

Saponins and tannins in the species of *Stachytarpheta* found in Awka, Nigeria and their taxonomic implications

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Research Paper

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Saponins and tannins content of the three *Stachytarpheta* species present in Awka, South East Nigeria was tested so as to establish taxonomic evidence between these species. Standard phytochemical methods were used in this analysis. However, the results revealed the presence of saponins and tannins in all parts of the three *Stachytarpheta* species, thus, a reason for their placement in the same family is justified. The quantitative phytochemical results of the three *Stachytarpheta* species were analyzed. The highest saponin content was found in the leaf of *S. jamaicensis* (1.82 ± 0.025) while the

least saponin content was found in the root of *S. angustifolia* (0.14 ± 0.018). Also, the leaf of *S. cayannensis* had the highest tannin content (5.96 ± 0.015) and the least tannin content was found in the root of *S. jamaicensis* (0.99 ± 0.028). Also, the result obtained from the quantitative analyses of these species may be a significant taxonomic solution in the placement of these *Stachytarpheta* species.

Key words: *Stachytarpheta*, *Cayannensis*, *Jamaicensis*, *Angustifolia*, Phytochemicals, Saponins and Tannins.

INTRODUCTION

Verbenaceae is predominantly a tropical family exhibiting a wide range of growth habit and inhabiting diverse habitats (Lillyamma and Shah, 1987). The family has about 98 genera and 3,000 species (Idu et al., 2009). They are low shrubs, herbs or trees. Flowers are in spikes. The genus *Stachytarpheta* Vahl. belongs to the family Verbenaceae and is represented in West Africa and Nigeria by three species namely: *Stachytarpheta cayannensis* Rich. Vahl, *Stachytarpheta angustifolia* Mill. Vahl and *Stachytarpheta jamaicensis* L. Vahl (Hutchinson and Daziel, 1963).

They are economic plants and may be grown as ornamentals (Gill, 1988). Members of Verbenaceae family are popular in traditional medicine. Moreover, all the *Stachytarpheta* species have been used ethno

medically as anti-diabetic, arbotifacient, emmenagogue, sedative, antihypertensive, anti-asthmatic and anti-fever (Schwontkowschi, 1993).

Stachytarpheta is an erect and branched half-woody plant, with stem slightly angled. The leaves are elliptic to oblong-ovate and 2 to 10 cm long. The leaf tips are pointed with toothed margins. The leaf base is decurrently on the petiole.

The spikes are terminal, rather slender, 10-30 cm long, 3-4 mm thick, green and continuous. The calyx is small, oblique and 4-toothed. The corolla is deep-blue or blue-purple, 1 cm long. The fruit is enclosed in the calyx and oppressed to and somewhat sunk in the rachis which is smooth, oblong and about 4mm long (Idu et al., 2009).

Phytochemistry is a systematic line of evidence and is

Table 1. Preliminary phytochemical analysis on *S.jamaicensis*.

Phytochemical component	Test	Observation	Inference		
			Leave	Stem	Root
Tannin	Ferric chloride test	Greenish-black	+	+	+
Saponin	Emulsion test	Presence of emulsion	+	+	+

+ presence

Table 2. Preliminary phytochemical analysis of *S. cayannensis*.

Phytochemical component	Test	Observation	Inference		
			Leave	Stem	Root
Tannin	Ferric chloride test	Greenish-black	+	+	+
Saponin	Emulsion test	Presence of emulsion	+	+	+

+ presence

Table 3. Preliminary phytochemical analysis of *S. angustifolia*.

Phytochemical component	Test	Observation	Inference		
			Leave	Stem	Root
Tannin	Ferric chlorides test	Greenish-black	+	+	+
Saponin	Emulsion test	Presence of emulsion	+	+	+

+ presence

also used in combination with other systematic lines of evidence which include but not limited to anatomy (Leaf, Stem and root), biosystematics, cytology, ecology, edaphic, genetics, gross morphology, palynology and phytogeography (Bowsher et al., 2008). Relatively, apart from physiognomic characters, phytochemicals, just like anatomical properties of plant parts are sources for taxonomic inferences in different groups of flowering plants (Stace, 1980; Harborne, 1973; Bowsher et al., 2008).

