

## POTENTIALS OF JUSTICIA SECUNDA M. VAHL AS SUPPLEMENT IN HELICICULTURE IN IMO STATE, NIGERIA

Chris Igbozuruike  
Imo State University, Owerri, Nigeria  
Email: farstdc@yahoo.com

### Abstract

The study was conducted to examine the potentials of *Justicia secunda* Vahl M. in heliciculture using *Archachatina marginata*. The juvenile snails were raised in a paddock pen partitioned into A and B. All the juveniles were stabilized for one month using a conventional diet that comprises of cucumber, calcium, carrot, kitchen waste and other plant leaves before being moved to paddock A and B. Snails in paddock A were fed with conventional feed and water on a daily basis, and rotten diet removed to keep the environment fresh. However, solid diets, leaves were often left till the 3rd day. In paddock B, the paddock was first planted with *Justicia Secunda* (bloodroot) in a fertile sandy loam soil enriched with poultry droppings. *Justicia Secunda* was planted and allowed to establish for two months in the adequately ventilated housing with less heat, before the snails were introduced. The juveniles were primarily fed with *Justicia secunda* and water only after stocking. The following parameters were taken during the study: weight of snails at 5 months of study. This was done by randomly selecting 5 snails from each paddock respectively. Paddock (A) snails on diet and paddock (B), those on *Justicia Secunda* (bloodroot). Shell length and width, aperture height and width were taken as described in figure 4. Number of whorl was taken by counting the shell turns on 5 randomly selected snails from each paddock, and body whorl length taken as shown in fig 4. Shell thickness was taken using a digital measuring caliper, and proximate analysis was done in the laboratory routinely. The results showed that *Archachatina marginata* fed with *Justicia secunda* were significantly different when compared with those on conventional feed. These were evident in all the parameters studied.

**Keywords:** Conventional Feed, *Justicia Secunda*, Heliciculture, Paddock

### INTRODUCTION

Land Snails (LS), to many tribes and cultures serves as just meat and staple food. However, snails are considered a delicacy in southeastern Nigeria. Snail is a healthy and nutritious food rich in crude protein, unsaturated fatty acids and minerals like Ca and Mg, as well as mucin which has bioactive compounds that shows antibiotic, anti-cancer, anti-rheumatism, anti-cough properties (Fred-Jaiyesimi, 2014). As reported by Okon and Ibom (2012), several species of giant African land snails are distributed across the continent, including *Achatina achatina* in Ghana, *Archachatina marginata* in Nigeria, *Achatina fulica* in East Africa, and various *Limicolaria* species found in West African countries such as Cameroon, Nigeria, Guinea and Gabon etc. The value placed on these numerous benefits from snail increased its scarcity because of diminishing availability in the wild, and hence the advent of snail domestication. Heliciculture otherwise known as Snail Farming entails domestication of edible land snails in a controlled environment that closely replicates their natural habitats for profit when the meat and/or other associated products are sold. Snail farming entails raising snails in enclosed, controlled environments that prevent their escape while essential resources such as food, water, and lime are provided to promote healthy growth (Okon and Ibom, 2012). Upon reaching maturity, the snails are harvested, processed, and either consumed locally or sold. The seasonal nature of wild snail availability further underscores the need for organized, year-round farming operations at both small-scale and commercial levels (Baby *et al.*, 2010).

Snails have a good feed conversion ratio and feeds upon diverse plant discards; however, they take relatively long time to attain marketable size. Consequently, Ikegwonu (2013) stressed the need to increase snail weight within a short period of time using available nutrient resources.

Agbogidi and Okonta (2011) in their experimental study, also advocated that high quality plant leaves should be incorporated in snail diet to increase early maturity with corresponding size. St. John's bush commonly known as

'bloodroot' and botanically as *Justicia secunda* is a flowering plant from the Acanthaceae family, which showed promises in traditional medicinal where it is used in folk medicine to treat issues like sickle cell disease, anemia, wound infections, as antioxidant, anti-inflammatory and fattening properties among others. The study examined the potentials of bloodroot as diet in heliciculture.

