Asian Research Journal of Agriculture

7(2): 1-5, 2017; Article no.ARJA.33116
ISSN: 2456-561X

Economics of Production of Weaner Rabbits Fed Diets Containing Fresh Water Snail (*Pila ampullacea*) Shell Ash

F. B. P. Abang[1*], E. Zoo[2] and T. Odunlade[1]

[1]Department of Animal Production, Federal University of Agriculture, Makurdi, Benue State, Nigeria.
[2]Department of Agriculture and Natural Resources, Gbajimba, Guma, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors FBPA and EZ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors EZ and TO managed the analyses of the study. Author FBPA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARJA/2017/33116
Editor(s):
(1) Sabri Gul, Professor, Depeartment of Animal Science, Mustafa Kemal University, Turkey.
Reviewers:
(1) Abdullahi M. Nuhu, Kaduna Polytechnic, Nigeria.
(2) V. Bhanu Rekha, Rajiv Gandhi College of Veterinary and Animal Sciences, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/22249

Original Research Article

Received 30th March 2017
Accepted 5th August 2017
Published 11th December 2017

ABSTRACT

This research was carried out using twenty five (25) mixed breed weaner rabbits to investigate the effect of replacing bone ash with fresh water snail (*Pila ampullaceal*) shell ash on the diet of weaner rabbits on the economics of production. Five experimental diets tagged T_1 to T_5 were formulated such that fresh water snail (*Pila ampullaceal*) shell ash replaced bone ash at 0%, 25%, 50%, 75% and 100% for treatments T_1 to T_5 respectively. The rabbits were randomly assigned to the five dietary treatments and replicated five times giving a total of one rabbit per replicate in a completely randomized design (CRD). The research showed that the diet affected the economics of production such that feeding dietary treatments resulted in positive profit per rabbit at 100% level of inclusion of the test ingredient. The cost of feed in gram of each treatment feed was lower in fresh water snail (*Pila ampullacea*) shell ash based diet than the control diet. This research has shown that fresh water snail (*Pila ampullacea*) shell ash can serve as a substitute for bone ash in weaner rabbits diet up to 100% positively affected the economics of production parameters.

**Corresponding author: E-mail: abang.favour@yahoo.com, abang.favour2@gmail.com;*

Keywords: Rabbits; fresh water snail (Pila ampullacea) bone ash; economic variables.

1. INTRODUCTION

The cost of feeding constitutes about 60-70% of the total cost of livestock production in Nigeria [1]. The high cost of production is largely due to the exorbitant prices and scarcity of conventional feed ingredients [2]. Therefore, in developing countries more important considerations would be to formulate cheap diets based on feedstuffs that are of little direct value as human food [3]. In an attempt to search for alternative sources of calcium feedstuffs, there is an urgent need to explore the potentials of non-conventional calcium sources that do not compete with human food consumption. One of such alternative feedstuff, which is not only cheap but also locally available, and does not attract competition in consumption between humans and livestock, is the fresh water snail (*Pila ampullacea*) shells.

The abundance of freshwater snails *(Pila ampullacea*) in River Benue and its tributaries has been studied by [4]. One of the most successful methods of catching is hand picking done as a community effort on regular basis.

Snail shell is a mineral ingredient that contains about 98% of calcium carbonate [5]. It is therefore a biological source of calcium that can be used in animal feeding. Investigations have been done on the use of many sources of calcium such as gypsum, limestone and oyster shell in layers and broilers diets [6], but there is a lack of information on the use of snail shells especially fresh water snail *(Pila ampullacea)* shells in animal feeds. This paper therefore seek to determine the cost effectiveness of fresh water snail *(Pila ampullacea)* shells in weaner rabbit diets as a non -conventional source of calcium and phosphorus.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted in the rabbitry unit at the Teaching and Research Farm, College of Animal Science University of Agriculture MakurdiBenue State. BenueState lies within the lower river Benue trough in the middle belt region of Nigeria. Its geographic coordinates are longitude 7° 47' and 10° 0' East. Latitude 6° 25' and 8° 8' North; and shares boundaries with five other states namely: Nasarawa State to the north, Taraba State to the east, Cross River State to the south, Enugu State to the south-west and Kogi State to the west. The state also shares a common boundary with the Republic of Cameroon on the south-east. Benue occupies a landmass of 34,059 square kilometers [7].