The objective of this research however, is to establish the presence and quantity of saponin and tannin in the species of *Stachytarpheta* and to ascertain the significance of these constituents as a taxonomic tool in the delineation of the species.

MATERIALS AND METHODS

Samples of *S.cayannensis* and *S.jamaicensis* were collected from Nnamdi Azikiwe University Premises. *S.angustifolia* was collected from Adabebe village in Amawbia Community; Awka South L. G. A. Samples of *S. cayannensis*, *S. angustifolia* and *S. jamaicensis* collected were properly and authenticated by Prof. J.C Okafor and vouchers deposited at the Herbarium, Department of Botany, Nnamdi Azikiwe University, Awka. The plant samples were air-dried and ground into a uniform powder

using a Thomas-Wiley milling machine. The aqueous extract of each sample was prepared by soaking 100 g of dried powder samples in 200 ml of distilled water for 12 h. The extracts were filtered using Whitman filter paper No 42 (125 mm). Chemical tests were carried out on the aqueous extract and on the powder specimens using standard procedures to identify the constituents as described by (Harborne, 1973; Sofowora, 1993; Trease and Evans, 1996).

RESULTS

Table 1 Shows the presence of the tested constituents on the leaves, stem and root of *S.jamaicensis* but steroid was absent in all parts of the plant. Table 2 Shows the presence of the tested constituents on the leaves, stem and root of *S.cayannensis* but steroid was absent in all parts of the plant. Table 3 Shows the presence of the tested constituents on the leaves, stem and root of *S.angustifolia* but steroid was absent in all parts of the plant.

Table 4 shows that the highest saponin content was found in the leaf of *S. jamaicensis* (1.82 ± 0.025) while the least saponin content was found in the root of *S. angustifolia* (0.14 ± 0.018); the analysis of variance showed a significant difference in the saponin content among plant parts and between *Stachytarpheta* species

Table 4. Quantitative phytochemical on root, stem and leaf of *Stachytarpheta* species.

Treatment	Saponin	Tannin
<i>S. angustifolia</i> (Leaf)	1.17 ± 0.022 ^l	5.00 ± 0.021 ^g
<i>S. angustifolia</i> (Stem)	0.35 ± 0.025 ^c	3.13 ± 0.016 ^d
<i>S. angustifolia</i> (Root)	0.14 ± 0.018 ^a	1.70 ± 0.011 ^b
<i>S. cayannensis</i> (Leaf)	0.92 ± 0.015 ^e	5.96 ± 0.015 ⁿ
<i>S. cayannensis</i> (Stem)	0.50 ± 0.031 ^d	3.07 ± 0.019 ^d
<i>S. cayannensis</i> (Root)	0.32 ± 0.028 ^{bc}	4.48 ± 0.028 ^l
<i>S. jamaicensis</i> (Leaf)	1.82 ± 0.025 ^g	4.14 ± 0.003 ^e
<i>S. jamaicensis</i> (Stem)	0.86 ± 0.029 ^e	2.24 ± 0.001 ^c
<i>S. jamaicensis</i> (Root)	0.28 ± 0.017 ^b	0.99 ± 0.028 ^a
Part of plant	**	**
<i>Stachytarpheta</i> species	**	**

Results are in Mean ± STD,*Columns with the same superscript (or sharing a common letter) are not significantly different.

($p < 0.05$). Also, the leaf of *S. cayannensis* had the highest tannin content (5.96±0.015) and the least tannin content was found in the root of *S. jamaicensis* (0.99±0.028); the analysis of variance showed a significant difference in the tannin content among plant parts and among *Stachytarpheta* species ($p < 0.05$).