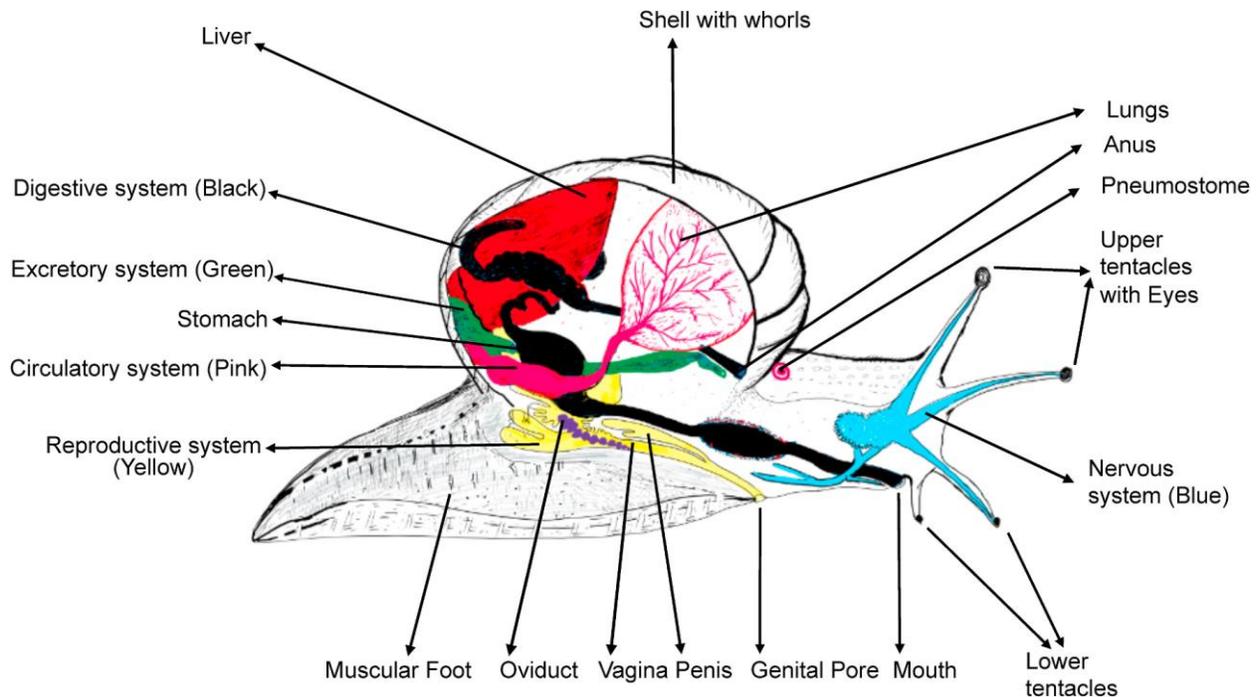


Figure 1 a. General anatomy of snails showing digestive, reproductive, respiratory and excretory systems.

## Materials and Method

### Study Area

The study was carried out in Owerri, Imo State Nigeria. Owerri lies at latitude 5.5096° N, and 7.0391°E.

**Procedure:** *Archachatina marginata* were used for the study. The juvenile were raised for one month on baseline (foundational) diet. The diet (feed) comprised of calcium, potato, carrot and cucumber waste etc. The juvenile were introduced into a housing facility (paddock) fenced to prevent rodent and pest attack. The housing was subsequently partitioned into two (2): Paddock A (Snails fed with regular diet), and Paddock B, those fed with *justicia secunda* plant (bloodroot). The paddock pen A was cleaned, disinfected, and feeding and water trough provided. Snails in paddock A were feed with- carrot, lettuce, calcium, water and cucumber including some kitchen waste and other organic material. In paddock B, before the introduction *Archachatina marginata*, *Justicia Secunda* were grown for 2 months in a fertile sandy loam soil fertilized with poultry droppings with adequate ventilation and protection from heat. The stabilized juvenile of *Archachatina marginata* were also introduced into the paddock after one month of stabilization in a brooding pen. *Justicia secunda* and water were the only feed primarily fed to the paddock B. In paddock A, feeding was done daily, and rotten diet removed to keep the environment fresh. However solid diets, leaves were often left till the 3rd day.



