

PROXIMATE ANALYSIS AND PHYTOCHEMICAL SCREENING OF ACETONE AND METHANOL LEAF EXTRACTS OF THAUMATOCOCCUS DANIPELLII

Azuaga T.I.*, Ushie O. A., Longbap B.D., Iyen S. I. and Nuhu B.E.

Department of Chemical Sciences, Federal University Wukari-Nigeria.

*Corresponding Author: Azuaga T.I.

Department of Chemical Sciences, Federal University Wukari-Nigeria.

Article Received on 13/10/2021

Article Revised on 03/11/2021

Article Accepted on 24/11/2021

ABSTRACT

Thaumatococcus daniellii leaves are commonly used for wrapping foods. To fully utilize the potentials of the plant, proximate analysis and phytochemical screening of acetone and methanol extracts of the leaf was studied. The proximate analysis of the leaf revealed that the sample contained 9.50% moisture content, 22.69% ash, 5.0% fat, 31.50% protein, 7.56% crude fibre and 23.75% carbohydrate. The result of phytochemical screening revealed the presence of flavonoids, alkaloids, and saponins in both acetone and methanol extracts. Phlobatanins and steroids were present only in acetone extract, while tannins were found only in methanol extract. Phenols were completely absent in all the extracts. The leaf is very rich in protein and carbohydrate with significant nutritional and medicinal benefits.

KEYWORDS: Phytochemical screening, proximate analysis, *Thaumatococcus daniellii*, acetone, methanol.

INTRODUCTION

Thaumatococcus daniellii is a monocotyledonous herb that is either cultivated or grow wild, and it is mostly found in the tropical rain forest and coastal areas of West Africa. 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 mostly used as food wrappers by local food industry while the petiole is weaved into mats and also used as building material (Adeyemi, *et.al*, 2014).

Thaumatococcus daniellii as a plant according to Arowosoge and Popoola, (2006); Osemeobo, (2005) contributes to the economy of the rural people in most parts of southern Nigeria through its stalks, leaves, fruits and rhizomes. The stalks are used for weaving, leaves for food wrapping and the fruits for sweetening drinks and foods. There have also been claims in the traditional medical practice that the sap of *Thaumatococcus daniellii* leaf stalk is used as a sedative and an antidote against venoms, stings and bites, while its root sap is used for the treatment of mental retardation (Onwueme, 1979).

Despite the huge potentials the plant holds, the full utilization of the leaves has been hampered due to scanty knowledge of it uses especially among the rural dwellers. This research is therefore carried out to add to the

available scientific proof on its phytochemistry as well as the nutritive benefits of the plant.

MATERIALS AND METHODS**Sample Collection and Preparation**

The leaves were obtained from a local market in Wukari local government area of Taraba state, Nigeria. The sample was air dried for three weeks then milled into fine powder using milling machine and passed through a 0.05 mm pore sized sieve. The method of cold maceration was used in the extraction. The leaves extract was prepared by soaking 100g of the sample in 250ml acetone for four days with frequent agitation until soluble matter is dissolved. The resulting mixture was filtered using filter paper and the filtrate was concentrated by evaporation using rotary evaporator, kept in a vacuum oven overnight at room temperature to remove the residual solvent and weighed. The procedure was repeated on the residue using methanol. The sieved powdered sample and extracts were kept in the refrigerator until required for testing.

Proximate Analysis

The proximate composition of the leaf of *T. daniellii* was determined by the official method of the Association of Official Analytical Chemists (AOAC, 1984 and 1990) and reported by Shalom, *et.al*, 2014; Ajayi and Ojelere, 2013. The proximate values were reported in percentage. Determination of moisture content was done by weighing the sample in crucible and drying in oven at 105°C, until

a constant weight was obtained, determination of ash content was done by ashing at 550°C for about 3 hours. The kjeldah method was adopted in the determination of the protein content by multiplication of the nitrogen value with a conversion factor of 6.25. The crude fibre content of the samples was determined by digestion method and the crude fat was done by Soxhlet extraction method. Total soluble carbohydrate was determined by the difference of the sum of all the proximate composition from 100 %.

Phytochemical Screening

Screening and identification of bioactive chemical constituents in the leaf of *T. daniellii* were carried out on the extracts using the standard procedures as described by Ushie and Adamu (2012), Ushie *et al.*, (2018) and Ushie *et al.*, (2019) as follows;

Test for Flavonoids

Testing for the presence of flavonoids was achieved by the alkaline reagent and Lead acetate tests.

Alkaline reagent test

In the Alkaline reagent test, the extract was treated with few drops of 2M sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of 1% hydrochloric acid solution, indicates the presence of flavonoids.

Lead acetate test

In the Lead acetate test extracts were treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of flavonoids.

Test for Alkaloids

Alkaloids were detected using both the Mayer's and Wagner's tests. Extracts were dissolved individually in 1% hydrochloric acid solution and filtered.

Mayer's test

The Mayer's test was done by treating filtrates with Mayer's reagent (5.0 g Potassium iodide). Formation of a yellow coloured precipitate indicates the presence of alkaloids.

