European Journal of Biophysics
2015; 3(4): 23-26
Published online August 25, 2015 (http://www.sciencepublishinggroup.com/j/ejb)
doi: 10.11648/j.ejb.20150304.11
ISSN: 2329-1745 (Print); ISSN: 2329-1737 (Online)

Effect of Pawpaw (*Carica Papaya*) and Plantain (*Musa Paradisiaca*) Leaves on Growth Performance of *Archachatina Marginata* (African Giant Land Snail)

Ufele Angela Nwogor

Zoology Department, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

Email address:
ufeleangel@yahoo.com

To cite this article:
Ufele Angela Nwogor. Effect of Pawpaw (*Carica Papaya*) and Plantain (*Musa Paradisiaca*) Leaves on Growth Performance of *Archachatina Marginata* (African Giant Land Snail). *European Journal of Biophysics*. Vol. 3, No. 4, 2015, pp. 23-26. doi: 10.11648/j.ejb.20150304.11

Abstract: The study was carried out to evaluate the growth response of *Archachatina marginata* subjected to three diets; *Carica papaya* (pawpaw), *Musa paradisiaca* (plantain) leaves and combination of both *Carica papaya* (pawpaw) and *Musa paradisiaca* (plantain) leaves. One hundred and thirty five adult *Archachatina marginata* snails were used in this experiment and they were randomly selected into nine cages of fifteen snails each. Each treatment was replicated three times. Data were collected on the growth parameters (weight, length and circumference). The result showed an increase in the growth parameters measured. The mean weight gain rates were 0.9g, 0.5g and 1.2g; shell length increase rates were 0.84cm, 0.62cm and 1.18cm; shell circumference increase rates were 1.41cm, 1.29cm and 2.0cm for pawpaw, plantain and combination of both treatments respectively. Statistically, there was a significant difference ($P < 0.05$) in the rate of weight gain. The mean weight gain in higher in Pawpaw than in plantain and highest in the combination of the two leaves (treatment 3). There was no significant difference ($P > 0.05$) in the rate of shell circumference increase for both pawpaw and plantain treatments, but was significant difference ($P < 0.05$) in treatment 3 which is combination of both leaves. The rate of shell length increase was significantly higher in pawpaw treatment ($P < 0.05$) than in plantain treatment. And it was highest ($P < 0.05$) in the combination of both leaves, that is, treatment 3. In the three treatments pawpaw leaves enhanced growth performance than plantain leaves but the combination was the best, although the two leaves are recommended for farmers and for use in compounding feeds for growing snails, it will be best when combined.

Keywords: *Archachatina marginata, Carica papaya, Musa paradisiacal*, growth performance

1. Introduction

Feeding accounts for a reasonable percentage of the cost of livestock production and a major factor that determines the viability and profitability of livestock farming ventures. In view of this, many studies are shifting interest to the use of feedstuffs such as roots, leaves, tubers and their by-products which can probably reduce feed cost and ultimately the production cost of livestock farming (Agbabiaka *et al.,* 2013). The shortage in food supply is more serious with deficiency in protein when compared to the availability of other classes of food. The population explosion implies that many people require the supply of protein in their diet because of its important role in human wellbeing which includes growth, maintenance of hormonal and enzymatic activities and improvement of the defense mechanism of the body (Ademolu *et al.,* 2004). Imevbore and Ademosun in 1988 accessed the nutritive value of snail and observed that it has a protein content of 88.37%. Snail meat is a source of calcium, magnesium and zinc. Hence it is used in the treatment of anaemia and hypertension. The high calcium content and polyunsaturated fatty acid of snail meat is the reason why it is recommended for cases of rickets. The poor lipid content of snail makes it to be about the only meat apart from fish to be recommended for a liver–diseased patient (Mogbo *et al.,* 2013b). Osemeobo (1992) listed 15 health conditions that are believed to be arable with the meat, fluid and shell of African giant snails. With growing awareness of the role of cholesterol in various heart and arterials diseases, the demand for low cholesterol meat like snails has become more acute. Among the Igbo of south-eastern Nigeria, snail meat is an indispensable item in the diet of a nursing mother (Okonta, 2012). Snail production in the wild has been on the decline due to the depletion of the rainforest, over harvesting of snails,

bush burning and the increased use of agricultural pesticides (Okorie and Ibeawuchi, 2004). The low capital and simple management practices involved have also drawn people to snail farming (Mogbo *et al.,* 2013a).

Giant African snails have voracious appetite (Agbogidi and Okonta, 2011 and Okonta, 2012). They are known to eat at least 500 different types of plants, fruits, vegetable, ornamental plants, tree barks and even paint on houses. Snails ability to utilize a variety of readily available feeding material to achieve appreciable weight gain under intensive management makes it a suitable and cheaper alternative to other animal protein sources (Okonta 2012; Bolu *et al*., 2009 and Alikwe *et al.,* 2013).

