Journal of American Science

Websites:
http://www.jofamericanscience.org
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Growth and Reproductive indices of Snails (*Archachatina marginata*) fed *Parcuetina nigrescens* Leaf as substitute for pawpaw leaf

Popoola[1], Y.A., Banjoko[3], O.J., Oladele-Bukola[1], M.O., Kehinde[2], A.S., Durotoye[1], E.S., Omole[1], A.J.,

[1.] Obafemi Awolowo University, Institute Of Agricultural Research and Training Moor Plantation, Ibadan, Nigeria
[2.] Forestry Research Institute of Nigeria, Ibadan
[3.] Federal College of Animal Health and Production Technology, Ibadan, Nigeria.
popoolayemi75@gmail.com, omoleboye@yahoo.com

Abstract: *Parcuetina nigrescens* (PN) is considered as weed but rich in protein and iron and readily available in Southern part of Nigeria hence this trial was conducted to evaluate the growth and reproductive indices of snail (*Archachatina marginata*) fed PN as substitute for pawpaw leaf. The snails were fed solely on pawpaw leaf (PL) or pawpaw leaf (PL) or mixtures. The snails in Group A (AB_1) were fed PL alone, Group B (AB_2) *Parcuetina nigrescens only*, Group C (AB_3) mixtures of leaves of *Parcuetina nigrescens and Pawpaw*. The management practices were all the same in all the treatments. Completely randomized design was used for the trial and each treatment was replicated four times with 10 snails per replicate. Data collected were feed intake, weight gain, shell length, thickness and width, feed conversion ratio, dressing percentage, number of eggs laid and size. There was a significant difference in the feed intake of the snails fed solely or mixtures of leaves of *Parquetina nigrescens and pawpaw* ($p<0.05$). The highest total feed intake of 917.47g was recorded in AB2. There was also significant differences in the mean weight of the snails fed experimental forages ($p<0.05$). The feed conversion ratio in AB_2 was significantly different from AB1 ($p<0.05$). The mean total number of egg laid was not significantly influenced by the treatment effects ($p>0.05$), it varied from 14.20 and 15.15. The mean weight of the eggs also was not significantly different from one another across the treatments ($p>0.05$), the values were 5.68, 5.69 and 5.69g for AB_1, AB_2 and AB_3, respectively. The results of the carcass yield shows that the dressing percentage of the snails fed experimental feeds was not significantly affected by the forages, the values range between 44.45 and 45.15 %. The result of organoleptic properties of snail meat indicated that the colour, taste, flavour and general acceptability were not influenced by the dietary treatments ($p>0.05$). Based on the result of the study it could be concluded that *Parcuetina nigrescens* could be used as substitute for pawpaw leaf.
[Popoola, Y.A., Banjoko, O.J., Oladele-Bukola, M.O., Kehinde, A.S., Durotoye, E.S., Omole, A.J. **Growth and Reproductive indices of Snails (*Archachatina marginata*) fed *Parcuetina nigrescens* Leaf as substitute for pawpaw leaf.** *J Am Sci* 2020;16(8):1-5]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 1. doi:10.7537/marsjas160820.01.

Keywords: Dressing percentage, growth, pawpaw leaf, *Parcuetina nigrescens,* snails