Fig 2. Snails feeding on *justicia Secunda* (bloodroot).

**Data Collection.** The following parameters were taken during the study: weight of snails at 5 months of study. This was done by randomly selecting 5 snails from each paddock respectively. Paddock (A) snails on diet and paddock (B), those on bloodroot. Shell length and width, aperture height and width were taken as described in figure 4. Number of whorl was taken by counting the shell turns on 5 randomly selected snails from each paddock, and body whorl length taken as showed in fig 4. Shell thickness was taken using digital measuring caliper, and proximate analysis was done in the laboratory routinely as described by Uboh *et al.* (2014).



Figure 3. *Archachatina marginata*

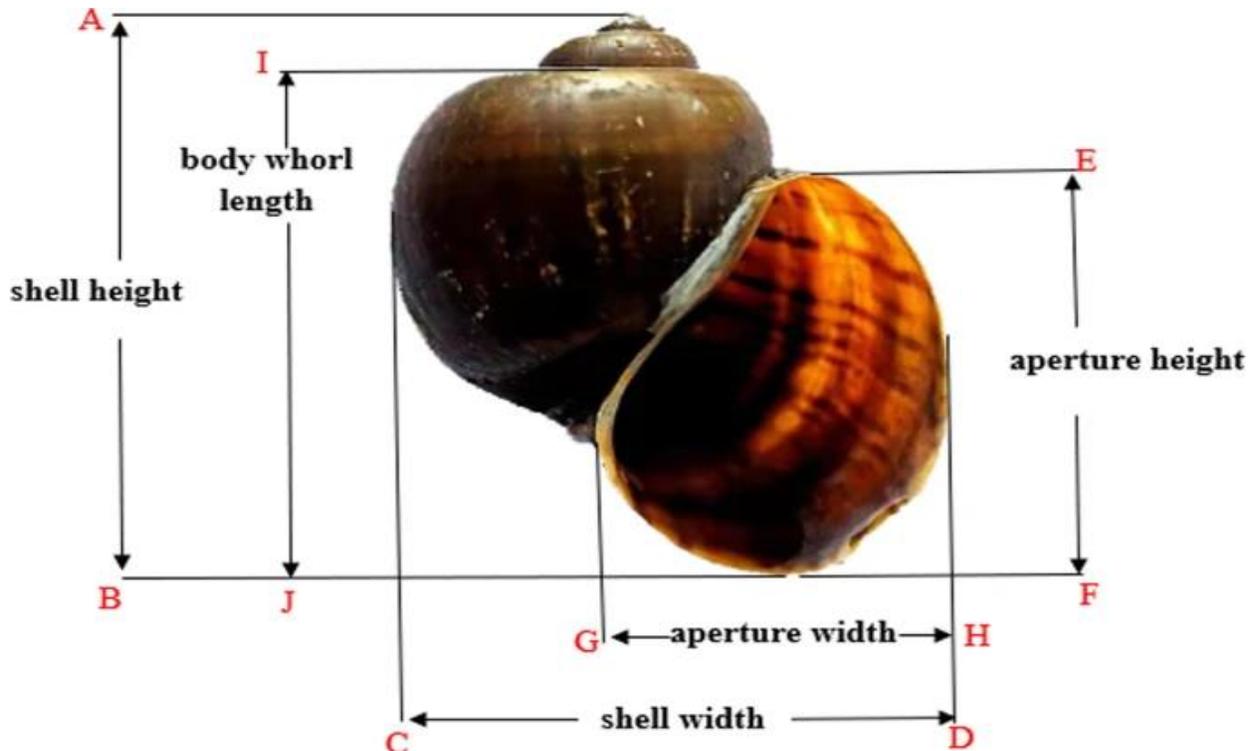


Figure 4: Snail morphometric measurements

**Data Analysis.** Data were analyzed using Student Package for Social Sciences (SPSS) and the mean results obtained.

**RESULTS AND DISCUSSION.**

The performance of *Archachatina marginata* fed with *justicia secunda* were significantly different (Tables 1 and 2) compared with those on conventional feed. These were evident in all the parameters studied. There were decreased body weight, body shell length and width, aperture length and width. The most negative effect of *justicia secunda* as the sole diet to the snail occurred in shell development where the shell thickness is reduced by half when compared by those in paddock A.