Wagner's test

In the Wagner's test filtrates were treated with Wagner's reagent (Potassium iodide 3.0 g). Formation of brown/reddish precipitate indicates the presence of alkaloids.

Test for Phlobatannins

A portion of each extract was boiled with 1% aqueous HCl. The solutions were observed for a red deposit of precipitate signifying the presence of phlobatannins.

Test for steroids

About 5 drops of concentrated H₂SO₄ was added to 1 mL of each extract in a test tube. The solutions were

observed for a red colouration indicating the presence of steroids in the extracts.

Test for Saponins

This was done by the Froth Test and Foam test.

Froth test

In the Froth test, the extract was diluted with distilled water to a 20 ml volume. This was shaken in a graduated cylinder for 15 minutes. Formation of 1 cm layer of foam indicates the presence of saponins.

Foam test

In the Foam test, exactly 0.5 g of the extract was shaken with 2 ml of water. If the foam that was produced persists for ten minutes, this indicates the presence of saponins.

Test for Tannins

A small quantity of the extract was mixed with distilled water and heated on a water bath. The mixture was filtered and ferric chloride was added to the filtrate. A blue black or brownish green indicate the presence of tannins.

Test for Phenol

To 1ml of the leaf extract 2ml of distilled water was added followed by a two drops of 10% ferric chloride. Formation of blue or black colour indicates the presence of phenols.

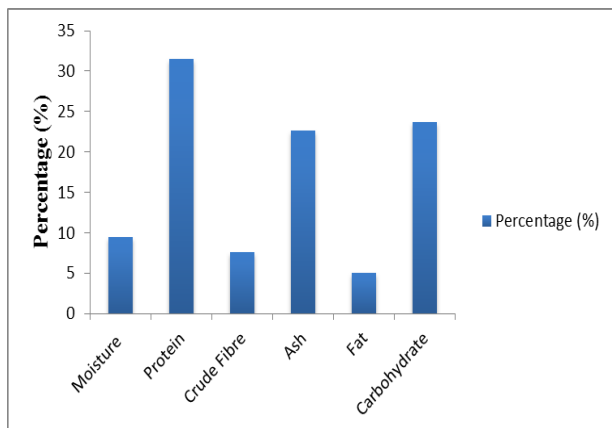
RESULTS AND DISCUSSION

Proximate Analysis

From the result of proximate analysis of *Thumatococcus daniellii* leaf shown on Table 1 and Figure 1, the moisture content was 9.50%, 22.69% ash content, 5.0% fat, 31.50% protein, 7.56% crude fibre and 23.75% carbohydrate. This result is an indication that *T. daniellii* leaf contains relatively low moisture, fat and crude fibre contents; but high ash, protein and carbohydrate contents. The high ash content determined suggests that *T. daniellii* leaf could be a good source of mineral elements. The result of the moisture content, fat and crude fibre are lower compared to 10.67%, 17.21% and 24.61% respectively reported by Shalom, *et.al.*,(2014). The *T. daniellii* leaf contain a considerable amount of fibres which is very helpful for digestion and for effective elimination of wastes, and can lower the serum cholesterol, the risk of coronary heart disease, hypertension, constipation, diabetes, colon and breast cancer (Ishida *et al.*, 2000).The high protein and carbohydrate content of the leaf is an indication that the leaf can be used an alternative source of dietary protein and carbohydrate. Carbohydrates especially are known to be important components in many foods, and the digestible carbohydrates are considered as an important source of energy. The findings of this study revealed that *T. daniellii* leaf are very good sources of carbohydrate with high energy values which gives the needed energy for good living of human and livestock

Table 1: Result of Proximate analysis of *T. daniellii* leaf.

Component	Percentage (%)
Moisture	9.50
Protein	31.50
Crude Fibre	7.56
Ash	22.69
Fat	5.00
Carbohydrate	23.75

**Figure 1: A plot of Proximate analysis of *T. daniellii* leaf.**

Preliminary Phytochemical Screening

The result of the phytochemical screening of acetone and methanol leaf extracts of *Thaumatococcus daniellii* revealed the presence of flavonoids, alkaloids, phlobatannins, steroids, saponins and tannins. Flavonoids, alkaloids and saponins were found in both acetone and methanol extract; phlobatannins and steroids were present only in acetone extract while tannins were detected only in methanol extract. Phenols were completely absent in both acetone and methanol extracts. These show that *T. daniellii* leaf contain bioactive components of medicinal value.

Alkaloids, flavonoids and steroids have been reported to have diuretic properties, thereby having the capacity to function as anti-inflammatory, antispasmodic, and anti-analgesic agents (Savithamma, *et.al*, 2011). Saponins are widely reported as very important precursors of therapeutic drugs such as cortisones and contraceptive oestrogens, and they are also mild detergents used in intracellular histochemistry staining to allow antibody access to intercellular protein (Ushie, *et. al*, 2019). Saponins also possess antioxidant, anticancer, anti-inflammatory properties as well as have the capacity to induce weight loss (Masola, *et. al*, 2008). Tannins as a bioactive component have the ability to fasten the process of wound healing and inflamed mucous membrane (astringency property). This property has made tannins very useful in nutrition, health and medicine mainly because of their physiological properties such as antioxidant, antimicrobial and anti-inflammatory properties (Savithamma, *et.al*, 2013).

