Journal of Research in Chemistry

**E-ISSN:** 2709-9423
**P-ISSN:** 2709-9415
JRC 2022; 3(1): 20-23

www.chemistryjournal.net
Received: 08-10-2021
Accepted: 16-11-2021

**Azuaga IC**
Department of Chemical Sciences, Taraba State University, Jalingo, Nigeria

**Azuaga TI**
Department of Chemical Sciences, Federal University, Wukari-Nigeria

**Ushie OA**
Department of Chemical Sciences, Federal University, Wukari-Nigeria

**Ugwuja DI**
Department of Chemical Sciences, Federal University, Wukari-Nigeria

**Longbap BD**
Department of Chemical Sciences, Federal University, Wukari-Nigeria

**Correspondence**
**Azuaga TI**
Department of Chemical Sciences, Federal University, Wukari-Nigeria

# Preliminary phytochemical screening and proximate composition of ethyl acetate and hexane leaf extracts of Benn (*Thaumatococcus daniellii*)

**Azuaga IC, Azuaga TI, Ushie OA, Ugwuja DI and Longbap BD**

**Abstract**
Preliminary phytochemical analysis and proximate composition of ethyl acetate and hexane leaf extracts of *Thaumatococcus daniellii* was studied. Standard procedures were followed to analyze the phytochemical and proximate composition of the sample in this present study. The results indicated that flavonoids and alkaloids were present in both ethyl acetate and hexane extracts, while tannis were absent in ethyl acetate but present in hexane extract. Phlobatannis, steroids, saponnis and phenols were completely absent in all the extracts. The proximate analysis of the leaf revealed that *Thaumatococcus daniellii* contained 9.5% moisture content, 22.7% ash content, 5.0% crude fat, 31.5% crude protein, 7.6% crude fibre and 23.8% carbohydrate. From the findings of this study, the phytochemicals and proximate composition shown by this plant extract (*Thaumatococcus daniellii*) underscores the nutritional and medicinal benefits, and support its application in the treatment of health conditions like diabetes mellitus as well as a useful antidote against venoms from snake bites and stings.

**Keywords:** Phytochemical screening, proximate composition, ethyl acetate, hexane, *Thaumatococcus daniellii*

## Introduction
Globally, there is the gradual shift toward the desire to produce and consume products from natural precursors. This is because of the many perceived health benefits associated with natural products; natural products chemistry has continued to gain acceptability due to a wide range of products gotten especially from plant parts like fruits, leaves, bark, roots, flowers etc.

According to WHO [1], the adoption of medicinal plants in the treatment of diseases especially in Africa account for about 80% of the world population; not only that, the dependence of developing countries on medicinal plants as a sole means of primary healthcare is estimated to be around 90% [2]. However, Jimoh [3] believes that this trend is not peculiar to developing countries alone as statistics has shown that over 50% of modern drugs worldwide are from natural sources, this view has been collaborated by Baker *et al*. [4] that the development of the pharmaceutical industry depends to a larger extent on natural products. Similarly, the deployment of plant-based materials in the formulation of drugs in pharmacopeia has been reported to be up to 25% [5].

Medicinal plants are such plants that have components that hold the potentials for therapeutic applications and therefore, can be used in the synthesis of valuable drugs (6). Usually, the physiological action of bioactive components of these plants on human beings defines their medicinal value [7].

*Thaumatococcus danielli* is a plant species predominant in most West African countries. It belongs to the family Marantaceae, and known to be a natural source of thaumatin, useful in the formulation of sweetners. Its leaves are used in wrapping food by the locals, as well as weaving of mats and in roofing [8]. The plant is able to grow not only in the tropical rain forest and coastal areas, but also in the hot and humid areas of West Africa. It uses the twigs of the forest as its natural habitat.

*Thaumatococcus danielli* is either cultivated or grow wild; the plant can be found in West African countries like Nigeria, Ivory Coast, and Ghana. In Nigeria, the leaves are known by the locals as katemfe, moi moi leaves, or ewe and it is used in wrapping food, weaving of mats as well as roofing material [9]. There have also been claims in the traditional medical practice that the sap of *Thaumatococcus daniellii* leaf has a soothing effect, an effective

antidote against venoms from snake bites, and stings [10].

