©IDOSR PUBLICATIONS
International Digital Organization for Scientific Research ISSN: 2550-7931
IDOSR JOURNAL OF APPLIED SCIENCES 5(1) 14-21, 2020.

Qualitative and Quantitative Phytochemical Analyses of *Talinum triangulare* (Water leaf)

[1]Eze-Steven Peter .E.*, [2]Chukwuezi Fabian O., [3]Ebugozi Richard Sonny, [2]Dimejesi S.A. and [1]Igwe, Blessing Onyinye

[1]Department of Applied Biochemistry, Faculty of Applied Natural Sciences Enugu State University of Science and Technology (ESUT) Nigeria.
[2]Department of Microbiology, Tansian University Umunya, Anambra State, Nigeria.
[3]Department of Biochemistry Tansian University Umunya, Anambra State, Nigeria.

ABSTRACT

Talinum triangulare is a herbaceous perennial tropical leaf. It is a non-conventional crop found in tropical regions of Africa. This study evaluated the phytochemical constituent of *Talinum triangulare* leaf. The preliminary phytochemical screening revealed that alkaloids, flavonoids, saponins, tannins, glycoside, phenol, terpenoids and steroids were present. The quantitative analysis of *Talinum triangulare* was carried out on the dry sample and the result revealed that flavonoids has a concentration of 2.88mg/g, alkaloids 1.20 mg/g, steroid 2.04mg/g, saponin .45mg/g, terpenoid 0.82mg/kg, glycoside 1.32mg/kg, phenol 1.03mg/g and tannins 1.44mg/g respectively. *Talinum triangulare* has been shown to possess significant phytochemicals, hence it is a potential source of highly nutritious feed stuff and phytomedicine. They are of nutritional and clinical relevance considering the diverse pharmacological uses of the plant in different parts of the world.
Keywords: Qualitative, quantitative, phytochemical, analysis, water leaf.

INTRODUCTION

Vegetables are those herbaceous plants whose part or parts are eaten as supporting food or main dish. It may be aromatic, bitter or tasteless [1]. Nigeria is endowed with a variety of traditional vegetables and different types are consumed by different ethnic groups for different reasons. They are important constituent of the human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein and energy [2]. Several vegetable species abound in Nigeria and most West African countries where they are used partly as condiments or spices in human diets or as supplementary feeds to livestock such as rabbits, poultry, swine and cattle [3]. These vegetables are harvested at all stages of growth and fed either as processed, semi-processed or fresh to man while they are usually offered fresh to livestock. Leafy vegetables are known to add taste and flavour, as well as substantial amount of proteins, fibre, minerals and vitamins to the diet. Lack of information on the specific nutrients and phytochemicals in a large number of the native vegetables species with which Nigeria is richly endowed is partly responsible for their under exploitation especially in areas beyond the traditional localities where they are found and consumed [4]. Among the leafy vegetables in which their phytochemicals and nutrients have not been extensively studies are leaves of water leaf.

Water leaf *(Talinum triangulare)* is one of the well-known vegetables in Nigeria and can fit into our stew, soup or even eaten raw. It is a good source of vitamins and minerals and

widely grown in tropical regions as a leaf vegetable [5]. In Nigeria, it is widely distributed and consumed as a leafy vegetable in the Southern ecological zones. Its leaves are used as softener of other vegetable species in vegetable soup. However, despite that the leaves are used as a natural softener of other vegetable species during vegetable soup preparation, no information has been published on this role. In order to ascertain the nutritive value of the vegetable species and thereby stimulate interest in its utilization beyond the traditional localities, this study was designed to determine the levels of the major nutrients in the leaves of water leaf.

Aim of the Study

The aim of this research work is to determine the qualitative and quantitative phytochemicals in Talinum triangulare *(water leaf)*

Figure 1: Picture of *Talinumtriangulare* (water leaf)

MATERIALS AND METHODS

Sample Collection

The *Talinum triangulare* leaf used in this study were carefully picked and selected amongst a nearby green vegetable leafs, at Agbani, in Nkanu local government area, Enugu State, Nigeria. The plant materials were identified and authorized by Prof. Ezeh in Applied biology and biotechnology of Enugu State University of Science and Technology, Enugu State, Nigeria. Reagent preparation, sample preparation and analysis were done in the Biochemistry laboratory in the Department of Applied Biochemistry, Enugu State University of Science and Technology, Enugu State, Nigeria.