Carica papaya leaves (pawpaw) is reported by various authors for optimum growth performance of *Archachatina marginata* (Ejidike, 2007). It is a rich source of protein (Adiwimarta *et al.,* 2010) and a rich source of 3 powerful antioxidant, vitamin C, vitamin A, and vitamin E, the mineral magnesium, calcium and potassium, and the B vitamin, panthothemic acid and foliate fibre. In addition to all these, it contains a digestive enzyme-papintha effectively treats causes of trauma, allergies and sports injuries (Aravind *et al.,* 2013).

Plantain(*Musa paradisiaca*) belongs to the family of banana and is popularly called cooking banana since it is seldom eaten raw they are monocotyledonous perennial crops in the tropical and subtropical world regions with more than 50% produced in Africa (Agbabiaka *et al., 2013;* Ojure and Quadri, 2012).

Plantain like banana offers great medicinal benefits. This is partly because banana aid in body retention of calcium, Nitrogen, and phosphorus, all of which help to build healthy regenerated tissues. They are excellent source of calcium, potassium, vitamins and other body building and nourishing nutrients (Kumar *et al.,* 2012). Okafor (2001) also noted that hibernation and aestivation play significant roles in snail's ability to breed, grow and reproduce. Snails generally are nocturnal, thus feeding, reproduction and locomotory activities are at the peak in the night (Ademolu *et al.,* 2011). The rate of reproduction is higher during wet season and often lays their eggs in the dry seasons. Their eggs are laid inside the soils and covered up with the soils.

2. Materials and Methods

2.1. Experimental Animal

One hundred and thirty five adult snails (*Archachatina marginata*) of similar weight, approximately 70g were used for the experiment. The distinguished characteristics of the species are the shell colouration and shape of the shell which is less pointed at the apex. The snails were allowed to acclimatize to their new environment for seven days before the onset of the experiment.

The snails were housed in plastic baskets. Each treatment comprising of three replicates containing forty-five snails per replicate and fifteen snails per treatment. The plastic baskets were filled with treated soil up to a height of 10cm to serve as a bedding material and provide a soft substrate for the snails. Water was sprinkled daily to increase humidity and prevent hibernation as reported by Mogbo *et al., (*2013b). The snails were kept under cool environmental conditions. The experiment lasted for eight weeks.

2.2. Experimental Diets

Three experimental diets were used as treatments. Treatment 1 contained pawpaw leaves plucked fresh from pawpaw tree. Treatment 2 contained plantain leaves fresh from plantain tree and Treatment 3 contained both pawpaw leaves and plantain leaves fresh from the trees. The diets are plucked fresh from the tree everyday and the leftover was discarded every day.

2.3. Data Collection

The weights of the snails were measured weekly using electronic weighing balance. The shell length and the shell circumference were also measured using twine which was later stretched on a meter rule as done by Afomezie *et al., (*2011).

2.4. Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) at α =0.05 confidence level using SPSS version 20.0 window. The comparison of mean was separated using a post Hoc test (Least Significant Difference), (William and George, 2008).

3. Result

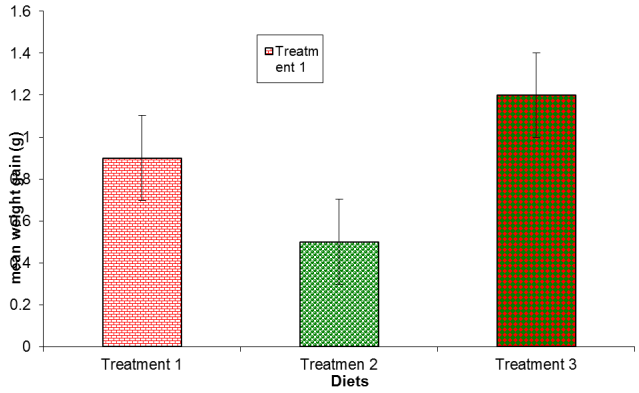

Figure 1. *Mean Weight gain of snails.*

Figure 1 shows the mean weight gain of snails fed with Pawpaw, Plantain leaves and combination of both leaves. From the figure it was observed that the snails fed with Pawpaw leaves had the higher mean weight gain (0.9g) than those fed with plantain leaves (0.5g), but those fed with combination of both leaves had the highest mean weight (1.2g).

Figure 2 shows the mean shell length increase of snails fed with different diets. From the figure 2 it was observed that snails fed with Pawpaw leaves had higher length increase

(0.84cm) than those fed with plantain leaves (0.62cm), but the snails fed with combination of both leaves had the highest mean shell length increase (1.18cm).