## Materials and Methods

### A. Collection and Preparation of Sample

Naturally grown leaves of *Thaumatococcus daniellii* from Wukari local government area of Taraba State were collected for this present study. The leaves were air dried for a period of 3 weeks, then pulverized and sieved using a 0.05 mm pore size sieve. Using cold maceration in the extraction, 100 g of the sample was soaked in 250 mL ethyl acetate for 4 days; frequent agitation was used to ensure the dissolution of all soluble matter. Thereafter, the mixture was filtered and the filtrate concentrated by evaporation and kept overnight in a vacuum at room temperature to remove residual solvent. This procedure was then repeated on the residue using hexane.

### B. Preliminary Phytochemical Screening

The analysis of the leaf of *Thaumatococcus daniellii* to identify the phytochemicals present was carried out using the extracts and following standard procedures reported by different researchers [11-13] as follows;

#### Test for Flavonoids

Testing for the presence of flavonoids was done using the alkaline reagent and Lead acetate tests.

#### Alkaline reagent test

Here, the extract was treated with few drops of 2 M sodium hydroxide solution. The presence of intense yellow colouration which turns colourless upon addition of 1% HCl solution, confirms the presence of flavonoids.

#### Lead acetate test

The test was achieved by treating the extracts with few drops of lead acetate solution. The formation of a yellow precipitate shows the presence of flavonoids.

#### Test for Alkaloids

Mayer's and Wagner's tests were both used in detecting the presence of alkaloids in the extracts after dissolving the extracts separately in 1% hydrochloric acid solution.

#### Mayer's test

About 5.0 g Potassium iodide (Mayer's reagent) was used in treating the filtrate. The presence of a alkaloids gave a yellow precipitate.

#### Wagner's test

Here, 3.0 g potassium iodide (Wagner's reagent) was used. The presence of alkaloids was detected by the formation of reddish/brown precipitate.

#### Test for Phlobatannins

The test for the presence phlobatannins was achieved by boiling a portion of the extract with 1% aqueous HCl. The presence of phlobatannins was detected with a deposit of red precipitate.

#### Test for steroids

The presence of steroids in the extracts was detected by adding 5 drops of concentrated $H_2SO_4$ to 1 mL of each extract in a test tube. The formation of red colouration confirms the presence of steroids.

#### Test for Saponins

This was achieved in two ways by deploying both Froth Test and Foam experiments.

#### Froth experiment

The extract was diluted to 20 ml using distilled water, followed by shaking in a graduated cylinder for a period of 15 minutes. A layer of foam of about 1 cm indicates the presence of saponins.

#### Foam experiment

About 0.5 g of the extract was shaken using 2 ml of water. The persistence of foam for up to 10 minutes signifies the presence of saponins.

#### Test for Tannins

Distilled water was added to a small quantity of the extract and heated on a water bath. The mixture was then filtered, followed by the addition of ferric chloride. The formation of a blue black or brownish green colouration shows that tannins are present.

#### Test for Phenols

This was achieved by adding 2 mL of distilled water to 1 mL of the extract, followed by the addition to the mixture of 2 drops of 10% ferric chloride. A blue or black colour formation indicates the presence of phenols.

### C. Proximate Analysis

The proximate analysis of *T. daniellii* leaf was done using the standard procedures of Association of Official Analytical Chemists [14] and reported by Okpaegbe, *et al*. Ajayi and Ojelere, [15, 16]. The data for the proximate composition was recorded in percentage. The moisture content of the sample was determined by weighing the sample into a crucible and drying at a temperature of 105 $^0$C using an oven. Ashing at about 550 $^0$C was done to determine the ash content; this was carried out for a period of 3 hours. The protein content was estimated using kjeldah procedure; the nitrogen value multiplied with a conversion factor of 6.25. Following a successful digestion of the sample, the crude fibre content was estimated, crude fat was done by soxhlet extraction procedure. The difference of the sum of all the proximate compositions from 100% then gave the measure of the carbohydrate content.

## Results and Discussion

### A. Preliminary Phytochemical Screening

The results obtained from phytochemical screening of ethyl acetate and hexane extracts of *Thaumatococcus daniellii* leaves as shown on Table 1, indicated the presence of flavonoids and alkaloids in both the extracts, while tannis were absent in ethyl acetate but present in hexane extract. Phlobatannis, steroids, saponnis and phenols were completely absent in all the extracts.

Flavonoids have been reported to be important water soluble antioxidants with free radical scavenging activity that prevents cell damage through oxidation. They are also reported to have the ability to inhibit tumour growth as well as anticancer activity [13]. Flavonoids components present in fruits, vegetables, tea and red wine have all been found to be helpful to the body more than known nutrients and vitamins [17].

