectively. The proximate composition and the acid fibre fraction obtained in this study showed that the nutrient requirements of the Uda sheep were fulfilled. The dry matter content of the experimental diet is adequate for a male sheep, although it is lower than the 93.05 to 96.01% reported by Aruwayo *et al*. (2022) and Aruwayo *et al.* (2024). The crude protein was within the 15 to 18% recommended for a growing sheep (ARC, 1990) and Aruwayo *et al*. (2024) report of and was therefore adequate for their nutritional requirement. High CP could increase voluntary feed intake as reported by Chriyaa *et al*. (1997).

Table 3: Growth performance of Yankasa rams fed the experimental diet

Parameters	Treatments				
	T1 (0%)	T2(5%)	T3 (10%)	T4(15%)	SEM
IWT (kg)	43.59	43.95	43.98	43.29	1.40
FW (kg)	50.36	50.35	49.06	52.45	4.02
DFI (g)	890.870^{a}	881.02^{b}	890.35^{a}	884.71^{ab}	1.59
TWG (kg)	7.77^{ab}	6.40^{b}	5.08^{ab}	9.16^{a}	1.19
DWG (g)	92.50^{b}	76.19^{c}	60.47^{d}	119.62^{a}	7.55
FE	0.10^{b}	0.09^{b}	0.07^{b}	0.14^{a}	0.01
CF/KG	255.15	262.75	269.69	277.04	-
CFC (N/kg)	21155.82^{d}	21472.47^{c}	22083.82^{b}	22771.61^{a}	187.99
CFLWG	3009.33	2726.33	2882.33	1919.40	310.89

abc= means within the same row with superscripts differ significantly (p<0.05)
IWT = Initial weight, FW= Final weight, DFI= Daily feed intake, TWG = Total weight gain, DWG =Daily weight gain, FE = Feed efficiency, CFC = Cost of consumed, CFLWG = Cost of feed per live weight gain, CF/KG = Cost of feed per KG, SEM=Standar Error of Mean

Growth Performance of the Experimental Animals

Table 3 indicates the growth performance of the experimental animals fed Yeast (Saccharomyces cerevisiae) and molasses ensiled groundnut shell.

The initial weight of the Yankasa rams used in the experiment were not significantly different (P>0.05) across treatments. Final weight varied numerically with T4 having the highest (52.45kg) and T3 the lowest (49.06kg). T1 and T3 have the highest dry matter feed intake values of 890.87g and 890.35g respectively and were statistically similar (P>0.05). T2 has a lower intake (881.02g) and were significantly different (P0>0.05) from T1 and T3. The TWG is highest in T4 (9.16kg) and lowest in T3 (5.08kg). Treatments T1, T3, and T4 did not differ significantly (p<0.05) but T2 is significantly different (P<0.05) from T4 that shows the highest daily weight gain (119.620g), followed by T3, T2, and then T1. These values suggest that T4 treatment may enhance daily weight gain more effectively. T4 has the significantly higher feed efficiency (0.14) which might indicate that this treatment better in feed efficiency while other treatments did not show any significant differences (P>0.05). T4 had significantly higher cost of feed consumed (N22771.610) while T1 has the lowest (N21155.820). Cost of feed consumed per kilogram liveweight gain showed highest cost (N3009.333) and T4 the lowest (N1919.403). Numerical lower CFLWG in T4 indicates it may be more economical. Final weight differences are more pronounced, with T4 yielding the highest final weight and T2 the lowest. This suggests that the specific treatment in T4 (groundnut shell with *Saccharomyces cerevisiae* and molasses) had a more substantial positive effect on growth, supporting that T4 is the most effective at improving final body weight in Yankasa rams. DFI measures how much feed each group consumed daily. T1 and T3 have higher DFI values than T2, suggesting that the rams on these treatments consumed more feed on average. The labels indicate that T1 and T3 are statistically similar in DFI, while T2 differs significantly, potentially consuming less due to the composition of its feed. This could imply that the feed composition in T1 and T3 was more palatable or nutritious, encouraging greater intake. The highest TWG in T4, followed by T1 and T3, suggests that the combination of fortified groundnut shell, *Saccharomyces cerevisiae*, and molasses in T4 effectively supports substantial weight gain.