Introduction

Parquetina nigrescens (Ewe Ogbo) in (Yoruba, Nigeria) is a shrub that is commonly found in West African countries especially Nigeria and Ghana (Raharjo *et. al.*,1990*;* Imaga *et. al.*,2010*;* Aderibigbe *et. al.,* 2011). The plants is commonly found growing on ant-hill across the African region specifically from Senegal to Nigeria, and over the Congo basin down to south tropical African (Odetola *et. al.*,2006; Kayode *et. al.,*2009). It is a perennial with twining stem and woody base shortly tapering 10-15cm long, 6-8cm broad with a smooth long stem on the leaves. The leaves from *Parquetina nigrescens* have been reported to have a remarkable range of qualities from superior nutritional composition, therapeutic application and prophylactic uses for both humans and animal, according to several authors *Parquetina nigrescens* leaves contained Na, K, Fe, Mg, Zn, Ca, Cu, Mn, P, Pb, Cd, Ni, Cr, and Co, with Fe present in the highest and Co the lowest concentrations (Odetola *et al.*, 2006*;* Kayode *et. al.,*2009*;* Imaga *et. al.,*2010*;* Aderibigbe *et. al.,* 2011). It was also discovered that anaemia, leucopenia and thrombocytopenia associated with the diabetes were corrected in the animals treated with the extract of the leaf (Raharjo *et. al.*,1990*;* Owoyele *et. al.,*2009). The extract also reduced the erythrocyte osmotic fragility, body and organ weights (Owoyele *et. al.,*2009). The leaf is a good source of protein with crude protein of 16-22% crude protein depending on the season, the part cut and age of the plant. Pawpaw leaf has been found to be one the feed resource for snails according to several authors (Ajasin *et. al.,*2010; Omole *et. al.,*2012;

Odeyinka, 2014). Cutting of the leaf of pawpaw has negative effect on the performance of the plant, it is important to look for other feed resources. There is paucity of information on the use of *Parquetina nigrescens* leaf as feed resource for livestock in general hence this work was designed to evaluate the performance, reproductive indices and carcass composition of snails PN as substitute for pawpaw leaf.

Methodology

The experiment was carried out at the Snailery Unit of the Institute of Agricultural Research and Training (I. A. R. & T.), Moor Plantation, located on Longitude 03°51E, Latitude 07°23N and Altitude 650" lies in the humid zone of the rainforest belt 0703.25 of Southwestern Nigeria with mean annual rainfall of 1220 mm and mean temperature of 26°C. The snails were fed solely on pawpaw leaf (PL) or pawpaw leaf (PL) or mixtures. The snails in Group A (AB_1) were fed PL alone, Group B (AB_2) *Parcuetina nigrescens only*, Group C (AB_3)- mixtures of leaves of *Parcuetina nigrescens and Pawpaw*. The management practices were all the same in all the treatments. 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 0.5m^2. All management practices were adhered to. Feed intake and weight gain were measured on daily and weekly basis respectively with the use of sensitive weighing balance. Feed intake was calculated by subtracting the left-over feed from the feed given while the weight gain was calculated by deducting the initial weight from the final weight. Shell length and width were measured on weekly basis with vernier caliper. Micrometer screw gauge was used to measure the shell thickness on weekly basis. Feed conversion ratio was calculated as the ratio of feed intake to weight gain. 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 separately. The cooked meat samples were served to thirty taste panelist for rating with the aid of questionnaires that were administered for rating (colour, appearance, flavor, texture, taste and overall acceptability) of the meat samples according to the method of Ajasin *e t. al*., (2010). The rating was 1,2,3, 4, 5, 6, 7, 8 and 9 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. The treatment scores was assessed by choosing the score rating of each samples with highest frequency and then the mean scores of treatment based samples were calculated on each of the meat sensory characteristics (colour, appearance, flavor, texture, taste and overall acceptability). The chemical composition of the feed and the meat were determined according to the method of A O A C (1990). All data were subjected to statistical analysis using analysis of variance and the means were separated if they are significantly different using Duncan Multiple Range Test (SAS 2000).

Results And Discussion

The chemical composition of the forages is as presented in table 1. Numerically, the crude protein of *Parquetina nigrescens* is higher than that of PL, the values were 21.26% and 19.75 % respectively. The crude fibre of PN was lower than that of pawpaw leaf and values were 16.13 and 17.44 respectively. The crude protein of PN reported was relatively similar to that of Kayode*et. al.,*2009 and Owoyele *et. al.,*2009. Table 2 shows the summary of growth performance of snails fed different forages, there was a significant difference in the feed intake of the snails fed solely or mixtures of leaves of *Parquetina nigrescens and pawpaw* ($p<0.05$). The highest total feed intake of 917.47g was recorded in AB2.