Alkaloids have been reported to exhibit microbiocidal effect as well as anti-diarrheal action, antihypertensive, anti-inflammatory and anti-fibrogenic actions [7]. Studies have also shown that some alkaloids exhibits useful activity against HIV/AIDS as well as associated intestinal infections [18]. Therefore, with the presence of alkaloids in *Thaumatococcus daniellii* it is highly recommendable for patient with diarrheal and small intestine problems. Tannins can however show toxicity towards filamentous fungi, yeast and bacterial; hence their presence in plants therefore offers them the ability to be useful medicine; this is because, tannin as a bioactive component has the ability to hasten the process of wound healing. Their usage as antimicrobial, anti-inflammatory and antioxidants has all been attributed to their astringency property [19].

**Table 1:** Result of Phytochemical screening

| Phytochemicals | Reagents | EAE | HE |
|---|---|---|---|
| Flavonoids | Extract + NaOH | + | - |
| | Extract + Lead acetate | + | + |
| Alkaloids | Mayer | + | + |
| | Wagner | + | + |
| Phlobatannins | extract + 2% HCl | - | - |
| Steroids | extract + $H_2SO_4$ | - | - |
| Saponins | Froth test | - | - |
| | Foam test | - | - |
| Tannins | extract +$H_2O$+$FeCl_3$ | - | + |
| Phenols | extract +$H_2O$+ $FeCl_3$ | - | - |

Key: HE= Hexane Extract, EAE= Ethyl Acetate Extract, + = present, - = absent

### B. Proximate Composition

The proximate analysis of *Thaumatococcus daniellii* leaf (in %) shown on Table 2 gave the composition of the sample as follows; 9.5% moisture, 22.7% ash content, 5.0% crude fat, 31.5% crude protein, 7.6% crude fibre and the 23.8% carbohydrate. The proximate composition of *T. daniellii* leaf shows that the leaf is beneficial both in terms of nutrition and health wise. An ash content of 22.7% is indicative of the minerals present in the leaf. The crude protein of 31.5% and 23.8% carbohydrate shows that the leaf is an alternative source of dietary protein and carbohydrate. Carbohydrates especially have been reported to be a major component in many foods, and providing energy to the body. A combination of low fat content of 5.0% and 7.6% crude fibre suggests that the leaf can enhance metabolism in the intestine and prevent common disorders associated with the intestine; disorders such as colon, rectum carcinoma and constipation [20]. The result of the moisture content, fat and crude fibre are lower compared to 10.67%, 17.21% and 24.61% respectively reported by other researchers [21]. Based on this present study, *T. daniellii* leaf have been found to be good sources of carbohydrate capable of providing high energy values to both humans and livestock.

**Table 2:** Result of Proximate analysis of *T. daniellii* leaf

| Component` | Percentage (%) |
|---|---|
| Moisture content | 9.5 |
| Crude protein | 31.5 |
| Crude fibre | 7.6 |
| Ash content | 22.7 |
| Crude fat | 5.0 |
| Carbohydrate | 23.8 |

## Conclusion

The use of plant parts as sources of most drugs have contributed in no small measure to the development of pharmaceutical industry. The preliminary phytochemical screening of *T. daniellii* leaf indicated that flavonoids, alkaloids and tannins were all present; while the proximate analysis revealed that the leaf is very rich in protein and carbohydrate contents. The results also show that with further research on the plant, novel bioactive compounds can be isolated and characterized for maximum utilization of the plant. The phytochemical and proximate composition of the leaf in this study offers further scientific basis for the use of the plant for medicinal purpose in Nigeria treating diabetes mellitus and as an antidote against venoms from snake bites, stings and therefore, can be utilized in the synthesis of useful pharmaceutical products.

## Acknowledgments

This research was not funded by any external funding agency; however the authors are very thankful for the support of all the members of the Organic research groups, Federal University Wukari & Taraba State University Jalingo, for their contributions in making this paper a success.