The daily weight gain metric aligns with the TWG findings, showing that T4 yields the highest DWG. This consistency confirms that the T4 treatment is efficient at promoting regular, sustained weight gain on a daily basis. This is in accordance with the report of Millam *et al*. (2016) and Kade (2020) who reported higher daily weight gain when treated groundnut shell was fed to ram lamb. Aruwayo *et al.* (2024) also reported similar trend in Sokoto red goats fed treated groundnut shell. The higher DWG in T4 highlights the effectiveness of *Saccharomyces cerevisiae* and molasses in improving utilization treated groundnut shell through enhanced digestive efficiency and nutrient absorption. This is in consonance with the investigation report by Musa *et al*. (2024) when *Saccharomyces cerevisiae* treated groundnut haulm was fed to small ruminants.

Feed efficiency is a key metric of how well the rams convert feed into body weight. T4 demonstrates the highest FE, indicating that it allows rams to utilize the feed more effectively for growth. This could be an indication better optimized nutrient profile or better digestibility in T4 that might have resulted from improved hydrolysis of the cell wall content. Aruwayo *et al.* (2024) asserted that treatment of groundnut shell improved feed utilization and ultimately, feed efficiency as a result improved hydrolysis of the cell wall.

Cost of feed per liveweight gain (CFCLW) examines the cost-efficiency of each treatment in terms of total feed cost per live weight gained. The lower CFCLW in T4 suggests that although it was costlier in terms of feed consumed, this was justified by the significant gains in body weight. This might be appealing for producers focusing on minimizing feed costs. CFLWG provides a clearer view of the cost relative to the actual weight gained. Here, T4 shows the lowest value, suggesting it is the most economical option in terms of feed cost per unit of weight gain. This result highlights T4 as the most effective and economically viable treatment option for improving growth at the lowest per-unit cost of gain. The fortified groundnut shell with *Saccharomyces cerevisiae* and molasses in T4 appears to be the most effective treatment which have resulted from better feed efficiency and growth in the experimental animals. For producers, T4 offers a more viable option for maximizing growth performance in Yankasa rams, potentially offsetting the higher initial feed cost with more efficient and economically beneficial gains. This analysis helps underscore the value of nutritional supplementation with yeast and molasses to enhance growth performance and feed efficiency in small ruminant production systems.

Nutrient Digestibility of the Experimental Animal

Table 4 indicates the nutrient digestibility of the experimental animals fed Yeast (Saccharomyces cerevisiae) and molasses ensiled groundnut shell

Table 4: Nutrient digestibility by the Yankasa rams fed the experimental diets

Parameters	Treatments				
	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	SEM
DM (%)	79.370[a]	77.620[b]	79.580[a]	78.530[a]	0.300
CP (%)	83.885[d]	84.835[c]	86.525[b]	89.685[a]	0.836
CF (%)	86.680[d]	87.685[c]	89.430[b]	91.255[a]	0.667
EE (%)	85.600[c]	86.420[c]	91.420[b]	93.490[a]	1.256
NFE (%)	71.240[d]	72.890[c]	74.630[b]	79.520[a]	1.172
LIG (%)	80.390[d]	83.285[c]	85.390[b]	89.665[a]	1.279
ADF (%)	74.240[d]	77.390[c]	78.440[b]	79.450[a]	0.742
NDF (%)	73.100[d]	76.640[c]	78.570[b]	79.530[a]	0.933

DM= Dry Matter, CP = Crude Protein, EE = Ether Extract, NFE=Nitrogen Free Extract, LIG = Lignin, ADF = Aid Detergent Fibre, NDF=Nitrogen Free Extract

Dry Matter (DM) digestibility of T1 and T3 (79.37% and 79.580%) showed significantly higher (P<0.05) values, followed by T4 and then T2 (77.62%) having the lowest digestibility. Crude Protein (CP) digestibility increased with increasing level of the test ingredient, with T4 showing significantly higher (P<0.05) value. This suggests that the combination of groundnut shell with *Saccharomyces cerevisiae* and molasses in T4 may enhance crude protein digestibility, possibly due to the improved breakdown of proteins and nitrogen utilization. Crude Fiber (CF) digestibility follow the same trend as that of crude protein digestibility. Higher fiber digestibility indicates that *Saccharomyces cerevisiae* and molasses might be aiding in fiber breakdown, likely by enhancing microbial fermentation in the rumen. Ether Extract (EE) digestibility was significantly higher (P<0.05) in T4 (93.490%), followed by T3, indicating an improved ability to utilize fats from the feed. This could be beneficial for energy supply in Yankasa rams, as a higher digestibility of ether extract translates to better energy absorption. The nitrogen-free extract, which represents digestible carbohydrates, increases progressively with each treatment. The highest value in T4 suggests that the fortified diet may enhance carbohydrate utilization, potentially supporting growth and energy metabolism.

