

Biochemical Analysis of Solenostemon Monostachyus as a Potential Feed Resource for Archachatina Marginata Snail Production in Bayelsa State

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BIOCHEMICAL ANALYSIS OF *SOLENOSTEMON MONOSTACHYUS* AS A POTENTIAL FEED RESOURCE FOR *ARCHACHATINA MARGINATA* SNAIL PRODUCTION IN BAYELSA STATE.

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Abstract

The present study investigated the biochemical composition of *Solenostemon monostachyus* leaf to evaluate its potential as a supplementary feed resource for *Archachatina archachatina* snail production in Bayelsa State, Nigeria. Proximate analysis revealed moisture (9.50%), crude protein (13.88%), crude fat (4.58%), crude fiber (4.33%), total ash (12.83%), and nitrogen-free extract (54.88%), indicating appreciable energy and protein contributions. Phytochemical analysis showed high levels of flavonoids (718.69 mg/100 g), phenols (576.98 mg/100 g), and tannins (332.48 mg/100 g), along with moderate concentrations of oxalate (63.58 mg/100 g), phytate (4.66 mg/100 g), trypsin inhibitor (320.04 mg/100 g), cyanide (1.88 mg/100 g), kaempferol (21.55 mg/100 g), and catechin (16.66 mg/100 g). Mineral analysis revealed calcium (16.83 mg/100 g), magnesium (32.09 mg/100 g), phosphorus (17.42 mg/100 g), potassium (10.57 mg/100 g), sodium (2.51 mg/100 g), and iron (6.88 mg/100 g), with trace amounts of zinc, manganese, copper, and selenium. These results demonstrate that *S. monostachyus* leaf is rich in energy, moderate in protein, and contains essential minerals critical for shell formation, growth, and reproduction in snails. Although the presence of antinutritional factors could limit nutrient bioavailability, processing methods may mitigate these effects. Overall, *S. monostachyus* exhibits promising potential as a sustainable local feed resource for enhancing snail production in Bayelsa State.

Keywords: *Solenostemon monostachyus*, biochemical composition, phytochemicals, minerals, snail nutrition.

Introduction

Snail farming (heliculture) is an emerging enterprise in Nigeria, offering a sustainable means of providing protein, employment, and income, mostly in the developing countries. The edible giant African land snail (*Archachatina archachatina*) is highly valued for its meat, which is rich in protein, iron, and essential amino acids. African land snails, are highly valued in the diets of many African tribes and beyond due to their affordability and high protein content (Wosu, 2003). Snails are recognized for their elevated levels of iron, calcium and protein, while having low fat content (Wosu, 2003; Okon & Ibom, 2012).

Snails make a substantial contribution to human existence and play a key role in ensuring food security (Akinnusi, 2002). Snail production is limited by inadequate feed resources and high competition with conventional livestock species for cereals and other feed ingredients Ebenebe *et al.*, (2017). Exploration of non-conventional, locally available plants as feed resources is vital. *Solenostemon monostachyus* (family: *Lamiaceae*), a common perennial herb found across tropical Africa, is usually used in ethnomedicine for treating inflammatory and oxidative stress-related conditions Adeyeye (2019). Its phytochemical richness suggests it may provide both nutritional and functional benefits in animal feeding systems. This study aimed to conduct a comprehensive biochemical analysis of *S. monostachyus* leaves, focusing on proximate, phytochemical, and mineral composition, to assess its potential as a feed supplement for *A. archachatina* snails in Bayelsa State.

Materials and Methods

2.1 Sample Collection and Preparation.

Fresh leaves of *Solenostemon monostachyus* 100g were collected from Niger Delta University in Bayelsa State, Nigeria. The leaves were dried in the sun, and milled into fine powder using a laboratory grinder.

2.2 Proximate Analysis: Moisture, crude protein, crude fat, crude fiber, ash, and nitrogen-free extract were determined following AOAC (2016) procedures.

2.3 Phytochemical Analysis: Quantitative determination of tannins, phenols, flavonoids, oxalates, phytates, trypsin inhibitor, cyanide, kaempferol, and catechin was carried out using spectrophotometric and titrimetric methods.

2.4 Mineral Analysis: Mineral composition (Ca, Na, K, Mg, P, Fe, Cu, Zn, Mn, Se) was determined using Atomic Absorption Spectrophotometry (AAS) after wet digestion. Phosphorus was analyzed using colorimetric methods.