Reagent preparation

Preparation of 10% acetic acid in ethanol

Acetic acid (10.0ml) was measured using a measuring cylinder and poured into 100ml volumetric flask and made up to mark.

Preparation of Dragendorff reagent

0.5g of bismuth nitrate into an empty beaker. Add about 10ml of distilled water. The mixture should be like a suspension. Add 10ml of concentrated hydrochloric acid and stir the resulting mixture. Pour 4g of potassium iodide into another beaker, add a little water and stir until it is completely dissolved. Mix the two solutions and observe the formation of a dark orange solution.

Preparation of 1% hydrogen chloride

Hydrogen chloride 1.0ml was measured using a measuring cylinder and was poured into avolumetric flask and was made up to the mark using distilled water.

Preparation of 10% sodium hydroxide

Sodium hydroxide pellets (10.0g) was weighed using an electronic weighing balance and introduced into a small beaker. This was followed up with the addition of water and then stirred continuously to dissolve. After dissolving, it was cooled and then transferred to 100ml volumetric flask and was made up to mark with distilled water.

Preparation of 5% NaCl

Sodium chlorides pellets (5.0g) was measured using weighing balance and was dissolved withlittle water in a beaker and poured into 100ml volumetric flask and made up to the mark.

Preparation of Fehling's solution

Copper sulphate (C11SO4) 17.235g was weighed using electric weighing balance. It was dissolved in 200ml of distilled water in a beaker. 0.13ml of concentrated H2SO4 was added and made up to the mark with 25ml of distilled water in a volumetric flask.

Preparation of 1% ferric solution

Ferric chloride, 5.0g was added weighed using electronic balance and dissolved in a standard 100ml volumetric flask and made up to mark with distilled water.

Preparation of 10% Sodium hydroxide (NaOH)

Sodium hydroxide (10.0g) was weighed using electric weighing balance and then induced into a 100ml volumetric flask and make up to mask with distilled water.

Sample Preparation

Talinum triangulare leaf were collected, washed and sliced. The leaf were air dried under room temperature for one week to obtain consistent weight. After air drying, the samples were grounded to fine powder using electrical blender. The grounded samples were stored in airtight bottle plastic till required for analysis.

Phytochemical analysis of *Talinum triangulare*

Phytochemical screening of the sample was carried out to identify the constituents, using standard phytochemical methods as described by [6], [7]. The analysis involved detection of alkaloids, glycoside, flavonoids, steroids, terpenoids, tannins, phenol and saponins.

Qualitative Phytochemical Analysis of *Talinum triangulare leaf*

The methods described by [8], [9] were used.

Test for Tannins

Extract (0.1g) was stirred with 10ml of distilled water and filtered. Few drops of 1% ferric chloride solution were added to 2ml of the filtrate. The presence of a blue-black or blue-green precipitate indicated the presence of tannins.

Test for Alkaloids

A quantity of the extract (0.1g) was boiled with 5ml of 1% aqueous HCL on a steam bath. The mixture was filtered and 1ml of the filtrate was treated with 2 drops of Dregendroff s reagent, an orange-red precipitate indicated presence of alkaloids.

Test for Saponins

A quantity of the extract (0.1g) was boiled with 5ml distilled water and filtered. To the filtrate, about 3ml of distilled water was further added and shaken vigorously for about 5 minutes. Frothing which persisted on warming was taken as an evidence for the presence of saponins.

Test for Glycosides

The extract (0.1g) was mixed with

30ml of distilled water and heated on awater bath for 5 minutes. To 5ml of the filtrate, 0.2ml of Fehling's solution A and B.Until it turns alkaline. The solutions were heated on a water bath for 2 minutes. A brick-red precipitate indicated the presence of glycoside.