Table 1: Determined Proximate Composition of sole and mixtures of pawpaw and *Parcuetina nigrescens* leaf on dry matter basis

Parameters (%)	AB_1	AB_2	AB_3
Dry Matter	31.98	30.12	30.03
Crude Protein	19.75	21.26	20.12
Crude Fibre	17.44	16.13	16.74
Ether Extract	4.43	5.36	5.04
Ash	9.23	13.34	10.42
Nitrogen Free Extract	49.15	43.91	47.68

AB_1 - leaf of pawpaw (PF) (control), AB_2- *Parcuetina nigrescens* leaf (PN) alone, AB_3 – PF+PN

Table 2: Summary of performance of growing snails fed sole or mixtures of leaves pawpaw and *Parcuetina nigrescens*

Parameters (Mean values)	AB_1	AB_2	AB_3	±SEM	P value
Initial weight (g)	70.6	70.8	71.1	3.45	0.05
Final weight (g)	322 [b]	330 [a]	329 [a]	6.67	0.05
Total weight gain (g)	252 [b]	259 [a]	259 [a]	4.98	0.05
Total feed intake (g)	906 [b]	917 [a]	916 [a]	12.4	0.05
Feed conversion ratio (g)	3.60 [a]	3.54 [b]	3.54 [b]	0.17	0.05
Shell length increment (g)	13.1	13.1	13.2	0.52	0.05
Shell width increment	11.6	11.4	11.4	0.44	0.05
Shell thickness increment	0.11	0.12	0.12	0.04	0.05
Foot weight (g)	143	144	142	4.99	0.05
Dressing percent (%)	44.4	45.2	45.1	1.80	0.05
Offal/live weight (%)	24.57	24.7	24.7	1.14	0.05
Shell/live weight (%)	24.37	24.4	24.3	1.23	0.05

Means along rows with different superscript are significantly different from each other (P<0.05)
AB_1 - leaf of pawpaw (PF) (control), AB_2- *Parcuetina nigrescens* leaf (PN) alone, AB_3 – PF+PN

There was also significant differences in the mean weight of the snails fed experimental forages ($p<0.05$) as presented in table 2, the highest weight gain was recorded in the snails fed PN solely which was relatively the same with those fed mixtures of PN and PL ($p>0.05$). The highest weight gain recorded in AB_2 could be due to high protein content of PN, It was reported earlier that PN is rich in protein and iron (Odetola *et. al*.,2006 Aderibigbe *et. al.,*2011. Also the crude fibre of PN was low when compared to that of PL as shown in table 1. The feed conversion ratio in AB_2 was significantly different from AB_1($p<0.05$) as shown in table 2. One snail each died in AB1 and AB3 which was not due to the effect of the forages, it was due to breaking of the shell when taking the measurements. The low mortality recorded could be due to proper management practices adhered to during the course of the feeding trial. The low mortality recorded could also be due to saved nature of the test feed resource as reported earlier that human being used to drink the extract of PN as a source of iron for those that have shortage of blood without any detrimental effect (Raharjo *et. al.,* 1990*;* Kayode *et. al.*,2009*;* Aderibigbe *et. al.*,2011). The mean total no of egg laid was not significantly influenced by the treatment effects ($p>0.05$) it varied from 14.20 and 15.15. The mean weight of the eggs also was not significantly different from one another across the treatments, the values were 5.68, 5.69 and 5.69g for AB1, AB2 and AB3, respectively. The value reported in this study was relatively similar to the report of Omole *et. al.,*2007; Ajasin *et. al.,*2010. The mean egg shell length and width were relatively similar across the treatments ($p>0.05$) indicating that *Parquetina nigrescens* leaf could be used as substitute for pawpaw leaf. The mean incubation period of the snails in all the treatments was not affected by dietary treatments ($p>0.05$). The incubation period reported was similar to the observation of several authors who reported incubation period of 30 to 32 days (Omole *et. al.,*2012; Odeyinka, 2014). The mean weight of the snails, shell length and width of the hatchlings at day old were not significantly different from one another across the treatments ($p>0.05$). The results of the carcass yield shows that the dressing percentage of the snails fed experimental diets was not significantly affected by the forages, the values range between 44.45 and 45.15 %. The dressing percentage was in agreement with the reports of several authors (Omole *et. al.,* 2007; Ajasin *et. al.,* 2010; Odeyinka, 2014).

