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Vitamin and Carotenoid Composition of Raw and Decoctions of Water Leaf (*Talinum triangulare)*

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Abstract

Background and aim: Despite the pharmacological relevance of Water leaf (*Talinum triangulare*), there is paucity of information in literature on the effect of boiling on its vitamin and carotenoid contents.

Methodology: The vitamin and total carotenoid assays of the raw and cooked leaves of the vegetable were performed using standard techniques.

Results: The raw leaves of *Talinum triangulare* possessed considerable amounts of vitamins and carotenoids. Cooking of the raw leaves of the vegetable for 5 minutes resulted in insignificant ($P>0.05$) losses of thiamine, riboflavin, niacin and tocopherol, but significant ($P<0.05$) loss of vitamin C and carotenoids.

Conclusion: The conventional method of cooking the raw leaves of *Talinum triangulare* in Nigeria leads to insignificant loss of thiamine, riboflavin, niacin and tocopherol contents but significant loss of its carotenoid and vitamin C contents.

Keywords: *Talinum triangulare;* Cooking; Raw leaves; Vitamins; Carotenoids

Introduction

Nutrients are building blocks of the human body that regulate essential body functions as well as furnish them with the energy for their work [1]. Nutrients are divided into macro-nutrients (proteins, fats, carbohydrates) and micronutrients (vitamins and minerals).

Vitamins refer to a class of micro nutrients that play essential roles to human health and are classified into water soluble (niacin, riboflavin, and thiamine) and fat soluble (retinol and tocopherol).

Riboflavin is involved in the regulatory functions of some hormones that are connected with carbohydrate metabolism. Niacin (Vitamin B3) is essential for the normal functioning of the skin, intestinal tract and the nervous system. Tocopherol as a lipophilic vitamin is the most powerful antioxidant [2]. Tocopherol protects the red blood cell from hemolysis, boosts the immune response, and reduces the risk of myocardial infarction by reducing the oxidation of LDL as well as acting as an anti-mutagen. It also functions synergistically with other antioxidants like vitamin A and C and selenium [3]. Vitamin C functions as a water soluble antioxidant.

Carotenoids are antioxidant compounds found in plants that can enhance the human health immune response by playing preventive roles against degenerative diseases such as: cancer, carcinogenesis, cardiovascular diseases, vision related abnormalities, Parkinsonism, infertility, etc. This source of vitamin A from vegetables and fruits is the main source for people living in developing countries and makes up about 70-90% of their dietary Vitamin A intake [4].

Water leaf (*Talinum triangulare*) is a herbaceous perennial plant that is widely grown in tropical regions as a leafy vegetable [5]. In Nigeria, it is used in the preparations of 'Afang', Edikaiko and 'Gbure' soups which are indigenous to the Efiks, Ibibios and Yorubas, respectively. Water leaf is a rich source of vitamins, β-carotene and minerals [5]. It has also been found to possess useful medical potentials [6,7] as well as in the management of cardiovascular diseases such as: stroke and obesity [8].

However, despite the widely reported pharmacological relevance of *Talinum triangulare,* there is dearth of information on the effect of boiling on its vitamin and carotenoid composition.

Since the chosen method of food preparation at home could affect its content of vitamins and carotenoids, we decided to investigate the effect of the traditional method of cooking this vegetable in Nigeria on its vitamin and carotenoid composition.

Materials and Methods

Fresh samples of water leaf (*Talinum triangulare*) were bought from Umuahia main market, Abia State, Nigeria and transported to our Laboratory for processing and analysis of the vitamin and tocopherol composition. Some samples of the vegetable were taken to the Department of Botany, Michael Okpara University of Agriculture, Umudike, Nigeria where they were identified and authenticated.

Sample treatments

Exactly 200 g of the homogeneous pieces of water leaf were immersed in a well-covered beaker, containing 500 ml of boiling water. The leaves were removed after 5 minutes of boiling.

Analytical procedure

Total carotenoid determination: The carotenoid content of the fresh leaves of the vegetable was determined using the method of Rodriquez-Amaya and Kimura [9] and results were expressed as µg/g

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on fresh weight basis.

Vitamin assay

Determination of riboflavin: 5 g of the sample was extracted with 100 ml of 50% ethanol solution and shaken for 1 h. It was filtered into a 100 ml flask and 10ml of the extract was pipetted into a 50 ml volumetric flask. A measured volume (10 ml) of 5% potassium permanganate and 10 ml of 30% H_2O_2 were added and allowed to stand over a hot water bath for about 30 min. Then a measured amount (2 ml) of 40% sodium sulphate was added. This was made up to the 50 ml mark and the absorbance was measured at 510 nm with a spectrophotometer [10].