Test for Terpenoids

The extract (0.1g) was dissolved in ethanol. Acetic anhydride (1ml) was added, followed by the addition of concentrated H2SO4. A change in color from pink to violet showed the presence of terpenoids.

Test for Flavonoids

A quantity (0.1g) of the extract was dissolved in water and filtered. To 5ml of the filtrate, 3ml of lead ethanoate solution was added. Appearance of a buff-colored (pale yellow-brown) precipitate indicated the presence of flavonoids.

Test for Steroids

To 0.1g of the extract, 2ml of acetic acid was added. The solution was cooled well in ice followed by the addition of concentrated tetraoxosulphate (VI) acid (H2SO4) carefully. Color development from violet to blue or bluish-green indicated the presence of a steroidal ring.

Test for phenols

About 0.1g of the extract was boiled with distilled water and then filtered. To 2ml of the filtrate, few drops of 10% ferric chloride solution were then added. A green-blue or violet coloration indicated the presence of phenolic hydroxyl group.

Quantitative Phytochemical Analysis of *Talinum triangulare.*

The methods described by [10], [11] were used.

Determination of Alkaloids

The sample *Talinum triangulare* was weighed (0.5g) using electric weighing balance into a 250ml beaker; 100ml of 10% acetic acid in ethanol was added to the sample and covered. The mixture was allowed to stand for hours for proper extraction to take place. The sample as filtered with paper and extract was concentrated on a water bath to one quarter of the original volume. 20ml of ammonium hydroxide was added drop wisely to from precipitate of the alkaloid in the filtrate. The filtrate was weighed with NH4OH and filtered. The filter paper was weighed before using it to filter. After filtering, the filter paper and the precipitate was dried in an oven at 40°C and weighed. The Alkaloid content was determined using the following formula.

$$\textit{concentration of alkaloid} = \frac{w2-w1}{w3}$$

Where,

W1 = Weight of empty filter paper

W2 = weight of the alkaloid and filter paper

W3 = weight of sample used

Determination of Saponin

Talinum triangulare was weighed (0.1g) using an electric weighing balance into 250ml conical flask and soaked with 50ml of 20% ethanol for three (3) minutes and heated for three hours at 55°C for proper extraction then filtered. The residue was re-extracted with another 50ml of 200% ethanol. The two extracts were combined and heated at 40ml at 90°C on a water bath. The concentrate was transferred into a 500ml separating funnel and 20ml of petroleum ether was added and shaken vigorously, the upper layer was discarded.

The purification process was repeated and 60ml of n-butanol was added, the lower layer was discarded while the upper layer was collected. The combined n-butanol extract was washed with 10ml of 5% aqueous NaCl and the lower layer was discarded while the upper layer was collected in a weighed beaker and heated to dryness. The beaker is allowed to cool in a desiccators and reweighed. The saponin content was determined using the following formula.

$$concentration\ of\ saponin = \frac{w2-w1}{w3}$$

Where,
W1 = weight of empty beaker
W2 = weight of beaker + weight of sample after heating
W3 = weight of sample used

Determination of Tannins

One gram (1.0g) of *Talinum triangulare* was weighed into a plastic bottle and 50ml of distilled water was added and shaken for 3 hours in a vibrator. The sample was filtered into a 50ml volumetric flask and make up to mark. 5ml of the filtrate was dispensed into a test tube and mixed with 1ml of 0.1m $FeCl_2$ in 0.1N HC1 and 0.008m potassium ferrocyanide, the absorbance was measured at 720nm for 10mins. The tannin concentration was determined using the following relation.

$$concentration\ of\ tannin = \frac{Abs \times D.F}{100 \times weight\ of\ sample\ used}$$