DISCUSSION

The tannin and saponin content of the three *Stachytarpheta* species present in Awka, South East, Nigeria was tested so as to establish taxonomic evidence. Relatively, Phytochemistry is a systematic line of evidence and is also used in combination with other systematic lines of evidence which include but not limited to anatomy (Leaf, Stem, root), biosystematics, cytology, ecology, edaphic, genetics, gross morphology, palynology, phytogeography (Stace, 1980). From the result above, tannin was present in all parts of the three *Stachytarpheta* species, thus, a reason for their placement in the same family. However, Hegnauer, (1989) observed that for the family *Euphorbiaceae*, secondary metabolites such as alkaloids, cyanogenic glycosides, diterpenes, glucosinolates, tannins and triterpenes are the most common metabolites of taxonomic importance of the suprageneric levels.

On the other hand, the presence of saponin was also tested. Hence, saponin was absent in all the parts of *S.angustifolia*, *S.jamaicensis* and *S.cayannensis*, this however, can be used to place the three species of *Stachytarpheta* in the same family. More so, David, (1994) reported that phytochemical data provide much useful information concerning relationship both within the *Euphorbiaceae* and between this family and relatives.

Generally, chemical identification of specific compounds will provide a greater insight into the relationships and differences among plant taxa (Akpabio, 1998). The presence or absence of secondary

metabolites and the biosynthetic pathways responsible for their production are useful for establishing taxonomic relationships (Domingues et al., 1988). Earlier attempts have been made in several fields of Biology to place the taxonomic relationships of species upon a firm physico-chemical foundation (Webster, 1994).

CONCLUSION AND RECOMMENDATION

The analysis however, revealed the presence of saponin and tannin in all parts of the three *Stachytarpheta* species. This also may be used to support the taxonomic relationship that exists between the species of *Stachytarpheta* found in Awka, South Eastern Nigeria.

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REFERENCES

- Akpabio KE (1988). Crude protein electrophoresis of seeds of eight species of *Crotalaria* L. Nig J Bot. 1:106-111.
- Bowsher CG, Steer MW, Tobin AK (2008). Plant Biochemistry. 2nd ed. Garland Science, Taylor & Francis Publishers (New York). p. 48-210.
- Domingues RM, Kaita MC, Avelar E, Souza KES, Moraes WDGS, Franco EN (1988). Characterization of exposed outer membrane protein in environmental and human bacteroides fragile strains. Zbl Bakt. 287(4):331-341.
- Gill LS (1988). Taxonomy of flowering plants. Africana FEB Publishers. Bamenda (Cameron). Pp. 55-70.
- Harborne JB (1973). Phytochemical Methods. A Guide to Modern Techniques of Plant Analysis. Chapman and Hall Publishers, (London). p. 40-75.
- Hegnauer R (1989). Euphorbiaceae. In: Chemotaxonomic. Birkhauser Verlag, der Pflanze (Basel). Pp. 440-474.
- Hutchinson J, Dalziel JM (1963). Flora of west tropical Africa. 2nd ed.

- Crown Agents Publishers, (London).
- Idu M, Erhabor JO, Odiá EA (2009). Morphological and Anatomical studies of the leaf and stem of some medicinal plants *Stachytarpheta jamaicensis* (L) vahl and *S.cayannensis* (L.C. Rich). Schav-ethnobotanical leaflets. 13:1417-1425.
- Lillyamma, M., and G.L. Shah (1987). Anatomical contributions to the taxonomy of some Verbenaceae: Petiole. Roc. Indian Acad. Sc. (Plant Science). 97(3):235-246.
- Schwontkowschi D (1993). Herbs of the Amazon Traditional and Common Uses. Science Student Brain Trust Publishing, (New York).
- Sofowora A, (1993). Medicinal plants and traditional medicine in Africa. 2nd ed. Spectrum Books Publisher, Ibadan (Nigeria).
- Stace CA (1980). Plant Taxonomy and Biosystematics. Edward Arnold Publishers, (London). p. 88-112.
- Trease GE, Evans WC (1996). A Text Book of Pharmacology. 14th ed. Bailliere Tindall Publishers (London).
- Webster GL (1994). Classification of the *Euphorbiaceae*. Ann. Missouri Bot. Gard. 81(1):3-32.