Results

The proximate analysis revealed a moderate protein content (13.88%) and high carbohydrate (NFE, 54.88%), indicating potential as an energy-protein source for snails. Phytochemical screening showed high flavonoid (718.69 mg/100 g) and phenolic (576.98 mg/100 g) contents, indicating antioxidant potential, while tannins (332.48 mg/100 g) were present at moderately high levels. Other secondary metabolites such as oxalate, phytate, and cyanide occurred in tolerable limits but may require processing to reduce antinutritional effects. Mineral analysis revealed significant amounts of calcium (16.83 mg/100 g), magnesium (32.09 mg/100 g), phosphorus (17.42 mg/100 g), and potassium (10.57 mg/100 g). These minerals are essential for shell formation, enzyme activity, and

growth in snails. Trace minerals such as iron (6.88 mg/100 g), zinc (0.85 mg/100 g), and selenium (0.02 mg/100 g) further highlight its nutritional relevance.

Table 1: Proximate Analysis

<i>Solenostemon Monostachyus</i>	Proximate Analysis (%)
Moisture %	9.50
Crude Protein %	13.88
Crude Fat %	4.58
Crude Fiber %	4.33
Total Ash %	12.83
NFE %	54.88

Calculation of metabolizable Energy using Ponzenga 1985 formula

$$37 \times \% \text{ protein} + 81.8 \times \% \text{ fat} + 35.5 \times \% \text{ NFE}$$

Metabolizable energy content of Solonestemono Monostachyus

$$\text{ME (Kcal/Kg DM)} = 2,836.444$$

$$\text{Energy requirement for snail} = 2200 \text{ Kcal ME /Kg}$$

Table 2. PHYTOCHEMICAL ANALYSIS

<i>Solenostemon Monostachyus</i>	Phytochemical Analysis
Tannin (mg/100g)	332.481
Phenol (mg/100g)	576.981
Flavonoid (mg/100g)	718.686
Oxalate (mg/100g)	63.583
Phytate (mg/100g)	4.658
Trypsin inhibitor (mg/100g)	320.037
Cyanide (mg/100g)	1.878
Kaemferol (mg/100g)	21.549
Catechin (mg/100g)	16.656
Alkaloid (%)	8.87

Table 3. MINERIAL ANALYSIS

<i>Solenostemon Monostachyus</i>	Mineral analysis
Calcium Ca (mg/100g)	16.831
Sodium Na (mg/100g)	2.510
Potassium K (mg/100g)	10.573
Magnesium Mg (mg/100g)	32.086
Phosphorus P (mg/100g)	17.423
Iron Fe (mg/100g)	6.876
Copper Cu (mg/100g)	0.010
Zinc Zn (mg/100g)	0.847
Manganese Mn (mg/100g)	0.431
Selenium Se (mg/100g)	0.019

Discussion

The results demonstrate that *S. monostachyus* leaf contains sufficient nutrients to support snail growth and reproduction. The protein content (13.88%) is comparable to values reported for other leafy vegetables used in snail feeding. Its high carbohydrate level (54.88%) indicates energy adequacy for metabolic activities, while moderate fiber (4.33%) suggests potential to enhance gut health without impairing digestibility. The high flavonoid and phenolic content indicates strong antioxidant potential, which may improve snail health and resilience to oxidative stress. However, the presence of tannins and trypsin inhibitors suggests possible interference with protein utilization; therefore, processing methods such as boiling, fermentation, or sun-drying are recommended to reduce antinutritional factors. Mineral contents Calcium, magnesium, and phosphorus were present in appreciable quantities, making *S. monostachyus* valuable for shell development and reproductive efficiency in *A. archachatina*. Iron and zinc further support hematological and enzymatic functions in snails. Overall, the biochemical profile confirms that *S. monostachyus* is a nutritionally rich and locally available feed resource. Its incorporation into snail diets could reduce dependence on expensive conventional feedstuffs, thereby enhancing productivity and profitability of snail farming in Bayelsa State.

Conclusion

The study concludes that *Solenostemon monostachyus* leaf possesses significant nutritional, phytochemical, and mineral properties that make it a potential supplementary feed resource for *Archachatina archachatina* snails in Bayelsa State.

While the presence of antinutritional factors requires caution, appropriate processing can mitigate their effects. Adoption of this plant as a feed ingredient could enhance sustainable snail production and contribute to food security in Nigeria.

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