## References

1. WHO. Legal Status of Traditional Medicine and Complimentary/Alternative Medicine: A worldwide review. 2001; WHO Publishing 1.
2. WHO. Traditional Medicine – Growing Needs and Potentials. WHO Policy Perspective Medicine, 2002.
3. Jimoh SO. Sustaining the roles of Non-timber forest products in Rural Poverty Reduction and household food security in Nigeria. Journal of Fisheries. 2006;1(2-4):63-69.
4. Baker JT, Borris RP, Carte B, Cordell GA, Soejarto DD, Cragg GM, *et al*. Natural product drug discovery and development: New perspective on international collaboration. Journal of Natural Products. 1995;58:1325-1327.
5. FAO. Food and Agricultural Organization. *Nonwood News:* An Information Bulletin on Non-wood Forest Products, 2000, 25.
6. Sofowora EA. Medicinal plant and traditional medicine in Africa. John Wiley and sons limited, 2008, 1-10.
7. Abiodun BA, Adewale A, Abiodun OO. Phytochemical and Proximate Analysis of Some Medicinal Leaves. Clinical Medicine Research. 2017;6(6):209-214.
8. Ojekale AB, Makinde SCO, Osileye O. Phytochemistry and anti-microbial evaluation of *Thaumatococcus danielli*, Benn. (Benth.) leaves. Nigerian Food Journal. 2007;25:176-183.
9. Adeyemi TO, Idowu A, Ogboru RO, Iyebor WE. Phytochemical screening, nutritional and medicinal benefits of Thaumatococcus danielli Benn (Benth.) International Journal of Applied Resources and Technology, 2014, 92-97.
10. Onwueme IC, Onochie BE, Sofowora EA. Cultivation of *Thaumatococcus danielli*-the sweetener. World Crops. 1979;31:321-335.
11. Ushie OA, Adamu HM. Phytochemical Screening of Borreria verticillata. Journal of Agriculture, Biotechnology and Ecology. 2012;3(1):108-117.

12. Ushie OA, Neji PA, Muktar M, Ogah E, Longbab BD, Olumide VB. Estimation of Some Phytochemicals in Swietenia macrophylla Leaves. Journal of Pharmaceutical Research and Reviews, 2018;2:15.
13. Ushie OA, Neji PA, Abeng FE, Azuaga TI, Aikhoje EF, Aji DL. Phytochemical Screening and Antimicrobial Activity of the Acetone and Methanol Leaf Extracts of Physalis angulate. Records of Chemical Sciences. 2019;1(3):6-12.
14. AOAC. Official Methods of Analysis of the ssociation of Official Analytical Chemists, 17th edition. Association of Official Analytical Chemists, Arlington, Virginia, 2003.
15. Okpaegbe UC, Magomya AM, Azuaga TI, Egah GO, Kaaer SN. Proximate Analysis And Phytochemical Screening Of Breadfruit (*TreculiaAfricana*) Seed Oil. *The International Journal of Engineering and Science (IJES)*, 2021;10(2): 71-76
16. [16] Ajayi, I.A., and Ojelere, O.O. Phytochemical Screening, Proximate analysis and Antimicrobial Activity of aqueous extract of Megaphrynium macrostachyum seeds. *International Journal of Engineering Research & Technology (IJERT). 2013;*2(9): 2123- 2131
17. Ushie OA, Okpashi VE, Azuaga TI, Iyen SI, Aikhoje EF, Lajaka JI. Phytochemical Screening and Antimicrobial Activities of Leaf Extracts of Mucuna Pruriens. Journal of Pharmaceutical and Allied Sciences. 2019;16(4):3124-3129.
18. McDevitt JT, Schneider DM, Katiyar SK, Edlind FS. Berberina: A candidate for the treatment of diarrhea in AIDS patients abstract. In program and Abstracts of the 36th Interscience conference on Antimicrobial Agents and Chemotherapy. American Society for Microbiology, Washington, DC, 1996.
19. Savithramma N, Linga RM, Suhrulatha D. Qualitative and quantification analysis of phytochemicals from leaf aqueous extract of *Allamanda cathartica* L. and *Terminalia paniculata* Roth. JPR: BioMedRx: An International Journal. 2013;1(8):821-825
20. Showemimo FA, Olarewaju JD. Agro-nutritional determinants of some garden egg varieties (*Solanium gilo* L.). Journal of Food Technology. 2004;2:172-175.
21. Shalom NC, Adetayo YO, Samuel TP, Bolaji JD, Tamunotonyesia E. Analyses of the Leaf, Fruit and Seed of *Thaumatococcus daniellii* (Benth.): Exploring Potential Uses. Pakistan Journal of Biological Sciences. 2014;17:849-854.