REPRODUCTIVE AND CARCASS EVALUATION OF SNAILS FED DIETS CONTAINING BOTANICALS AS GROWTH PROMOTERS

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ABSTRACT
An experiment was conducted to determine the effect of botanicals (mixtures of Neem leaf, Bitter leaf and Moringa leaf meals) as growth promoters on the reproductive and carcass quality of snails (Archachatina marginata). The treatment groups were NBM1, NBM2, NBM3 and NBM4 which contained 0, 1, 2 and 3 % inclusion of (NBM), respectively. A completely randomized design was used for the trial and each treatment was replicated four times with 10 snails per replicate. Data were collected on reproductive indices and carcass yield. The results revealed that the mean total egg laid was influenced (P<0.05) by the inclusion of NBM in the diets. The highest number of eggs laid was recorded in the snail fed a diet of 3% NBM level, and was relatively similar to snails fed a diet containing 2% NBM. The incubation period was not affected (P>0.05) by the dietary treatments. The mean general acceptability of snail meat was relatively the same (P>0.05) across the treatments. The sensory evaluation of the meat of the snails fed experimental diets showed that NBM had no adverse effect on the meat quality. The results from the study indicate that mixtures of leaves of neem, Moringa Oleifera and bitter leaf plants improve reproductive indices and carcass quality of the snails. It could be concluded that NBM can be used as growth promoters in the diet of snails at up to 3% of the entire diet.
Keywords: **Snails, Growth promoter, Carcass quality, Egg weight, Clutch size**

INTRODUCTION

Snail meat is richer in lysine and arginine than whole egg, which explains the increasing demand for snail meat (Fayenuwo *et al.,* 2019; Popoola *et al.,* 2020). One of the challenges militating increased snail production is the slow growth, which could be due to genetics, environmental influence and feeding among others (Oluokun *et al.,* 2013; Omole *et al.,* 2013). Growth promoters are compounds given to animals to improve growth rate and feed efficiency (Kerr and Shurson, 2013; Ortega *et al*., 2022). Growth promoters could be natural or synthetic. Natural and synthetic growth promoters improve the growth and carcass quality of livestock. However, synthetic growth promoters may have residual effects on human and animal health (Gonzalez *e. al.,* 2017).). The leaves of *Moringa oleifera*, Neem and bitter leaf could play the role of growth promoters in livestock production. In light of this, the reproductive performance and carcass quality of snails could be improved using leaf meals as growth promoters. Therefore, this study was conducted to assess the reproductive indices and carcass quality of snails fed diets containing mixtures of Neem leaf, Bitter leaf and Moringa leaf meal (NBM).

MATERIALS AND METHODS

The treatment groups comprised dietary inclusion of leaf meal mixtures of Neem leaf, Bitter leaf and Moringa (NBM) at 0, 1, 2 and 3 %; NBM1, NBM2, NBM3 and NBM4 respectively. The leaf was air-dried before incorporation with feed ingredients. A completely randomized design was used for the trial and each treatment was replicated four times with 10 snails per replicate. The snails were reared in a cage of 12 compartments and each compartment had a dimension of 0.5x 0.5m2. The reproductive indices such as incubation period, weight, shell length and width of the eggs and that of the hatchlings at day old were counted, measured or calculated. The feeding trial lasted for 12 weeks. Carcass analysis was carried out at the end of the feeding trial by randomly selecting 4 snails from each replicate and weighed separately. Each snail was killed by striking the shell with a club. The shell, foot and viscerals were separated and weighed. The cooked meat samples were served to thirty taste panellists for the rating with questionnaires to elicit information on the colour, appearance, flavour, texture, taste and overall acceptability of the meat samples according to the method of Larmond (1977). Likert scale of 1, 2, 3, 4, 5, 6, 7, 8 and 9 ratings which correspond to dislike extremely, dislike very much, dislike moderately, dislike slightly, neither like nor dislike, like slightly, like moderately, like very much, like extremely was adopted. The treatment scores were assessed by choosing the score rating of each sample with the highest frequency. The mean scores on meat sensory characteristics (colour, appearance, flavour, texture, taste and acceptability were calculated. Data obtained were subjected to statistical analysis using analysis of variance (ANOVA) and the means were separated using Duncan's Multiple Range Test (SAS, 2000).