Table 2: Result of Phytochemical screening of *T. daniellii* Leaf.

Phytochemicals	Reagents	ME	AE
Flavonoids	Extract + NaOH	+	+
	Extract + Lead acetate	-	+
Alkaloids	Mayer	+	+
	Wagner	+	+
Phlobatannins	extract + 2% HCl	-	+
Steroids	extract + H ₂ SO ₄	-	+
Saponins	Froth test	+	+
	Foam test	+	+
Tannins	extract +H ₂ O+FeCl ₃	+	-

Key: ME= Methanol Extract, AE= Acetone Extract, + = present, - = absent.

CONCLUSION

The leaf of *Thaumatococcus daniellii* have shown to have high nutritional value, and can be conveniently incorporated in the production of animal feeds owing to its high protein and carbohydrate contents. The detection of some phytochemicals such as flavonoids, alkaloids, steroids, tannins, saponins and phlobatannins is an indication that *Thaumatococcus daniellii* leaves can be used in the formulation of useful pharmaceutical products there by, validating the use of this plant parts in the traditional treatment of diseases in Nigeria.

REFERENCES

- Adeyemi, T.O., Idowu, A., Ogboru, R.O., and Iyebor, W.E. Phytochemical screening, nutritional and medicinal benefits of *Thaumatococcus daniellii* Benn (Benth.) *International Journal of Applied Resources and Technology*, 2014; 92-97.
- 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.
- AOAC. Official Methods of Analysis, Association of Official analytical Chemists 14th Edition. Arlington, VA, 1984.
- AOAC, Official Methods of Analysis: Association of Analytical Chemistry. 5th Edn., AOAC Inc., Washington, DC, USA., 1990.
- Arowosoge, O.G.E., and Popoola, L. Economic analysis of *Thaumatococcus daniellii* (Benn.) Benth. (Miraculous berry) in Ekiti State, Nigeria. *Nigerian Journal of Food Agriculture and Environment*, 2006; 41: 264-269.
- Ishida, H., Suzuno, H., Sugiyama, N., Innami, S., Todokoro, T., Maekawa, A. Nutritional evaluation of chemical component of leaves stalks and stems of sweet potatoes (*Ipomoea batatas* poir). *Food Chemistry*, 2000; 68: 359-367.
- Masola, S.N., Moshia, R.D., and Wambura, P.N. Assessment of antimicrobial activity of crude extracts of stem and root barks from *Adansonia*

- digitata* (Bombacaceae) (African baobab). *African Journal of Biotechnology*, 2008; 8: 5076-5083.
8. Onwueme, I.C., Onochie, B.E., and Sofowora, E.A. Cultivation of *Thaumatococcus daniellii*-the sweetener. *World Crops*, 1979; 31: 321-335.
 9. Osemeobo, J.G. Living on wild plants: Evaluation of the rural household economy in Nigeria. *Cambridge Journal*, 2005; 7: 246-256.
 10. Shalom, N. C., Adetayo Y. O., Samuel, T. P., Bolaji, J. D., and 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.
 11. Savithramma, N., Linga, R. and Beena, P. Phytochemical Studies of *Dysophylla myosuroides* (Roth.) Benth. In: Wall and *Talinum cuneifolium* (Vahl.) Willd. *Research Journal of Phytochemistry*, 2011; 5: 163-169.
 12. Savithramma, N., Linga, R. M., and 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.
 13. Ushie, O A., and Adamu, H.M. Phytochemical Screening of *Borreria verticillata*.- *Journal of Agriculture, Biotechnology and Ecology*, 2012; 3(1): 108-117.
 14. Ushie, O. A., Neji, P. A., Muktar, M., Ogah, E., Longbab, B.D., and Olumide, V.B. Estimation of Some Phytochemicals in *Swietenia macrophylla* Leaves. *Journal of Pharmaceutical Research and Reviews*, 2018; 2: 15.
 15. Ushie, O.A., Neji, P.A., Abeng, F. E, Azuaga, T.I. Aikhoje, E.F., and Aji, D. L. Phytochemical Screening and Antimicrobial Activity of the Acetone and Methanol Leaf Extracts of *Physalis angulate*. *Records of Chemical Sciences*, 2019; 1(3): 6-12.
 16. Ushie, O. A., Okpashi, V. E., Azuaga, T.I., Iyen, S. I., Aikhoje, E.F and Lajaka, J. I. Phytochemical Screening and Antimicrobial Activities of Leaf Extracts of *Mucuna Pruriens*. *Journal of Pharmaceutical and Allied Sciences*, 2019; 16(4): 3124-3129.