Determination of thiamine: A measured amount (5 g) of the sample was homogenized with ethanolic sodium hydroxide (50 ml) and filtered into a 100 ml flask. Then, 10 ml of the filtrate was pipetted and the colour was developed by the addition of 10 ml of potassium dichromate and the absorbance of the resulting solution was read at 360 nm against the reagent blank [10]

Determination of niacin: 5 g of the sample was treated with 50 ml of 1 N sulphuric acid and the set up was shaked for 30 min, after which 3 drops of ammonia solution were added to the solution and filtered. A measured amount (10 ml) of the filtrate was pipetted into a 50 ml volumetric flask and 5 ml of potassium cyanide was added. This was acidified with 5 ml of 0.02 N H_2SO_4 and the absorbance was measured with a UV spectrophotometer at 470 nm [10].

Determination of ascorbic acid (vitamin C): The titrimetric method using 2,6 dichlorophenolinophenol was used [11].

Determination of tocopherol (vitamin E): The tocopherol contents of both the raw and cooked vegetables were determined using the method of Tsen [12]. Results were expressed as mg/100g on fresh weight basis.

Statistical Analysis

Results are reported as the means ± standard deviations of triplicate experiments. Student t-test was used for statistical comparison. Results were considered to be significant at $P<0.05$.

Results

Vitamin and carotenoid composition

About 33.33% loss of thiamine, 17.65% loss of riboflavin, 17.78% loss of niacin, 4.80% loss of tocopherols and 15.69% loss of ascorbic acid respectively were recorded in cooked leaves of the vegetable (Table 1). We recorded about 13.19% loss of carotenoids when the raw vegetable was cooked (Figure 1).

Discussion

The cooking method used in this study, reflects the major way in which water leaf is being consumed in a typical African diet.

The results obtained, show that *Talinum triangulare* is a rich source

	Thiamine (mg/100 g)	Riboflavin (mg/100 g)	Niacin (mg/100 g)	Tocopherol (mg/100 g)	VitaminC (mg/100 g)
Raw	0.03 ± 0.00	0.17 ± 0.01	0.45 ± 0.02	22.71 ± 0.13	48.95 ± 0.30
Cooked	0.02 ± 0.00	0.14 ± 0.01	0.37 ± 0.01	21.62 ± 0.03	41.27 ± 0.04*

Values are the means + SD of triplicate experiments. *$P<0.05$ versus raw (within the columns)

Table 1: Vitamin composition of raw and cooked water leaf

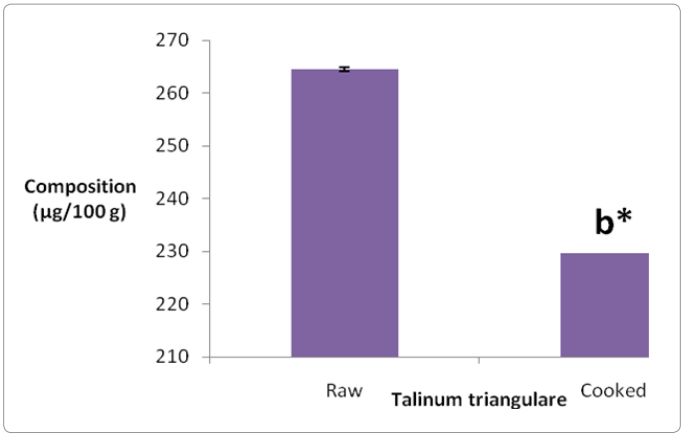

Figure 1: Carotenoid composition of raw and cooked samples of *Talinum triangulare*. $^{b*}P<0.05$ in comparison with raw.

of some water soluble as well as fat soluble vitamins which was not surprising as most of these vitamins are abundant in plants as they are synthesized from plant tissues.

Although riboflavin and niacin are heat stable, the tocopherol, thiamine and vitamin C contents of some foods decrease with cooking and this could be the explanation for the decreased quantities of these vitamins (tocopherol, thiamine, vitamin C) in the cooked vegetable [2,13], Our findings however, on tocopherols are in contrast to that of Simone and Elmar [14] who reported increased release of tocopherols in Broccoli after heat treatment. The decrease in the levels of riboflavin and niacin in the cooked vegetable may be due to leaching of the cell content with cooking, as the method ruptures the cell wall of the vegetable. In addition, the lower percentage loss of tocopherol compared with the water soluble vitamins is attributed to the fact that the fat soluble vitamins (A and E) are said to be less heat labile than the water soluble vitamins [15].

The carotenoids have been shown by various researchers as anti-cancers agents. The loss of carotenoid contents in the cooked vegetable is attributed to the softening of the plant tissue leading to the release of the carotenoids [9]. In addition, the study showed that the conventional cooking method for Talinum triangulare retained the carotenoids better than vitamin C and this justifies the hydrophobic and hydrophilic nature of carotenoid and vitamin C, respectively.

Conclusion

The study showed that *Talinum triangulare* possesses considerable amounts of vitamins and carotenoids. The traditional method of cooking this vegetable results in insignificant loss of proximates, phytochemicals, Ca, Fe, Zn, thiamin, riboflavin, niacin and tocopherol, but significant loss of vitamin C and carotenoids. Finally, the traditional method of cooking *Talinum triangulare* retains its tocopherols better than vitamin C.

Acknowledgement

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Conflict of Interest Statement

We declare that we have no conflict of interest.

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