2.2 Source of Bone Ash

Bone ash was bought at God 4 us livestock consult, beside SRS junction, new bridge road, north bank Makurdi.

2.3 Sources and Processing of Freshwater Snail (*Pila ampullacea*) Shells

Freshwater snails are in abundance in River Benue and its tributaries. The test ingredient was sourced locally at Gbajimba and Iyeh in Guma Local Government Area and Makurdi metropolis, where the flesh is usually removed and the shells are thrown away by the consumers.

The shells were thoroughly washed, dried and burnt for about 1 hour until they became whitish in appearance; they were then crushed into fine powder as shell ash and used in the diet. The mineral composition of the shell was analyzed by the procedure of Association of Official Analytical Chemists [8].

2.4 Experimental Design

A Completely Randomized Design (CRD) was used for this experiment. A total of twenty five (25) weaned male rabbits of mixed breeds at five weeks of age with an initial average weight of between 664.00 – 667.00 g were obtained from Dagwom Farm, National Veterinary Research Institute (NVRI) Vom, Jos Plateau State for the research. The rabbits were allowed for a preliminary feeding period of seven days to enable them acclimatizeafter which they were randomly assigned to five (5) dietary treatments (T_1 to T_5). Each of the dietary treatments had five (5) rabbits with each rabbit serving as a replicate (R_1 to R_5).

2.5 Housing and Management of Experimental Animals

The rabbits were housed individually in the hutches and labeled according to the treatment and replicate assigned to them. The dimension of the hutches was 40cm × 30cm × 30cm (this was to enable it accommodate the feeders and drinkers). The initial weight of each rabbit was

taken before assigning them to one of the five dietary treatments. Prophylactic medication was given against any infection before the commencement of the experiment. Each rabbit was observed daily to ensure good health. A measured quantity of the treatment diet was served daily for each replicate and was provided *ad-libitum,* left over feed was weighed every week and the quantity consumed was determined by difference. Fresh clean water was also provided every morning. The experiment lasted for 12 weeks.

2.6 Experimental Diets

Five experimental diets were formulated tagged T_1 to T_5 respectively. T_1 served as a control diet. Fresh water snail (*Pila ampullacea*) shell ash replace bone ash at 0%, 25%, 50%, 75% and 100% respectively.T_1 containing 100% bone ash while T_5 contained 100% fresh water snail (*Pila ampullaceal)* shell ash. These were mixed with other ingredients as in the Table 1.

2.7 Economics of Production

The analysis of economics of production was done for the rabbits to evaluate the cost effectiveness and profitability of utilizing these feed resources. The parameters determined include Total fixed cost, cost of feed (₦/kg), cost per weaner, cost of feed/g weight gain (₦/g), feed cost saving/g meat (₦), Total cost, Selling Price per mature rabbit and profit per rabbit(₦).

Total fixed cost includes the cost of labour, equipment, transport and medications. Cost of feed (₦/kg) was obtained as the total cost of producing a kg of the feed. Total cost =Total variable cost + Total fixed cost. Selling price per rabbit was calculated as the prevailing market price of adult rabbit per kg by the average final weight (kg). Profit = Selling price per mature rabbit (₦) − Total cost.

2.8 Statistical Analysis

The data collected were subjected to one way Analysis of Variance (ANOVA) using Minitab statistical software version 14 [9]. The separation of means was effected using Duncan's Multiple Range Test (DMRT) as outline by Obi [10].