Where,
Abs= value of absorbance read
D.F= dilution factor

Determination of Steroids

One gram (1.0g) of *Talinum triangulare* was dispersed in 100ml of distilled water into a conical flask, the mixture was shaken for 3 hours and allowed to stand overnight. Then it was filtered, the filtrate was eluted with 100ml normal ammonium hydroxide solution, 2ml of the elute was put into a test tube and mixed with 2ml of chlorofoam and also 3ml of acetic hydride was added to the mixture, followed by 2ml of concentrated H_2SO_4 drop wisely. The absorbance was measured in a spectrophotometer at 240 nm.
The steroid concentration was determined using the following relationship

$$concentration\ of\ steroid = \frac{Abs \times D.F}{100 \times weight\ of\ sample\ used}$$

Quantification of Terpenoid Content

The determination of terpenoid was carried out according to the method of [12]. A quantity (0.lg) of the extract was weighed out separately, macerated with 20ml of ethanol and filtered through whatman No. 1 filter paper. The filtrates (1ml) were pipette out and 1 ml of 0.5% phophorylbdic acid solution was added and shaken. Gradually 1ml of concentrated H2SO4 was added to each. The mixtures were left to stand for 30 minutes. Ethanol (2ml) was added and absorbance was measured at 700nm.

$$concentration\ of\ Terpenoid = \frac{Abs \times D.F}{100 \times weight\ of\ sample\ used}$$

Quantification of Glycoside content

The determination of Glycoside was carried out according to the method of [13]. The extract (1.0g) was weighed out separately, meccerated with 20ml of distilled water and 2.5 ml of15% lead acetate was added and filtered. Chlorofoam (2.5ml) was added to the filtrate, shaked vigorously and the lower layer collected and evaporated to dryness. Glacial acetic acid (3ml) was also added together with 1ml of 1% ferric chloride and 1ml of concentrated H_2SO_4. The mixture was shaken and put in the dark for 2 hours. Absorbance was measured at 530nm.

$$concentration\ of\ glycoside = \frac{Abs \times D.F}{100 \times weight\ of\ sample\ used}$$

RESULTS

Qualitative Phytochemical Analysis of *Talinum triangulare*

Table 1: The results of the phytochemical composition of the dried leaves of *Talinum triangulare.*

PARAMETER	ABUNDANCE
Tannin	++
Alkaloid	++
Saponin	+
Glycoside	++
Terpenoid	+
Flavonoid	+++
Steroid	+++
Phenol	++

Key

- Means absent
+ Means present in little quantity
++ Means moderately present
+++ Means present in large amount

Quantitative Phytochemical Analysis of *Talinum triangulare*

Table 2: The quantitative phytochemical composition of *Talinum triangulare*

PHYTOCHEMICALS	CONCENTRATION (mg/g) (MEAN—SD)
Flavonoid	**2.88—0.11**
Alkaloid	**1.20±0.35**
Steroid	**2.04±0.04**
Tannin	**1.44x0.07**
Saponin	**0.45+0.02**
Terpenoid	**0.82+0.13**
Glycoside	**1.32 ±0.23**
Phenol	**1.03+0.16**

DISCUSSION

This study was aimed at investigating the phytochemical composition of *Talinum. triangulare.* The preliminary phytochemical screening of the plant extract revealed the presence of flavonoid and steroids in larger amounts while the saponins, terpenoids, and phenol are in lower amounts (Table 1). This is an indication that the plant could possess some possible antioxidant activities which could be harnessed in the treatment and management of some diseases [14].

The levels of these phytochemicals in *Talinum triangulare* were shown in Table 2 above. It was found that flavonoids have the highest concentration (2.88mg/g). This showed that the vegetable is good for the management of cardiovascular diseases and oxidative stress, since flavonoids are biological antioxidants [15]. The presence of alkaloid (1.20mg/g) contributes to the medical significance of *T. triangulare.* Alkaloids have been used as Central nervous system stimulant, topical anaesthetic in opthamology, powerful pain relivers, anti puretic action, among other uses [16]. The result of the phytochemical composition revealed a low value for tannins (1,44mg/g).Tannins posseses anti-nutritional effects, following their ability to reduce the palatability of food by complexing with proteins making them unavailable to the body. However, the value of tannins from our result is not high enough to constitute harm to the body in correlation to the work of [17].

