ECONOMIC IMPACT OF FEEDING YANKASA RAMS WITH UREA-TREATED SUGARCANE BAGASSE SUPPLEMENTED WITH YEAST AND ENZYME

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ABSTRACT
An experiment was carried out to determine the economic benefits of feeding Yankasa rams with treated sugarcane bagasse supplemented with yeast and enzyme. Twenty-four (24) Yankasa rams with mean body live weight 18±0.2 kg were used for the study. The rams were allotted to treatments in a 2×3 factorial arrangement in a completely randomized design to evaluate the effect of inclusion levels of enzyme (2, 4 and 6g/kg) in treated bagasse with or without yeast at 5g/kg of diet inclusions levels for 90 days. Data collected were analyzed using the general linear model procedure of SAS and significant differences were compared using Duncan Multiple Range Test. The result indicated that there was a significant (P<0.05) difference total weight gain and average daily gain. Total feed intake was increased by 16% in rams fed TMR without yeast and 2g inclusion level of enzyme compared to those fed TMR with yeast and 6g inclusion level of enzyme. Rams fed TMR without yeast and 6g/kg inclusion level of enzyme had highest cost/kg gain (₦491.88) while rams fed TMR with yeast and 4g/kg inclusion level had the least cost/kg gain (₦418.82). The value of gain decreases with increase in inclusion level of enzyme in TMR with yeast. However, income incurred over cost was increased by 35% in rams TMR with yeast and 4g/kg inclusion level of enzyme. Rams fed TMR with yeast and 4g/kg inclusion level of enzyme had higher income (₦1523.4) while least income incurred (₦1210.2, ₦1164.3 and ₦986.0) was recorded in rams fed TMR without yeast and 2, 4 and 6g/kg respectively. Therefore, it was concluded that 4g/kg inclusion level of enzyme with yeast had higher net benefits and farmers should include enzyme at 4g/kg with yeast for better economic returns.
Keywords: Enzyme, Yeast, Yankasa Rams, Economics

INTRODUCTION

Feed additives are important components used in improving nutritional quality of feed which is influenced not only by nutrient content but also by other aspects such as hygiene, digestibility, palatability and pH stabilization (Yirga, 2015). These additives comprise of probiotics, antibiotics and exogenous enzymes. Probiotics are live microorganisms that when administered in adequate amounts confer benefits to the host. They have also been reported to influence the production of livestock animals in terms of digestibility, growth rate, pH, and efficiency (Rahman *et al*., 2013; Mookiah *et al*., 2014). *Saccharomyces cerevisiae* is one of the commonest probiotics used in ruminant diets and known to improve productivity, better nutrient digestion and prevent acidosis (FAO, 2016). The efficiency of energy and protein utilization in the rumen is relatively low and can be improved by the modulation of several metabolic pathways, including the inhibition of methane production and deamination. This low efficiency not only reduces production performance, but also contributes to the release of pollutants to the environment (Tamminga, 1996). Therefore, with this regard and the ban on the use of antibiotics in the diets of animals, this study aims to investigate the use of treated sugarcane bagasse supplemented with yeast and enzyme to evaluate the net economic returns in feeding Yankasa Rams.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University Zaria, located on latitude 11° 11' N and longitude 07° 38' E. (Wikipedia, 2018).

Source of bagasse and treatment

Sugarcane bagasse was sourced from sugarcane juice producer in Makarfi Local Government Area of Kaduna State. The bagasse was sun dried for three days and ground into smaller particle sizes of

approximately 5mm and then treated with urea at 5% (50g of urea was dissolved in one litre of water to treat one kg of bagasse). The treated bagasse was then packed in a Pardue Improved Cowpea Storage (PICS) bags for two weeks, after which it was opened and aerated before inclusion in the TMR.

Experimental design and diets

Twenty-four (24) growing Yankasa rams with an average live weight of 18kg were used for the experiment. The rams were allotted to treatments in a 2×3 factorial arrangements in a completely randomized design, to compare the effect of urea treated bagasse without yeast and urea treated bagasse with yeast at 5g/kg inclusion level with different levels of enzyme supplementation on economic benefits of growing Yankasa rams. A commercial cocktail enzyme (Fullzyme®) was used and included at the rate of 2, 4 and 6g/kg. Other feed ingredients include maize offal, cotton seed cake, molasses, bone meal, salt and mineral premix. Four rams were assigned per treatment. The trial lasted for 90 days.