Table 1: Gross composition of experimental diets

Ingredient (%)	Percentage inclusion of *NBM* leaf meal NBM$_1$ (0%)	NBM $_2$ **(1%)**	NBM $_3$ (2%)	NBM $_4$ (3%)
Maize	44.0	44.0	44.0	44.0
NBM	0.0	1.0	2.0	3.0
GNC	26	26	26	26
Fish meal	2.5	2.5	2.5	2.5
Brewer Dry Grains	15.5	14.5	13.5	12.5
*Other fixed ingredients	27.5	27.5	27.5	27.5
Total	100.0	100.0	100.0	100.0
Cost/kg (N)	151.34	149.34	137.2	134.32
Calculated Composition				
Crude protein (%)	24.22	24.21	24.13	24.08
ME (kcal/Kg)	2605.2	2599.3	2589.45	2572.12

ME= Metabolisable energy; GNC-Groundnut cake

*Others fixed ingredients: Bone meal= 2.3; Oyster shell= 9.70.

RESULTS AND DISCUSSION

Table 2 shows the reproductive performance of the snails fed experimental diets containing mixtures of NBM. The mean total egg laid was influenced (P<0.05) by the inclusion of NBM in the diets. The number of eggs laid was highest in snails fed a diet with 3% NBM and lowest in those fed a diet without NBM inclusion. The mean weight of the eggs laid was also affected by the dietary treatments (P<0.05), and values ranged from 5.57 to 5.93g. The mean weight of eggs laid by the snails in this study was higher than the values reported by Omole *et al.* (2013) and Fayenuwo *et al* (2019). This could be due to the effect of NBM in the diet. The mean weight of hatchlings was higher in snails fed NBM inclusion at 3% than in other snails.

Table 2. Reproductive performance of growing snails fed diets containing mixtures of Neem, Bitter and Moringa leaf meal

Parameters	**NBM$_1$ (0%)**	**NBM$_2$ (1%)**	**NBM$_3$ (2%)**	**NBM$_4$ (3%)**	**±SEM**
Total egg laid (Number)	16.67^{b}	18.75^{ab}	19.93^{a}	19.98^{a}	1.02
Weight of the eggs(g)	5.57^{c}	5.68^{b}	5.91^{b}	5.93^{a}	0.32
Egg shell length (mm)	4.50^{b}	4.62^{a}	4.63^{a}	4.63^{a}	0.32
Egg shell width (mm)	3.45^{a}	3.49^{a}	3.52^{a}	3.53^{a}	0.35
Incubation period (day)	31.67	31.66	31.67	31.66	1.72
Weight of hatchling at day old (g)	5.72^{c}	6.24^{b}	6.59^{ab}	6.70^{a}	0.11
Shell length hatchling (mm)	3.65	3.65	3.66	3.67	0.03
Shell width hatchling (mm)	2.84	2.85	2.87	2.87	0.04

^{ab}= Means along rows with different superscript are significantly different from each other (P<0.05)
NBM= Neem leaf, Bitter leaf and Moringa leaf

The incubation period was not affected by the dietary treatments, and aligns with the results of Ajasin *et al*. (2015) and Oluokun *et al* (2013). Overall, the results from this study indicates that mixtures of leaves of Neem, *Moringa Oleifera* and bitter leaf enhanced the reproductive performance and carcass quality of the snails. In conclusion, neem, bitter and moringa leaf mixtures can be included in snails' diet to serve as growth promoter at up to 3% of the entire diet.