Table 1. Morphometric measurements of the Snails and other parameters as influenced by feed.

| Parameters      | Paddock A (Diet) | Paddock B(bloodroot) |
|-----------------|------------------|----------------------|
| Weight of Snail | 54.017g          | 50.961g              |

|                   |         |        |
|-------------------|---------|--------|
| No. of whorls     | 3       | 2.5    |
| Shell thickness   | 0.8mm   | 0.4mm  |
| Body Shell length | 10.37cm | 9.02cm |
| Body Shell width  | 6.81cm  | 5.41cm |
| Aperture length   | 6.39cm  | 5.15cm |
| Aperture Width    | 4.95cm  | 4.11cm |

The Proximate Analysis of *Archachatina marinata* as influenced by conventional diet and *justicia secunda* as showed in Table 2 revealed that paddock A which received conventional feed outperformed paddock B which received *justicia secunda* primarily except on moisture content.

Table 2: The mean values of the Proximate Analysis of *Archachatina marinata* as influenced by different feed.

| SOURCES          | MOISTURE | PROTEIN (%) | CRUDE FAT (%) | ASH (%) |
|------------------|----------|-------------|---------------|---------|
| <b>Paddock A</b> | 70       | 17.2        | 3.1           | 2.2     |
| <b>Paddock B</b> | 69       | 14.5        | 2.4           | 1.73    |

The values of some mineral elements as displayed in table 3 showed significant differences when compared. There were higher values in paddock A, when compared with paddock B.

Table 3: The mineral composition of *Archachatina marinata* as influenced by feed.

| SOURCES          | CA     | P     | Mg    | K      | NA    | CU | FE    | MN   | ZN   |
|------------------|--------|-------|-------|--------|-------|----|-------|------|------|
| <b>Paddock A</b> | 181.02 | 67.14 | 33    | 110.72 | 52.04 | -  | 15.00 | 0.39 | 1.36 |
| <b>Paddock B</b> | 162.55 | 80.38 | 26.71 | 68.46  | 50.13 | -  | 8.31  | 0.30 | 1.15 |

All values are expressed as mg/100 g; Ca, Calcium; P, Phosphorus; K, Potassium; Na, Sodium; Cu, Copper; Fe, Iron; Mn, Manganese; Zn, Zinc.

The results showed that *Archachatina marinata* fed with bloodroot showed low levels of parameters measured when compared with those fed with conventional diet except p and Fe. Case in point, low levels of Ca, Mg and K observed in table 3 for Paddock B may have contributed to lower shell thickness, shorter body shell length and width in *Archachatina marinata* fed with bloodroot. This was supported by the finding of Ibom *et al.* (2014), which reported the significance of including calcium and limestone in snail feeding or feed formulation. The significant levels of Fe and phosphorus in paddock B revealed the building block of bloodroot. According to Corrêa and Alcântara (2012), *J Secunda* Vahl is a nutrient packed plant especially iron and phosphorus. Some results from paddock B though with lower levels when compared with paddock A, were insignificant when compared with other results especially Baby *et al.* (2010) that showed snail weight of 50.99g, shell thickness of 5.0mm, body shell length of 9.86 and aperture width of 11.34mm from *Archachatina marinata* of two and half whorl.