Table 3. Reproductive performance of snails fed sole or mixtures of leaves pawpaw and *Parcuetina nigrescens*

Parameters (Mean values)	AB_1	AB_2	AB_3	±SEM	P value
Total egg laid (Number)	14.2	15.1	15.1	1.02	0.05
Weight of the eggs (g)	5.68	5.69	5.69	0.41	0.05
Egg shell length (mm)	4.68	4.71	4.74	0.32	0.05
Egg shell width (mm)	3.65	3.70	3.68	0.35	0.05
Incubation period (day)	31.2	31.3	31.3	1.72	0.05
Weight of hatchling at day old (g)	5.76	5.79	5.78	0.11	0.05
Shell length hatchling (mm)	3.61	3.62	3.62	0.03	0.05
Shell width hatchling (mm)	2.81	2.85	2.82	0.04	0.05

Means along rows with different superscript are significantly different from each other (P<0.05)
AB_1 - leaf of pawpaw (PF) (control), AB_2- *Parcuetina nigrescens* leaf (PN) alone, AB_3 – PF+PN

Table 4: Organoleptic properties of snails fed sole or mixtures of leaves pawpaw and *Parcuetina nigrescens*

Parameters (Mean values)	AB_1	AB_2	AB_3	±SEM	P vaue
Colour /9	7.69	7.71	7.69	0.44	0.05
Taste /9	7.38	7.34	7.39	0.40	0.05
Flavour /9	6.85	6.91	6.88	0.42	0.05
Texture /9	6.78	6.74	6.77	0.43	0.05
General Acceptability /9	7.57	7.53	7.63	0.45	0.05
Crude protein (%)	19.48	19.59	19.71	20.34	0.05
Crude fibre (%)	0.05	0.06	0.06	0.01	0.05
Ether extract (%)	0.98	0.97	0.96	0.03	0.05
Ash (%)	12.5	12.9	12.9	12.8	0.05

Means with the same superscripts are not significantly different (P > 0.05).
AB_1 - leaf of pawpaw (PF) (control), AB_2- *Parcuetina nigrescens* leaf (PN) alone, AB_3 – PF+PN

The relative same dressing percentage of the snails also suggest that *Parcuetina nigrescens* leaf could be used as alternative feed resource for snails. The result of the chemical composition of the meat shows that protein content of the meat in all the treatments were relatively the same (p>0.05) as shown in table, the value range between 19.48 and 19.71%. The protein content reported in all the treatments compared favourably with the report of Ajasin *et. al.,* (2010) and Fayenuwo et. al., (2017). The mean fat content of the meat was not affected by the dietary treatments (p>0.05) as presented in table 4. The low fat content reported was similar to observation of several authors (Omole *et. al.,*2012; Odeyinka, 2014; Fayenuwo *et. al.,*2017) that snails contain low fat content and regarded as good antidote for fat related diseases such as obesity, hypertension etc. The result of organoleptic properties of snail meat indicated that the colour, taste, flavour and general acceptability were not influenced by the dietary treatments (p>0.05).