Table 1. Composition of experimental diets with fresh water snail *(Pila ampullacea)* shell ash as a replacement for bone ash (%)

Feedstuff	Experimental diets				
	0% (Pasa)	25% (Pasa)	50% (Pasa)	75% (Pasa)	100% (Pasa)
Maize	3 0 . 0 0	30.00	30.00	30.00	30.00
Full fat soybean	20.00	20.00	20.00	20.00	20.00
Groundnut cake	12.00	12.00	12.00	12.00	12.00
Maize offal	14.00	14.00	14.00	14.00	14.00
Rice offal	20.05	20.05	20.05	20.05	20.05
Bone ash	3.00	3.00	3.00	3.00	3.00
Pasa	0.00	0.75	1.50	2.25	3.00
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Table Salt	0.30	0.30	0.30	0.30	0.30
Vita/min. premix	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Analyzed nutrients:					
Dry Matter	96.05	95.97	96.39	96.00	96.10
Crude Protein	17.50	17.94	17.50	17.50	17.50
Calculated nutrient composition (%):					
Crude protein	16.86	16.86	16.86	16.86	16.86
Crude fibre	10.27	10.27	10.27	10.27	10.27
M.E(Kcal/kg)	2637.10	2637.10	2637.10	2637.10	2637.10
Methionine	0.57	0.57	0.57	0.57	0.57
Lysine	0.58	0.58	0.58	0.58	0.58
Calcium	1.21	1.22	1.26	1.29	1.34
Phosphorus	0.44	0.43	0.42	0.41	0.40

Note: Pasa = Pila ampullacea shell ash

3. RESULTS AND DISCUSSION

Economics of production variables of feeding dietary treatments offresh water snail *(Pila ampullacea)* shell ash are presented in Tables 2, 3 and 4. The cost of feed was significantly ($P<0.05$) higher in control diet (T_1) than in T_5. The cost per gram weight gain was least at 100% level of inclusion of fresh water snail *(Pila ampullacea)* shell ash leading to cost saving per gram of meat. The cost of feed intake per rabbit per week was lower in T_5 than the control (T_1). The profit per rabbit (₦881.70) at 100% level of fresh water snail *(Pila ampullacea)* shell ash was higher than the profit per rabbit at the control diet (₦879.90). The reduction observed in cost of feed is an indication that fresh water snail (*Pila ampullacea*) shell ash could be used to reduce the cost of rabbit feed. The profit of ₦1157.60 per rabbit is capable of dictating the success of any rabbit producer. This level of profit margin for using fresh water snail *(Pila ampullacea)* shell ash will likely result in increased production of rabbits thereby making rabbit meat available at affordable price which will invariably bridge animal protein deficiency gap prevalent in developing countries; especially Nigeria.

Table 2. Cost of feed intake for weaner rabbits (₦/Kg/g)

Treatment	Cost of feed ₦/Kg	Cost of feed ₦/g
0%	84.30	0.084
25%	83.55	0.084
50%	82.80	0.083
75%	82.02	0.082
100%	81.30	0.081

Table 3. Cost of feed intake/rabbit/week/treatment (₦/g)

Week	Treatments levels					∑X
	0%	25%	50%	75%	100%	
1	32.68	26.04	38.26	21.81	29.73	148.52
2	38.98	36.12	48.40	27.88	34.34	185.72
3	54.52	49.14	51.63	33.13	34.43	222.85
4	57.12	42.67	57.10	36.16	41.47	234.52
5	57.96	50.32	60.92	38.29	43.17	250.66
6	55.61	62.24	58.84	48.87	49.42	274.94
7	62.75	58.46	54.95	51.58	44.79	272.53
8	66.11	62.14	60.92	51.99	51.35	292.51
9	57.20	65.18	62.83	55.43	50.14	290.78
10	63.17	64.00	62.83	57.97	49.41	297.38
11	63.34	64.18	62.83	57.15	52.65	299.65
12	62.58	58.63	62.25	60.68	50.22	294.36
£X	**672.02**	**639.129**	**681.26**	**496.94**	**531.11**	
X	**56.00±3.21[a]**	**53.26±3.66[a]**	**56.77±2.17[a]**	**41.41±3.66[b]**	**44.26±2.26[b]**	