Table 1: Gross composition of experiment II Diets

	WY			TY		
Parameters (%)	2	4	6	2	4	6
Maize offal	34.2	34.2	34.2	34.2	34.2	34.2
Rice offal	10	10	10	10	10	10
Cotton seed cake	17.5	17.5	17.5	17.5	17.5	17.5
Urea treated bagasse	30	30	30	30	30	30
Molasses	5	5	5	5	5	5
Bone meal	2	2	2	2	2	2
Common salt	1	1	1	1	1	1
Mineral Premix	0.27	0.27	0.27	0.27	0.27	0.27
Total	100 (99.97%)	100 (99.97%)	100 (99.97%)	100 (99.97%)	100 (99.97%)	100 (99.97%)
Calculated CP	12	12	12	12	12	12
Calculated CF	18.7	18.7	18.7	18.7	18.7	18.7
M.E Kcal/Kg	2299	2299	2299	2299	2299	2299

M.E=Metabolizable energy, CP=crude protein, CF=crude fibre, WY=Treated without yeast, TY=Treated with yeast

Note: The yeast and enzyme supplementation is not part of the formulated diet

Economic analysis

The current market price of the various feed ingredients was used to compute the total cost of feed that was consumed during the feeding trial. Cost of feed per kilogram, feed cost per kilogram weight gain, total weight gain, and cost of live weight of rams were used to determine how profitable or otherwise it was to feed Yankasa rams with urea treated bagasse supplemented with yeast and enzyme at various inclusion levels using the method described by Anigbogu (2003).

Cost of total feed consumed = Total feed intake x Cost per kg of feed.

Cost/kg weight gain = Cost per kg of feed x Efficiency of feed utilization

Cost of production = Cost of inputs (Cost of feed consumed + Cost of rams)

Gross profit = Price/kg ram x Final weight of ram.

Profit (Net income incurred) = Gross profit - Cost of production.

Statistical analysis

All data collected at the end of the experiment were analysed using GLM procedure of statistical Analysis (SAS, 2002). Significant differences in treatment means were compared using DMRT (Duncan 1955). The following model was used

$Y_{ijk} = \mu + T_i + E_j + (T \times E)_{ij} + e_{ijk}$

Where

Y_{ijk} = Observation measured,

μ= Overall mean,

T_i= Treated without or with yeast supplementation (0, 5g)

E_j=Inclusion levels of enzyme (2g, 4g and 6g)
$(T \times E)_{ij}$=Interaction between yeast and enzyme supplementation
e_{ijk}= Random error.

RESULTS AND DISCUSSION

Table 2: Main effect of yeast supplementation in urea treated bagasse based TMR on cost benefits

Parameters	WY	TY	SEM
Total weight gain (kg)	3.9[b]	4.59[a]	0.22
Average daily gain (g)	43.33[b]	51.01[a]	0.25
Total feed intake (kg)	53.85	50.55	2.89
Total cost of feed (₦)	1802.4	1991.4	99.09
Cost/kg gain (₦)	462.15	433.85	26.83
Value of gain (₦)	2925.0	3442.5	171.89
Income over cost (₦)	1122.6	1451.1	163.02

Table 2 presents the effect of yeast supplementation in urea treated bagasse based TMR on cost benefit by Yankasa rams. A significant (P<0.05) difference was observed in total weight gain and average daily gain. Rams fed TMR with yeast supplementation had a 9.4% increase in total cost of feed consumed compared to those fed TMR without yeast. However, cost/kg gain was decreased by 7% in rams fed TMR with yeast supplementation. Rams fed treated bagasse with yeast supplementation had lower cos/kg gain (₦433.85) compared to rams fed TMR without yeast supplementation (₦462.15). Value of gain and income incurred over cost were increased with yeast supplementation. Rams fed TMR with yeast had higher value of gain (₦3442.5) and income incurred over cost (₦1451.1) while rams fed TMR without yeast had lower value of gain (₦2925.0) and income incurred over cost of production (₦1122.6). The significant difference observed in total weight gain and average daily gain at the end of the study could be attributed to the addition of yeast in bagasse based TMR. Cost/kg gain, value of gain, and income incurred over cost of feed at the end of this study in rams fed TMR with yeast were less compared to those fed without yeast. This has proven that addition of yeast in the diets of Yankasa rams is more viable economically for fattening Yankasa rams as evident can be seen in higher weight gain obtained in rams in the same treatment.

