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Phytochemical Composition of *Talinum triangulare* (Water Leaf) Leaves

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Abstract: The qualitative and quantitative analyses of *Talinum triangulare* (water leaf) leaf which is commonly used as vegetable in Nigeria were carried out on both dry and wet samples. The result of dry and wet samples revealed the presence of bioactive compounds namely flavonoids (69.80±4.42 mg/100 g and 58.33 ± 9.00 mg/100 g), alkaloids (55.56±5.00 mg/100 g and 13.89±5.00 mg/100 g), saponins (1.48±0.20 mg/100 g and 1.37±0.60 mg/100 g) and tannins (1.44±0.73 mg/100 g and 1.09±0.26 mg/100 g) respectively. The results indicate that the leaves contain an appreciable amount of bioactive compounds. Medically the presence of these phytochemicals explains the use of this vegetable in ethnomedicine for the management of various ailments.

Key words: Quantitative, qualitative, bioactive, phytochemicals

INTRODUCTION

Vegetables serve as indispensable constituents of the human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein and energy (Oyenuga and Fetuga, 1975). 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 (Aletor and Adeogun, 1995). 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 (Oyenuga and Fetuga, 1975; Adewunmi, 1987).

While the amounts of the nutrient constituents in the more commonly used leaf vegetable species in Nigeria have been studied to some extent (Kola, 2004), the lesser known regional and local species remain virtually neglected. 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. Among the leafy vegetables in which their phytochemicals and nutrients have not been extensively studies are leaves of water leaf. *Talinum triangulare* (water leaf) is an herbaceous perennial, caules cent and glabrous plant widely grown in tropical regions as a leaf vegetable (Ezekwe *et al*., 2001).

It is consumed as a vegetable and constituent of a sauce in Nigeria. Nutritionally, water leaf has been shown to possess the essential nutrients like B-carotene, minerals (such as calcium, potassium and magnesium), pectin, protein and vitamins (Ezekwe *et al*., 2001). Water leaf has been also implicated medically in the management of cardiovascular diseases like stroke, obesity, etc. (Adewunmi and Sofowora, 1980) and traditionally it is used as softener of other vegetable species.

With recent wave of economic depression and its attendant effect on the purchasing power of the population of less developed nations, it has become obvious that the local food stuffs will play increasing role in the food, nutrition and health security of the rural people and the increasing urban poor. As popular as this vegetable is in Nigeria, There is still paucity of information on the phytochemical constituents of *Talinum triangulare*. Hence the present study was carried out to evaluate the phytochemical constituents of *Talinum triangulare* (water leaf) leaves.

MATERIALS AND METHODS

Collection and preparation of samples: The leaves of *Talinum triangulare* (water leaf) were collected from Ishiagu, Ebonyi State, Nigeria and were identified by taxonomist Dr, Ibiam, F.O, of the Department of Applied Biology of Ebonyi State University, Abakaliki, Nigeria. The leaves were destalked, washed and sun dried by constantly exposing the leaves to sunlight for 2-3 days and turning of the vegetable leaves to avert fungal growth. The leaves were later milled to obtain the Vegetable Leaf Meals (VLMs) using an electric blender, some of the leaves were also ground fresh using electric blender and both were stored in refrigerator in a well labeled air-light containers for analysis.

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Qualitative phytochemical screening of *Talinum triangulare*: Phytochemical screening procedures carried out were adopted from Oloyed (2005). This analysis determines the biologically active compounds that contribute to the flavour, colour and other characteristics of vegetable leaves.

Test for alkaloids: About 2 g of the ground sample were pounded separately on a mortar. 0.2 g was boiled with 5 ml of 2% hydrochloric acid on a steam bath for 5 min. The mixture was allowed to cool and filtered and the filtrate was shared in equal proportion into 3 test tubes and labeled A, B, C. One (1) ml portion of the filtrate was treated with 2 drops of the following reagents respectively. With Dragendroff's reagent a red precipitate was shown. With Mayer's reagent a creamy white coloured precipitate indicated the presence of alkaloid (Harborne, 1973; Trease and Evans, 1989).

Test for flavonoids: 0.5 g of the macerated sample of *Talinum triangulare* was introduced into 10 mls of ethyl acetate and heated in boiling water for 1 min. The mixture was then filtered and the filtrate used for the following test. 4 ml of the filtrate was shaken with 1 ml of 1% aluminum chloride solution and kept. Formation of a yellow colour in the presence of 1 ml dilute Ammonia solution indicated the presence of flavonoids (Harborne, 1973; Igwe, 2004).