Table 4. Economics of production of weaner rabbits fed diets containing fresh water snail (*pila ampullacea*) shell ash as a replacement for bone ash

Parameters	Treatments levels				
	T1 (0%Pasa)	T2 (25%Pasa)	T3 (50%Pasa)	T4 (75%Pasa)	T5 (100%Pasa)
Total fixed cost (₦/R)	603.80	603.80	603.80	603.80	603.80
Average feed intake per rabbit (Kg)	7.17	6.03	7.59	7.15	7.13
Cost of feed ₦/g	0.084	0.084	0.083	0.082	0.081
Average cost of feed consumed/rabbit(g)	56.00±3.21[a]	53.26±3.66[a]	56.77±2.17[a]	41.41±3.66[b]	44.26±2.26[b]
Cost of feed /g weight gain (₦/g)	53.69	54.35	52.92	52.17	51.72
Feed cost saving/g meat(₦)	-	- 0.66	0.77	1.18	1.97
Total Cost (₦)	1358.10	1357.35	1356.60	1355.85	1355.10

Parameters	Treatments levels				
	T1 (0%Pasa)	T2 (25%Pasa)	T3 (50%Pasa)	T4 (75%Pasa)	T5 (100%Pasa)
Cost per weaner (₦)	670.00	670.00	670.00	670.00	670.00
Selling price per mature rabbit(₦)	2237.00	2163.41	2229.60	2184.60	2236.80
Profit per rabbit (₦)	879.90	872.25	873.00	828.75	1157.60

₦ = Naira; R = Rabbit, Pasa = Pila ampullacea shell ash

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The economics of production analysis revealed that more savings accrued at 100% inclusion level of fresh water snail *(Pila ampullacea)* shell ash.

4.2 Recommendations

It is recommended that fresh water snail *(Pila ampullacea)* shell ash be used up to 100% in the diets of weaner rabbits so as to maximize profit.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Nworgu FC, Adebowale EA, Oredin OA, Oni A. Prospects and economic of broiler production using two plant protein sources. Tropical Journal of Animal Science. 1999; 2(1):159–166.
2. Apata DF, Ojo U. Efficiency of the *Trichoderma viride* enzymes complex in broiler starter fed cowpea testa based diet. In: Ukachuku, S. N., Ibeauchi, J. A., Ibe, S. N., Ezekwe, G. and Abasiekong, S. F. (Eds), Animal Production in the New Millennium: Challenges and Options. In Book of proceeding 25th Annual NSAP Conference. 2000;132-134.
3. Ansah T, Emelia AA, Deku G, Karikari P K. Evaluation of false Yam (*Icalina olviformis*) leaves on the growth performance of weaner rabbits (*Oryctolagus cuniculus).* Journal of Animal and Feed Research. 2012;2(1):76-79.
4. Omudu EA, Iyough A. Ecological studies of the gastropod fauna of some minor tributeries of river. Research International. 2005;2(2):306-310.
5. Cobbinah JR, Vink A, Onwuka B. Snail farm: Production, processing and marketing. Agrodok- Series No. 47, Agromisa Foundation, CTA, Wageningen. 2008;84.
6. Omole AJ, Ogbosuka GE, Salaka RA, Ajayi OO. Effect of replacing oyster shell with gypsum in broiler finisher diet. Journal of Applied Sciences Research. 2005;1(2): 245–248.
7. Wikipedia. Benue State. Geology and Envirnmemt. Wikipedia the free encyclopedia; 2015. Available:https://en.wikipedia.org
8. Official Methods of Analytical chemists AOAC). 16th Edition, Arlington, Virgininia. USA; 1995.
9. MINITAB Statistical Software. volume.16, Minitab Inc. P.A.; USA; 2014.
10. Obi IU. Statistical methods of detecting differences between treatment means. 2nd Edition. Snaap Press. Enugu, Nigeria. 1990;25-85.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/22249