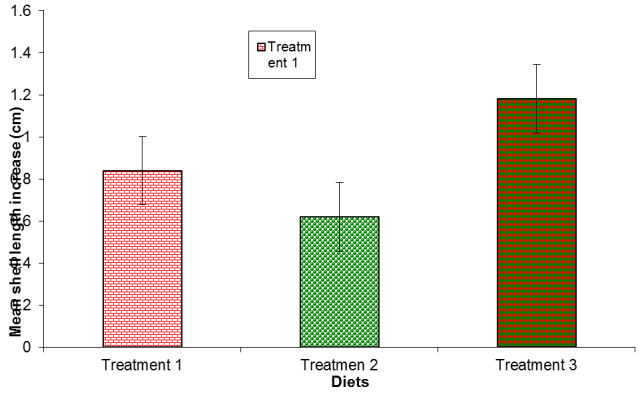

Figure 2. *Shell length increase of snails.*

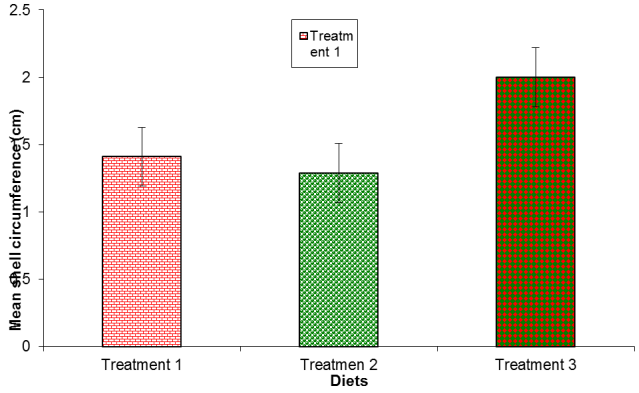

Figure 3. *Mean Shell circumference increase of snails.*

Figure 3 shows the mean shell circumference increase of snails fed with different diets. From the figure 3, it was observed that snails fed with Pawpaw leaves had a higher increase in the shell circumference (1.41cm) than those fed with plantain leaves (1.29cm), while those fed with combination of the leaves had the highest increase (2cm).

4. Discussion

The result showed that *Archachatina marginata* thrived on both treatments as shown in Figure 1 to 3. All growth parameters measured increased progressively. The weight hence, increased progressively during the period of the experiment. There was a significant difference between the rates of weight gain in both treatments ($P < 0.05$) statistically. Although, both treatments provided the basic nutrients required for the growth of snails. Both plants used have been shown to be rich in vitamins, proteins and minerals (Adeolu and Enesi, 2013; Ayoola and Adeyeye, 2010). The shell length and circumference increased progressively all through the study period. The rate of increase of shell length was significantly higher in pawpaw treatment (0.84cm) ($P < 0.05$) compared to the plantain treatment (0.62cm) and highest in combination of both leaves (treatment 3) (1.18cm). The rate of increase of shell circumference in the pawpaw treatment was also higher but this was not statistically significant ($P > 0.05$), but there was statistically significant different ($P < 0.05$) in the combination both leaves (treatment 3) ($P > 0.05$). This finding suggests that the pawpaw treatment may contain important minerals that enhance shell growth such as calcium, magnesium, potassium, etc. This finding is in accordance with the report of Ayoola and Adeyeye (2010). They reported that pawpaw (*Carica papaya*) has very high calcium (8612.50mg/kg) and potassium (2889mg/kg) levels. This is very high compared to that reported for plantain leaves by Adeolu and Enesi (2013).

5. Conclusion

In conclusion, plantain and pawpaw leaves treatments in this study have shown great potential as feed for rearing the snails as it supported the growth performance of the snails. Therefore, using the above results, snail farmers are advised to use both pawpaw and plantain leaves in feeding the snails, but the best is combination of both leaves as shown in the result.

References

[1] Ademolu, K.O., Idiowu, A.B., Mafiang, C.F. and Osinowo, O.A. (2004). Performance, proximate and Mineral analysis of African giant land snail (*A. marginata*) fed different nitrogen sources. *African Journal of Biotechnology*. 3(8):412-417.

[2] Ademolu, K.O., Jayeola, O.A., Dedeke, G.A. and Idowu, A.B. (2011). Comparative analysis of the growth performance and haemolymph biochemical properties of normal and albino giant land snail- *Archachatina marginata*. *Ethiopian Journal of Environmental studies and management*. 4(2):101-106.

[3] Adeolu, A.Y. and Enesi, D.O. (2013). Assessment of proximate mineral, vitamin and phytochemical compositions of plantain (*Musa paradisiaca*) bract- an agricultural waste. *Research Journal of plant science*. 4(7):192-197.