This result varies from the work of [18] probably because of differences in the environment and type of soil where the plant was cultivated.

CONCLUSION

The Results of phytochemical analysis indicate that the leaves contain an appreciable amount of bioactive compounds. It can therefore be concluded that *T. triangnlare* leaves can contribute significantly to the health management of man and should be recommended in our daily nutritional need.

REFERENCES

1. Adebayo, A.S., Gbadamosi, L.A. and Adewunmi, C.O. (2000). Formations of antimicrobial dried powdered herbs in soap bases. In phyto medicines in malaria and sexually transmitted diseases; Challenges for the new millennium. Pp. 32-38
2. Aja, P.M., Okaka, A.N.C., Onu,

P.N., Ibiam, U. and Urako, A.J. (2010). Phytochemical Composition of *Talinum triangulare* (Water Leaf) Leaves, *Pakistan Journal of Nutrition.* **9**(6): 527-530..
3. Anderson, G.A. (2007). Hepato-protective effect of Aqueous Extract of Water Leaf *(Talinum Triangulare)* on Carbon tetrachloride (CCL4) Induced Liver Damage in Wistar Rats.*International Journal of Pathology*.**1**: 30-34.
4. Donald, R.B. and Cristobal, M. (2006). Antioxidant activities of flavonoids. *Journal of Agriculture.***52**: 125-757.
5. Droge, G. (2002). Bioactive constituents from *Persea americana* flowers. *Journal of Medicinal Chemistry,***5**(6): 364-368.
6. Ekpenyong, T.E. (2011). Nutrient Composition of Tropical Foodstuffs available to rabbit feeding. *Journal of Applied Rabbit Research.***9**: 14-20.
7. Gershenzon, T., Bimlesh, K., Mandeep, K. and Gurpreet, K. (2007). Phytochemical Screening and Extraction: A Review. *Journal of Internationale Pharmaceutica Sciencia,***1**(1): 103.
8. Harborne, J.B. (1973). Phytochemical Methods. Chapman and Hall Limited, London, pp. 49- 88.
9. Harborne, J.B., Jeffrey B. and Herbert, B. (2010). *Phytochemical Dictionary: A Handbook of Bioactive Compounds from Plants.* Bristol: Taylor & Francis. Pp. 34-45.
10. Ibeawuchi, I. I., Nwufo, M. I., Oti, N. N., Opara, C. C. and Eshett, E.T. (2009). Productivity of Intercropped Green (Amaranthus cruentus)/ Waterleaf (*Talinum triangulare)* with Poultry Manure Rates in Southeastern Nigeria. *Journal of Plant Sciences.***2**(2): 222-227.
11. Kola, F., (2009). Proximate Composition of Bungu (*Ceratothesesamoides endl.)* leaves and seeds. *Biochemistry.***16**: 88-92.
12. Oloyed, O. I. (2015). Chemical profile of unripe pulp of *Carica papaya. Journal of Nutrition.***4**: 379-381.
13. Oyenuga, D. and Fetuga, R. (2010). Some caveats for bioengineering terpenoid metabolism in plants. *Trends in Biotechnology,***16**: 349-355.
14. Pietta, P.G. (2010). Flavonoids as antioxidant. *Journal of National Productivity,***63**: 1035-1042.
15. Rajasekaran, G., Sivagnanam, T. and Xavier, R. (2009). Nutraceuticals as therapeutic agents. *Annual review on nutrition,***1**: 345-456.
16. Skene, K.J., Albert, K., Herman J.W., Wim J.Q. and Oliver, K. (2009). Combinatorial biosynthesis of medicinal plant secondary metabolites. *Biomolecular Engineering,***23**: 265-279.
17. Trease, G.E. and Evans, W.C (1989). Pharmacognosy. 11th Edition. Saunder Publishers, London. Pp. 42-44, 221-229, 246-249, 404-306, 331-332, 391-393.
18. Wang, Z., Li, H. and Liu, Y. (2010). Review in the studies on saponins activity of cancer prevention and anticancer. *Zhong Yao Cai.* 26: 444-448.