Conclusion

It could be concluded that *Parcuetina nigrescens* improved weight gain, feed conversion ratio and dressing percentage. It did not have any adverse effect on health status and it is available all year round in southern Nigeria where rearing of snails is mostly common, hence *Parcuetina nigrescens* could be used to feed snails as substitute for pawpaw leaf.

References

1. Raharjo, Y. C., Cheeke, P. R. and Patton, N. M. 1990. Effect of cecotrophy on the nutrient digestibility of alfalfa and black locust leaves. *Journal of Applied Rabbit Research* 13: 56–61.
2. Imaga, N. A., Gbenle, G. O., Okochi, V. I., Adenekan, S. O., Edeoghon, S. O., Kehinde, M. O., Bamiro, S. B., Ajiboye, A. & Obinna, A., 2010. Antisickling and toxicological profiles of leaf and stem of *Parquetina nigrescens* L. *Journal of Medicinal Plants Research* 4(8): 639–643.
3. Aderibigbe, O. R., Odetola, A. A., Oluwole, F. S., Farombi, E. O., Onabanjo, O. O. & Jiboku,

O. A., 2011. Antioxidant properties of methanol extract of *Parquetina nigrescens* in ulcerated rats. International Journal of Tropical Medicine 6(2): 25–29.

4. Odetola, A. A., Oluwole, F. S., Adeniyi, B. A., Olatiregun, A. M., Ikupolowo, O. R., Labode, O., Busari, K. O. & Shorinola, J. A., 2006. Antimicrobial and gastrointestinal protective properties of *Parquetina nigrescens* (Afzel.) Bullock. *Journal of Biological Sciences* 6(4): 701–705.
5. Kayode, A. A. A., Kayode, O. T. & Odetola, A. A., 2009. Anti-ulcerogenic activity of two extracts of *Parquetina nigrescens* and their effects on mucosal antioxidants defense system on ethanol-induced ulcer in rats. *Research Journal of Medicinal Plant* 3(3): 102–108.
6. Owoyele, B. V., Nafiu, A. B., Oyewole, I. A., Oyewole, L. A. & Solinflammatory and antipyretic effects of *Parquetina nigrescens* leaf extract. *Journal of Ethnopharmacology* 122(1): 86–90.
7. Ajasin, F. O., Omole, A. J., Fapohunda, J. B., Obi, O. O. (2010) The Feeding Value of Biscuit Waste As Replacement For Maize In The Diet Of Growing Snails (*Archachatina marginata*) *Journal of American Science* 6 (2) 1-5.
8. Omole, A. J.; Osunkeye, O. J.; Odejide, J. O.; Sodamola, M. O.; Popoola, Y. A (2012) The African Giant Land Snails Green Choice Agric. Publications 56pp.
9. Odeyinka S. M., (2014) Animal feed industries and snail farming lecture delivered at the 3rd International Conference on Giant Land Snail (GALS) Proceedings of the 3rd International Conference on Giant African Land Snails held at Federal College of Education Osiele, Abeokuta on 1st 4th June, 2014.
10. Association of Official Analytical Chemist, A. O. A. C. (1990). Official Methods of Analysis, 13th Edition, Washington, D. C.
11. S. A. S. (2000). S. A. S. User's Guide. Statistical Analysis System Institute, Inc. Cary, N. C.
12. Fayenuwo, J. O., Omole, A. J., Awe, A. O., Popoola, Y. A., Owosibo,. O. T, Odejide, J. O. and Okpeze, V. E. (2017). Physico- chemical properties of snails fed varying levels of kenaf grain – leaf mixtures meal. *Proceedings of 42nd conference of Society for Animal Production 26 – 30 March,* 2017 held Landmark University, Omu-Aran, Kwara State, Nigeria. Pp.520 – 522. *Ghana Society for Animal Production*pg.167 - 170.
13. (2010) The Feeding Value of Biscuit Waste As Replacement For Maize In The Diet Of Growing Snails (*Archachatina marginata*) *Journal of Ethnopharmacology* 122(1): 86–90.

7/24/2020