These ingredients can enhance the rumen environment, making nutrients more accessible and digestible. Research has shown that *Saccharomyces cerevisiae* supplementation enhances DM digestibility in ruminants by optimizing rumen pH and promoting beneficial microbial populations, which in turn improves fiber breakdown (Elghandour *et al.,* 2022). Molasses, rich in readily fermentable sugars, supports microbial activity, further aiding DM digestibility (Yang *et al*., 2023). The significantly higher CP digestibility in T4 indicates that the fortified diet enhances nitrogen retention and protein utilization. Improved CP digestibility translates to better growth performance and muscle development in rams. Bach *et al*. (2023) reported that yeast cultures in ruminant diets enhance CP digestibility by promoting the growth of cellulolytic and proteolytic bacteria, which contribute to effective nitrogen utilization in the rumen. It was further documented by Zhang *et al*. (2023) that molasses as an energy source has been shown to complement protein metabolism, leading to higher CP digestibility. The increased CF digestibility, particularly in T4, suggests that the diet supports fiber degradation, which is crucial for ruminants that rely on fibrous feed sources. Improved fiber digestibility supports energy intake and nutrient absorption. Research highlights that *Saccharomyces cerevisiae* aids in fiber breakdown by increasing fibrolytic microbial populations, allowing ruminants to utilize fiber more effectively (Mao *et al.,* 2021). Molasses further enhances fiber digestion by boosting microbial energy supply, supporting effective fermentation (Gado *et al*., 2022).

Higher EE digestibility in T4 indicates that the ensiled diet enhances fat utilization. Improved fat digestibility is advantageous as it increases energy density in the diet, beneficial for animals requiring higher energy for growth and metabolism. The presence of yeast in ruminant diets has been linked to improved EE digestibility, attributed to its ability to stabilize rumen fermentation and enhance microbial efficiency (Zhou *et al*., 2023). Molasses has also been shown to support fat digestion by providing an energy source that complements microbial activity in the rumen (Abdel-Rahman *et al*., 2023).

Higher NFE digestibility in T4 suggests enhanced carbohydrate utilization, an essential factor for providing energy to ruminants. This is likely due to the availability of fermentable sugars in molasses which enhances microbial fermentation. Molasses a rich source of NFE, boosts carbohydrate digestion by promoting microbial efficiency in the rumen. Combined with yeast, it supports sustained fermentation, leading to improved energy availability from NFE (Chen *et al*., 2023). Molasses, by enhancing the energy supply, further complements this effect, aiding in more effective fermentation of fibrous components (Huang *et al*., 2023).

The digestibility of the cell contents digestibility recorded better values in T4. This is beneficial because the higher the digestibility of these parameters, the better for the animals. Yeast and molasses combination might have enhanced the breakdown of lignin, which could be advantageous for overall fiber digestion as well as NDF and ADF. Higher lignin digestibility in T4 indicates that the ensiled diet supports the breakdown of complex fibers, which are usually resistant to digestion. This result suggests that yeast and molasses may promote microbial species that can partially degrade lignin, improving feed efficiency. Studies have shown that yeast and molasses increase the digestibility of complex plant fibers by enhancing rumen microbial diversity, which can modify the breakdown of lignin and other complex fibers (Tang *et al*., 2022). The higher ADF and NDF digestibility in T4 suggests that the ensiled diet aids in breaking down cellulose and hemicellulose, key components of fiber that contribute to energy release. The report of Li *et al*. (2022) revealed that yeast supplementation improves ADF and NDF digestibility by promoting fibrolytic bacteria that facilitate fiber breakdown.