Test for saponins: 0.1 g of the sample was boiled with 5 ml of distilled water for 5 min. Mixture was filtered while still hot and the filtrate was then used for the following tests (Trease and Evans, 1989). To 1 ml of the filtrates, 2 drops of olive oil was added, the mixture was shaken and observed for the formation of emulsion. 1 ml of the filtrate was diluted with 4 ml of distilled water. The mixture was vigorously shaken and then observed on a stand for stable froth (Trease and Evans, 1989).

Test for the presence of tannins: Into 2 g of the ground sample was added 5 ml of 45% ethanol and boiled for 5 min. The mixture was cooled and filtered. 1 ml of the filtrate was added 3 drops of lead sub acetate solution. A gelatinous precipitates were observed which indicates the presence of Tannins. Another 1 ml of the filtrate was added 0.5 ml of bromine water. A pale brown precipitates were observed indicating the presence of Tannins (Trease and Evans, 1989).

Test for glycosides: 2 g of the sample was mixed with 30 ml of distilled water and it was heated for 5 min on a water bath, filtered and used as follows: five mls of the filtrate was added to 0.2 ml of fehling solution A and fehling solution B until it turns alkaline and heated in a water bath for 2 min. A lightish blue colouration was observed (instead of brick red precipitate) which indicates the absence of glycosides (Oloyed, 2005).

Quantitative phytochemical analysis of *Talinum triangulare*

Determination of alkaloids: 0.5 g of the sample was dissolved in 96% ethanol -20% H_2SO_4 (1:1). 1 ml of the filtrate was added to 5 ml of 60% tetraoxosulphate (VI), and allowed to stand for 5 min. Then, 5 ml of 0.5% formaldehyde was added and allowed to stand for 3 h. The reading was taken at absorbance of 565 nm (Harborne, 1976).

Determination of flavonoids: Flavonoid in the test sample was determined by the acid hydrolysis of spectrophotometric method. 0.5 g of processed plant sample was mixed with 5 ml of dilute HCl and boiled for 30 min. The boiled extract was allowed to cool and filtered. 1 ml of the filtrate was added to 5 mls of ethyl acetate and 5 mls of 1% NH_3. This was then scanned from 420n-520nm for the absorbance. (Harborne, 1976).

Determination of saponins: 0.5 g of the sample was added to 20 ml of 1NHCl and was boiled for 4 h. After cooling it was filtered and 50 ml of petroleum ether was added to the filtrate for ether layer and evaporated to dryness. 5 ml of acetone ethanol was added to the residue. 0.4 mls of each was taken into 3 different test tubes. 6 ml of Ferrous sulphate reagent was added into them followed by 2 ml of conH_2SO_4. It was thoroughly mixed after 10 min and the absorbance was taken at 490 nm (Oloyed, 2005).

Determination of tannins: 5 g of the ground sample was shaken constantly for 1 min with 3 ml of methanol in a test tube and then poured into a Buchner funnel with the suction already turned on. The tube was quickly rinsed with an additional 3 ml of methanol and the content poured at once into the funnel. The filtrate was mixed with 50 ml of water and analyzed within an hour. For aqueous extractions, 5 ml of water was used for the extraction and for the rinse and the filtrate was added to 50 ml of water. 3 ml of 0.1 ml $FeCl_3$ in 0.1 NH_4Cl was added to 5 ml of the extract and followed immediately by timed addition of 3 ml of 0.008 ml K_2, Fe $(CN)_6$ The absorbance was taken at 720 nm spectrophotometrically (Onwuka, 2005).

RESULTS

The results of qualitative analysis of *Talinum triangulare* (water leaf) leaves in dry and wet samples are shown in Table 1. The results obtained showed the presence of alkaloid, saponins, flavonoids, tannins and absence of glycosides.

Results of quantitative analysis of *Talinum triangulare* are presented in Table 2. The results of phytochemicals analysis (quantitative) of *Talinum triangulare* (water leaf) leaves in both dry and wet samples show higher levels in the dry sample than wet sample.