Table 3: Main effect of inclusion level of enzyme in urea treated bagasse based TMR on cost benefit

Parameters	2	4	6	SEM
Total weight gain (kg)	4.32	4.17	4.23	0.28
Average daily gain (g)	48.05	46.38	47.08	3.09
Total feed intake (kg)	54.97	49.05	52.57	3.54
Total cost of feed (₦)	1928.4	1787.4	1974.8	121.3
Cost/kg gain (₦)	446.38	428.63	466.85	32.86
Value of gain (₦)	3240.0	3127.50	3172.5	210.5
Income over cost (₦)	1311.6	1340	1197.7	199.6

Table 3 showed the cost benefit of inclusion levels of enzyme in bagasse based TMR. The result showed that total cost of feeding rams indicated a non-linear response as the inclusion level of enzyme increased from 2g/kg to 6g/kg in the diet. Rams fed TMR with 6g/kg inclusion level of enzyme had the highest cost of feed (₦1974.8), and the least was recorded in rams fed TMR with 4g/kg inclusion level of enzyme (₦1787.4). The result further pointed out that the cost of feed per kg gain was least in rams fed diet containing 4g/kg of enzyme (₦428.63) than those fed diet containing 6g/kg inclusion level of enzyme (₦466.85). However, value of gain was higher in rams fed diet containing 2g/kg inclusion level of enzyme (₦3240.0) compared to rams fed TMR with 4g/kg inclusion level of enzyme (₦3127.5) while income incurred over cost was higher in rams 4g/kg inclusion level of enzyme (₦1340.0) compared to 6g/kg inclusion level of enzyme (₦1197.7). Increasing levels of enzyme in TMR had economic benefits as greater income was obtained in rams

fed TMR with 4g/kg compared to rams fed 6g/kg inclusion level. This could be attributed to higher weight gains that resulted from feeding the animals with enzyme which in turn translated to higher value gain leading to better income. Increase in income reported in this study agrees with the report of Mijinyawa *et al*. (2016) who reported an increase in net benefit by fattening Red Sokoto bucks fed TMR with or without enzyme.

Table 4: Interaction effect of yeast and inclusion levels of enzyme in urea treated bagasse based TMR on cost benefits

	WY			TY			
Parameters	**2**	**4**	**6**	**2**	**4**	**6**	**SEM**
TWG (kg)	4.12^{ab}	3.75^{b}	3.82^{ab}	4.65^{a}	4.60^{ab}	4.52^{ab}	0.39
ADG (g)	45.83^{ab}	46.66^{ab}	42.50^{b}	51.66^{a}	51.11^{a}	50.27^{a}	4.38
TFI (kg)	58.20	49.20	54.15	51.75	48.90	51.00	5.00
TCF (₦)	1879.80	1648.20	1879.00	1976.80	1926.60	2070.60	171.60
Cost/kg gain (₦)	456.26	439.52	491.88	425.11	418.82	458.09	46.48
Value of gain (₦)	3090.00	2812.50	2865.00	3487.50	3450.00	3390.00	297.70
Net Income (₦)	1210.20	1164.3	986.00	1510.70	1523.4	1319.4	282.30

TWG=Total weight gain, ADG=Average daily gain, TFI=Total feed intake, TFC=Total cost of feed SEM=Standard Error of Mean

The interaction effect of yeast and inclusion levels of enzyme in bagasse based TMR on cost benefit is presented in Table 4. The result indicated that there was a significant ($P<0.05$) difference total weight gain and average daily gain. Total feed intake was increased by 16% in rams fed TMR without yeast and 2g inclusion level of enzyme compared to those fed TMR with yeast and 6g inclusion level of enzyme. Rams fed TMR without yeast and 6g/kg inclusion level of enzyme had highest cost/kg gain (₦ 491.88) while rams fed TMR with yeast and 4g/kg inclusion level had the least cost/kg gain (₦ 418.82). The value of gain decreases with increase in inclusion level of enzyme in TMR with yeast. However, income incurred over cost was increased by 35% in rams TMR with yeast and 4g/kg inclusion level of enzyme. Rams fed TMR with yeast and 4g/kg inclusion level of enzyme had higher income (₦1523.4) followed by rams fed TMR with yeast and 2g/kg inclusion level (₦1510.70), while least income incurred (₦1210.2, ₦1164.3 and ₦986.0) was recorded in rams fed TMR without yeast and 2, 4 and 6g/kg respectively. The Significant difference obtained at the end of this study in total weight gain and average daily gain may be attributed to possible synergy between yeast and enzyme supplementation. value of gain, and income incurred suggests that supplementing diet with yeast and addition of enzyme (Fullzyme) at 2g/kg and 4g/kg will significantly increase weight gain and average daily gain which in turn will lead to higher value gain with higher net benefits and income. This is consistent with the findings of Mijinyawa *et al*. (2016) who reported an improved performance and increased cost benefit when the author fed urea treated sugarcane bagasse with or without enzyme to red Sokoto bucks.

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