Nitrogen Utilization of Yankasa rams fed the Experimental diets

Table 5 indicates the nitrogen Utilization of Yankasa rams fed the Experimental diets

Table 5: Nitrogen Utilization of Yankasa rams fed the Experimental diets

Parameters	Treatments				
	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	SEM
NITK (g)	26.56[bc]	26.25[c]	26.81[b]	27.33[a]	0.15
NIF (g)	2.76[c]	3.35[a]	2.57[bc]	2.99[b]	0.08
NIU (g)	0.93[b]	0.90[b]	0.96[a]	0.98[a]	0.12
NA (g)	23.80[b]	22.90[c]	23.61[b]	24.34[a]	0.20
NB (g)	22.87[b]	22.00[c]	22.65[b]	23.36[a]	0.18
NRT (%)	86.22[b]	87.15[a]	84.69[c]	86.10[b]	0.33

NITK=Nitrogen Intake, NIU=Nitrogen in urine, NIF= Nitrogen in feed, NA=Nitrogen Absorbed, NB=Nitrogen Balance, NRT=Nitrogen Retained

Treatment T4 had the highest nitrogen intake, followed by T3, T1, and T2. This suggests that the addition of *Saccharomyces cerevisiae* and molasses in T4 enhanced feed intake and nitrogen availability. The differences among treatments are statistically significant, indicating the effectiveness of the ensiled diet in increasing nitrogen consumption. Higher nitrogen intake correlates with improved protein availability, supporting growth and production in ruminants. T2 recorded the highest nitrogen excretion through urine, followed by T4, T3, and T1. This may suggest less efficient nitrogen utilization in T2, as more nitrogen is being excreted rather than retained. Lower nitrogen losses through urine are desirable for reducing environmental nitrogen emissions and improving nitrogen retention for growth. and T3 showed higher nitrogen excretion in feces compared to T1 and T4. This may indicate incomplete digestion or absorption of dietary nitrogen in T2 and T3. T4 demonstrated lower fecal nitrogen loss, reflecting improved nitrogen absorption due to the ensiled diet. Lower nitrogen in feces suggests better nutrient absorption and utilization. T4 showed the highest nitrogen absorption, followed by T1 and T3, with T2 being the lowest. This indicates that T4's diet is more effective in supporting nitrogen digestion and absorption in Yankasa rams. The differences are statistically significant. Higher nitrogen absorption supports better protein synthesis, growth, and maintenance. T4 demonstrated the highest nitrogen balance, while T2 showed the lowest. A positive nitrogen balance, as seen across all treatments, indicates that nitrogen intake exceeds nitrogen excretion, which is essential for growth and tissue repair. Higher nitrogen balance in T4 reflects improved protein retention and utilization. T2 had the highest nitrogen retention percentage, closely followed by T4 and T1. T3 recorded the lowest nitrogen retention, suggesting slightly less efficient nitrogen utilization in this group. Despite the variations, all treatments exhibit high retention rates, which indicate efficient use of dietary nitrogen. High nitrogen retention is crucial for maximizing growth and production, with T4 showing an optimal balance between intake and retention. The results indicate that ensiled groundnut shell diets with *Saccharomyces cerevisiae* and molasses positively influence nitrogen utilization in Yankasa rams, with T4 consistently demonstrating superior performance across parameters. The improvements can be attributed to the synergistic effects of yeast and molasses on rumen function. Yeast cultures provide a stable rumen environment by buffering pH and promoting beneficial microbial populations, which improves nitrogen utilization efficiency (Elghandour *et al*., 2022). Molasses, as a source of readily fermentable carbohydrates, supplies energy for microbes, enhancing the conversion of dietary nitrogen into microbial protein (Yang *et al.*, 2023). Lower fecal and urinary nitrogen losses in T4 suggest efficient nutrient absorption and reduced wastage, consistent with findings by Gado *et al*. (2022). These findings align with research emphasizing the role of yeast and molasses in improving nitrogen metabolism and retention in ruminants. The high nitrogen retention and positive nitrogen balance observed in T4 reflect an optimized diet that supports growth and production.

CONCLUSION

The results of the research revealed that diets with ensiled groundnut shell with *Sacchromyces cerevecea* and molasses inclusion performed better than the control.

Inclusion level of 15% of the test ingredient was better in digestibility, nitrogen utilization, feed efficiency, total weight gain and cost per live weight gain. Therefore, ensiling groundnut shell with *Sacchromyces cerevecea* and molasses up to 15% is recommended. Further, research on the use of the test ingredient is recommended.

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