There were decreased body weight, body shell length and width, aperture length and width. Remarkably, Snail shell thickness (paddock B) were half when compared with paddock A. For paddock A: snail weight 54.02g, number of whorls 3, shell thickness, 0.8mm, body shell length and width -10.37cm and 6.81cm, aperture length and width 6.39cm and 4.95cm; while paddock B had 50.961g body weight, 2.5 for number of whorl, shell thickness of 0.4mm, body shell length and width -9.02cm and 5.41cm, aperture length and width 5.15cm and 4.11cm respectively. There were no significant difference between the paddocks for moisture content, however, percentage protein difference of 17.2 for paddock A, and 14.5 for paddock B occurred. Also, percentage crude fat and ash were significantly different. 3.1 crude fat for paddock A, 2.4% for B. 2.2% ash for A, 1.73 for B respectively. Mineral elements were also affected and significantly different. The results showed that *Archachatina marinata* fed with bloodroot showed low levels of parameters when compared with those on conventional diet except Phosphorus and iron mineral elements. For paddock A, 181.02 Ca, 67.14 P. 33 Mg, 110.72 K, 52.04 Na, 15.00 Fe, 0.39 Mn and 1.36 Mg/kg Zn respectively while paddock B had: 162.55 Ca, 80.38 P. 26.71 Mg, 68.46 K, 50.13 Na, 8.31 Fe, 0,39 Mn and 1.15 Zn Mg/Kg respectively. The differences between these paddocks with regards to this essential elements may have affected the overall performance of the snail. Case in point, low levels of Ca, Mg and K observed in table 3 for Paddock B, may have

contributed to lower shell thickness, shorter body shell length and width in *Archachatina marinata* fed with bloodroot. This must be the reasons behind the inclusion of calcium and limestone in snail feeding and, or feed formulation. The significant levels of Fe and Phosphorus in paddock B revealed the building block of bloodroot. Justicia Secunda is a nutrient packed plant especially iron and phosphorus and this may have contributed to significant levels of Fe and P in paddock B. Results from paddock B though lower when compared with paddock A were insignificant when compared with results especially Baby *et al.* (2010) that showed snail weight of 50.99g, shell thickness of 5.0mm, body shell length of 9.86 and aperture width of 11.34mm from *Archachatina marinata* of two and half whorl fed with conventional diet. The result showed that justicia secunda is a nutrient packed plant, and the leaves had great values that showed positive effect in overall snail growth and development. Justicia Secunda should be incorporated into snail fed as a viable sources of nutrient for heliculture. It should be noted that Justicia Secunda performance was like breast-milk that supports overall growth and development of a new born baby until at certain body weight where inclusion of other essential nutrients(food) becomes crucial for optimum growth and gene expression.

## CONCLUSION

Justicia secunda demonstrated its ability in heliculture and this were promising. The shortcomings of this plant in snail farming can be likened to breastmilk and the snail a baby. Irrespective of how rich the breast milk is, there are certain age and body weight at which the breast-milk cannot sustain the babys' growth and development, hence additional food sources.

Snail farming (Heliculture) in Nigeria presents numerous opportunities, and increasingly gaining global attention as a viable agribusiness because of the nutritional, aesthetic, and medicinal value of snails among others.

The finding revealed that justicia secunda though wonderful source of snail feed, should be used alongside calcium and carbohydrate rich feed sources especially after snail whorl count of 3 turns.

## References

- Adegoke, A. C. Bukola, U. Comfort, O. Amos, Snails as meat source: epidemiological and nutritional perspectives, J. Microbiol. Antimicrob. 2 (2010).
- Adikwu, M. U. (2012). Snail production for sustainable development and good health. In S. I. Ola, G. A. Dedeke, & A. O. Fafiolu (Eds.), *Proceedings of the 1st International Conference on Giant African Land snails (NeTGALS)* (pp. 3-7). Federal University of Agriculture, Abeokuta, Nigeria.
- Afolabi, J. A. (2013). Snail farming as an environment friendly and viable enterprise in Ondo State, Nigeria. *Journal of Human Ecology*, 42(3), 289-293.
- Afrimash (n.d). Snailery design and management. Afrimash Retrieved from <https://afrimash.com/snail-farming-all-you-need-to-know/2/>.
- Agbogidi, O.M. and Okonta , B.C. (2011) Reducing poverty through snail farming in Nigeria, Agric. Biol. J. N. Am. 2(1) 169-172.
- Ajibola, E. S., Rahman, S. A., Ademolu, K. O., Biobaku, K. T. and Okwelum, N. (2013). Preliminary investigation on the effects of crude extract of snail mucin from the giant African land snail (*A. marginata*) on heart functions. *Proceedings of the 2nd International Conference/Workshop on giant African land snails (NetGALS)*. Federal University of Agriculture, Abeokuta, 2nd – 5th June. Pp. 6-10.
- Aluko, F. A., and Adisa, A. A. (2014). Qualitative characteristics and suture measurements of two breeds of snail reared in Nigeria. *Journal of Experimental Agriculture International*, 4(12), 1492-99.