[4] Adiwimarta, K., Daryatmo, J., Orskov, E.R., Mayes, R.W. and Hartadi, H. (2010). Utilization of cassava leaf and *Carica papaya* leaf as feeds and anthelmintics for goats. *Advances in Animal Biosciences*. 1(1):114-114.

[5] Afomezie, P.I., Ebenebe, C.I., Njoku, O.O., Ufele, A.N. and Okonkwo, J.C. (2011). Effects of different soil Treatments on weight gain, shell length and shell aperture of snails (*Archachatina marginata*). *Pakistan Journal of Nutrition*. 10(2):151-154.

[6] Agbabiaka, L.A., Okorie, K.C. and Ezeafulukwe, C.F. (2013). Plantain peels as dietary supplement in practical diets for African catfish (*Clarias gariepinus* burchell 1822) fingerlings. *Agriculture and Biology Journal of North America*. 4(2):155-159.

[7] Agbogidi, O.M. and Okonta, B.C. (2011). Reducing poverty through snail farming in Nigeria. *Agriculture and Biology Journal of North America*. 2(1):169-172.

[8] Alikwe, P.C.N., Okpeku, M. and Ndukari, S. (2013). Response of African Giant Land Snail (*Archachatina marginata*) of Graded levels of *Asplenium barteri* leaf meal supplement. (*IOSR) Journal of Agriculture and Veterinary science*. 6(1):32-35.

[9] Aravid, G., Debjit, B., Duraivel, S. and Harish, G. (2013). Traditional and Medicinal uses of *Carica papaya*. *Journal of Medicinal Plants Studies.* 1(1):7-15.

[10] Ayoola, P.B. and Adeyeye, A. (2010). Phytochemical and Nutrient Evaluation of *Carica papaya* (pawpaw) leaves. *International Journal of Research and Reviews in Applied Science*. 5(3): 325-328.

[11] Bolu, S.A.O., Sola-Ojo, F.E., Olorunsaya, O.A. and Idris, K. (2009). Effect of graded levels of dried pawpaw(*Carica papaya*) seed on the performance, heamatology, serum biochemistry and carcass evaluation of chicken broilers. *International Journal of Poultry Science*. 8(9):905-909.

[12] Ejidike B.N. (2007). Influence of Artificial Diet on captive rearing of African Giant land Snail *Archachatina marginata*. Pulmonata; Stylommatophora. *Journal of Animal and Veterinary Advances.* 6(8):1028-1030.

[13] Imevbore, E. and Ademosun, A.A. (1988). The nutritive value of African Giant Land Snail (*Archarchatina marginata*). *Nigerian Journal of Animal Production*. 15: 109-112.

[14] Kumar, K.P.S., Bhowmik, D., Duraivel, S. and Umadevi, M. (2012). Traditional and Medicinal Uses of Banana. *Journal of Pharmacognosy and Phytochemistry*. 1(3):51-63.

[15] Mogbo, T.C., Okeke, J.J., Ufele, A.N. and Nwosu, M.C. (2013b). Effects of Housing Types on the growth performances of snail (*Achatina achatina*). *American Journal of Life Science Researches*. 1(3):102-110.

[16] Mogbo, T.C., Okeke, J.J., Ufele, A.N., Nwosu, M.C. and Ibemenuga, K.N. (2013a). Preliminary Investigation on the Influence of Housing Types on Reproductive Characteristics of snail (*Achatina achatina*). *American Journal of Bioscience*. 1(4):54-58.

[17] Ojure, M.A. and Quadri, J.A. (2012). Quality Evaluation of Noodles production from unripe plantain flour using Xanthan gum. *International Journal of Research and Review in Applied Science*. 13(3):740-743.

[18] Okafor, F.U. (2001). Edible land snails: a manual of biological management and farming of snails. Splendid publishers, Lagos. pp1-54.

[19] Okonta, B.O. (2012). Performance of giant African land snail *Archachatina marginata* (Swainson) fed with selected diets. *Global journal of Bioscience and Biotechnology*. 1(2):182-185.

[20] Okorie, P.U. and Ibeawuchi, I.I. (2004). Phenotypic Characteristics of the African Giant Snail, *Archachatina marginata* (Swainson). *Animal Research International Journal*. 1(3): 144-147.

[21] Osemeobo, G.H. (1992) Effects of land-use and collection on the decline of African giant snails in Nigeria. *Environmental Conservation*. 19:153-159.

[22] William, A.C., and George, W.S. (2008). Statistical Methods, 6th Ed., The Iowa State University Press. Ames, Iowa, USA. Pp. 167-263.