Table 3: Summary of Carcass evaluation of Snails fed diets containing mixtures of Neem, Bitter and Moringa leaf meal

Parameters	NBM_1 (0%)	NBM_2 (1%)	NBM_3 (2%)	NBM_4 (3%)	± SEM
Live weight (g)	347.86	35.34	346.71	348.67.	23.45
Foot weight (g)	147.29^{b}	152.43^{ab}	156.05^{a}	158.85^{a}	2.97
Dressing percentage (%)	42.34^{b}	43.51^{ab}	45.01^{a}	45.56^{a}	23.45
Colour	86.5	86.01	86.14	86.34	0.33
Taste	84.34	84.36	84.4	84.14	0.34
Flavour	85.1	85.51	86.49	87.41	0.31
Texture	84.45	84.12	84.30	84.16	0.31
General Acceptability	84.58	84.67	84.69	84.79	0.32

^{ab} = Means along rows with different superscript are significantly different from each other ($P<0.05$)

The results of carcass and sensory evaluation of snails fed diet containing different levels of NBM are shown in Table 3. The dressing percentage across the treatments was influenced ($P<0.05$) by the inclusion of NBM in the snail diet. The lowest dressing percentage was recorded in the diet containing 0% NBM. There was no significant difference in dressing percentage between snails fed diet containing 2 and 3% NBM. The dressing percentage obtained in this study was compared favourably with the reports of Ajasin *et al. (*2015), Oluokun *et al*. (2013) and Omole *et al*. (2013). The sensory parameters of taste, flavour, texture and general acceptability of the meat were not affected ($P>0.05$) by the levels of NBM in the diets. This implied that neem, bitter and moringa leaf meals had no adverse effects on the sensory properties of snail meat and, hence could be used as alternative feed ingredients for snails.

REFERENCES

Ajasin, F.O., Ogunleke, F.O., Adekunle, O. F., Makanjuola, B. A., Okpeze, C.N., Ononogbu, C., Owosibo, O. T., Omole, A. J. (2015). Hamecozyme Enzyme On Performance characteristics of Snails (*Archachatina Marginata*) Fed Brewer Dry Grain Based Diet. *Journal of Molluscan Research 1:58-63*

Fayenuwo, J. O., Popoola, Y.A., Omole, A.J., Owosibo, O.A., Harry, B. J and Olorungbohunmi, T.O. (2019). Growth and reproductive indices of snails fed varying proportions of leaves of *Moringa oleifera* and Pawpaw (*Carica papaya*). *Livestock Research for Rural Development* 31 (3) 2019

Gonzalez Ronquillo, M. and Angeles Hernandez JC. Antibiotic and synthetic growth promoters in animal diets: review of impact and analytical methods. *Food Control.* (2017) 72:255–67. doi: 10.1016/j.foodcont.2016.03.001

Kerr, B.J. and Shurson, G.C. (2013). Strategies to improve fiber utilization in swine. *Journal of Animal Science and Biotechnology,* 4:11. doi: 10.1186/2049-1891-4-11.

Oluokun, J.A, Omole, A.J. and Fapohunda, J.B. (2005). Effect of increasing level of calcium supplementation in the diets of growing snail on performance characteristics. *Research Journal of Agriculture and Biological Sciences* 1:76-79

Omole, A.J. (2018). Wealth Creation and Food Security through Snail Production. *International Conference / workshop on Giant African Land Snails (NETGALS).* At Institute of Agricultural Research and Training, (I.A.R&T) Moor plantation, Ibadan. Nigeria. 3rd – 7th June, 2018.

Popoola, Y.A., Banjoko, O.J., Oladele-Bukola, M.O., Kehinde, A.S., Durotoye, E.S., Omole, A.J. (2020). Growth and Reproductive indices of Snails (*Archachatina marginata)* fed *Parcuetina nigrescens* Leaf as substitute for pawpaw leaf. *Journal of American Science,* 16 (8): 1-5.