- Amubode, A. A., and Fafunwa, F. (2014). Snail farming and hospitality industries. In Abiona, J. A., and Osunsina, I. O. (eds.). *Proceedings of the 3rd International Conference on Giant African Land Snails (NetGALS)*, Federal College of Education, Abeokuta, Nigeria. Pp. 31-36.
- Baby, R.L., I. Hasan, K.A. Kabir, and Naser, M.N. (2010). Nutrient analysis of some commercially important molluscs of Bangladesh, *J. Sci. Res.* 2 (2) 390–396.
- Carroll, C., Booth, A., Leaviss, J., and Rick, J. (2013). Best fit” framework synthesis: Refining the method. *BMC Medical Research Methodology.* 13, 37.
- Corrêa, G.M., Alcântara, A.F.d.C. (2012). Chemical constituents and biological activities of species of *Justicia*: A review. *Rev. Bras. Farmacogn* 22, 220–238.
- Dragi'cevi' C. O., and M.'Z. Balti' C, .(2005). Snail meat: significance and consumption, *Vet. Glas.*59. 463–474, <https://doi.org/10.2298/VETGL0504463D>.
- Fred-Jaiyesimi, A. A. (2014). Snails: Source of potential dynamic nutraceuticals and pharmaceuticals. *Proceedings of the 3rd International Conference/Workshop on giant Africa land snails (NetGALS)*, Federal College of Education, Abeokuta, 1st – 4th
- Ibom, L. A., Okon, B., Okon, F. I., and Nwambam, I. U. (2014). Morphological characterisation of giant African land snails from three Agro-ecological zones of Delta States. *Proceedings of 3rd International Conference/Workshop on Giant African Land Snail (NetGALS)*, 1st – 4th June, 2014, Abeokuta, Nigeria, Pp. 38-44
- Ikegwuonu, N. C. (2013). Snail farming as an enterprise: Training developed pamphlet by the smallholders foundation. Owerri: Smallholders Foundation.
- Jummai, A. T., & Okoli, B. J. (2013). Compositional evaluation of Giant East African Snail. *Research Journal in Engineering and Applied Science*, 2(5), 391-401.
- Malik, A., A. Aremu, G.B. Bayode, B.A. Ibrahim, (2011). A nutritional and organoleptic assessment of the meat of the giant African land snail (*Archachatina maginata swaison*) compared to the meat of other livestock, *Livest. Res, Rural Dev.* 23
- Odeyinka, S. M. (2014). Animal feed industries and snail farming. *Lecture delivered at the 3rd International Conference/Workshop on Giant Land*
- Okon, B., and Ibom, L. A. (2012). *Snail Breeding and Snailery Management*. Fresh Dew Publications, Calabar, Nigeria. Pp.1-70.

Okon, B., Ibom, L. A., Ettah, H. E., and Ukpuho, I. E. (2012). Effects of genotype, dietary protein and energy on the reproductive and growth traits of parents and F1, hatchlings of *Achatina achatina* (L.) Snails in Nigeria. *International Journal of Applied Science and Technology*, 2, 179-185.

Olomu, J. M. (2011). *Monogastric Animal Nutrition: Principles and Practice*, 2nd Edition. ST Jackson Publishers.

Rowson, B., Dixon, W. N., and Ngereza, C. F. (2010). Terrestrial mollusk of Pemba Island, Zanzibar, Tanzania and its status as an "Oceanic Island". *Zookey*, 70(1), 3-9.

Uboh, F. E., Willians, I. O., and Essien, N. C. (2014). Effect of processing on the proximate and mineral composition of *A. marginata* and *A. achatina*. *Food and Public Health*, 4(1), 10-14.

Welter, S. F. (2015). Species summary for *Helix pomatia*. Animal Base.