Table 1: Qualitative phytochemical data of dry and wet samples of *Talinum triangulare*

	Dry sample	Wet sample
Alkaloid	+ve	+ve
Flavonoids	+ve	+ve
Saponins	+ve	+ve
Tannins	+ve	+ve
Glycosides	-ve	-ve

Table 2: Quantitative phytochemical data of dry and wet samples of *T. triangulare*

Name of the phytochemical	Dry sample	Wet sample
Flavonoids (mg/100g)	69.8±4.42	58.33±9.00
Aikaloids (mg/100g)	55.56±5.00	13.89±5.00
Saponins (mg/100g)	1.48±0.20	1.37±0.60
Tannins (mg/100)	1.44±0.73	1.09±0.26

DISCUSSION

Phytochemical analysis is very useful in the evaluation of some active biological components of some vegetables and plants (medicinal). The qualitative and quantitative analyses of *Talinum triangulare* were carried out in both dry and wet samples. Alkaloids, flavonoids, saponins, tannins, were revealed to be present in *T. triangulare* (Table 1 and 2 respectively). This shows high level of its possible medicinal and dietary values (Oloyed, 2005). Although, some of these analyzed constituents of the vegetable species may be completely harmful to both man and farm animals and some are species specific as observed in the case of tannins (Odebiyi and Sofowora, 1979). Some of these active components have been demonstrated to possess anti nutritional effects, following their ability to reduce palatability and digestibility of feedstuff (Odebiyi and Sofowora, 1979).

In Table 2, the levels of these phytochemicals (bioactive compounds) were shown. Generally, the dry sample showed higher levels of these bioactive compounds than the wet sample. The reason may be that the bioactive compounds are not volatile compounds and hence have a high dried weight. These results are in correlation with the findings of Akindahunsi (2005). High levels of flavonoids (69.80±4.42 mg/100 g and 58.33 ±9.00 mg/100 g) in Table 2 showed that the vegetable is good for the management of cardiovascular diseases and oxidative stress, since flavonoids are biologic antioxidants. Antioxidants are compounds that protect cells against the damaging effects of reactive oxygen species, such as singlet oxygen, super oxide, peroxyl radicals, hydroxyl radicals and peroxynitrile. An imbalance between antioxidants and reactive oxygen species results in oxidative stress, leading to cellular damage (Burlon and Ingold, 1984). Oxidative stresses have been linked to cancer, aging, atherosclerosis, inflammation, ischemic injury and neuro degenerative diseases (Parkinson's and Alzheiner's) (Palozza, 1998). Flavonoid may help provide protection against these diseases by contributing along with antioxidant vitamins and enzymes, to the total antioxidant defense system to the human body. Epidemiological studies have shown that flavonoids and carotenoids intake are inversely related to mortality from coronary heart diseases and to the incidence of heart attacks (Donald and Cristobal, 2006).

The oxidation of Low-density Lipoproteins (LDL) has been recognized to play an important role in atherosclerosis, immune system cells macrophages recognize and engulf oxidized LDL, a process that leads to the formation of atherosclerotic plagues in the arterial wall, LDL oxidation can be induced by macrophages and can also be catalyzed by metal ions like copper. Several studies have shown that certain flavonoids can protect LDL from being oxidized (Donald and Cristobal, 2006).

The presence of saponins (1.48±0.20 mg/100 g and 1.37±0.60 mg/100 g) and alkaloids (55.56±5.00 mg/100 g and 13.89±5.00 mg/100 g) (Table 2) in *T. triangulare* contribute to its medicinal value. Saponins inhibit Na^+ efflux by the lockage of the entrance of the Na^+ out of the cell. This leads to higher Na^+ concentration in the cells, activating a Na^+-Ca^{2+} anti porter in cardiac muscle. The increase in Ca^{2+} in flux through this anti porter, which strengthens the contractions of heart muscle (Schneider and Woliling, 2004).

The valuable pharmaceutical properties in *T. triangulare* may be attributed to the presence of bioactive compound like alkaloid (55.56±5.00 mg/100 g and 13.89±5.00 mg/100 g). Alkaloid has been used as CNS stimulant, topical anaesthetic in ophthalmology, powerful pain relievers, anti puretic action, among other uses (Heikens *et al*., 1995). The result of anti nutrient composition (Table 2), revealed low value of tannins (1.44±0.05 mg/100 g and 1.09±0.26 mg/100 g). This is not high enough to constitute human poison. The lethal value is above 5% (Adebayo *et al*., 2000).

Results of this study revealed that leaves of *T. triangulare* contain an appreciable amount of flavonoids, alkaloids, saponins, among others and low level of toxicants like tannins, since it contains substantial amount of bioactive compounds. It can therefore be concluded that *T. triangulare* leaves can contribute significantly to the health management of man and should be recommended in our daily nutritional need.

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