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COMPARATIVE STUDIES ON THE PROXIMATE AND PHYTOCHEMICAL ANALYSIS OF *TALINUM TRIANGULARE* AS A FUNCTION OF DRYING TECHNIQUES.

F. U. Okwunodulu*, M. M. Onuchi and M. N. Nwachukwu

Department of Chemistry, Michael Okpara University of Agriculture, Umudike, Abia State Nigeria.

*Corresponding author's email: okwunodulufelicia@gmail.com Tel- 08063429321

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ABSTRACT

Plants contain active chemical compounds that are nutraceutical. In this work, both the proximate and phytochemical analysis of *Talinum triangulare* were carried out in fresh sun dried, steamed sun dried and oven dried condition respectively. Results revealed presence of carbohydrate (35.27, 34.06 and 27.94)%, crude fibre (10.59, 9.33 and 11.81)%, crude protein (21.66, 21.66 and 20.65)%, fats (11.12, 9.15 and 10.90)%, ash (21.36, 24.95 and 28.70)%, moisture (29.35, 35.25 and 14.60)%, and calories (327.08, 305.23 and 292.40)%. Phytochemicals analyzed were saponins (1.097, 0.927and 1.172)%, tannins (0.250, 0.197 and 0.345)%, alkaloids (3.972, 4.70 and 3.410)%, flavonoids (0.740, 0.623 and 0.685)%, phenols (0.072, 0.017 and 0.051)% andphytate (0.056, 0.451 and 0.527)%. Oven dried *Talinum triangulare* induced the increase bioactive compounds in phytochemical analysis than in both fresh sun dried and steam sun dried ones, while fresh sun dried sample proved best in proximate analysis. The findings indicate that *Talinum triangulare* contain an appreciable quantity of nutraceutical that will be of benefit for both human and life stock.

Key words: Proximate, Phytochemical, *Talinum triangulare*, Fresh sun dried, Steam sun dried , Oven sun dried

INTRODUCTION

Vegetables all over the world serve different purposes such as condiments, herbs, flavouring and spices. Nigeria has wide variety of them which are highly nutritious both to man and animals; aquatic and terrestrial animals. Among these vegetables that are available, accessible and affordable is *Talinumtriangulare*. It is an edible leafy vegetable that belongs to the family *Portulaceae*, it is a short -lived perennial herb, growing to 30-60cm in height. The leaf is greenish in colour with succulent stem agricultural sustainability. It is a herbaceous plant widely grown in tropical regions as a leaf vegetable [1]. It is consumed as a vegetable and constituent of a sauce in Nigeria. According to [2], because of its high moisture contents of approximately 90.8 g per 100 gm the leaf, it is referred to as water leaf. Generally, fresh vegetables are important source of nourishment and vital ingredient in healthy balance diet. Vegetables contain phytochemical and proximate which are nutritional and medicinally useful [3]. Medicinal properties of water leaf have been ascertained by many researchers to contain chemical substances as flavonoids, alkaloids and tanins that help in management of cardiovascular diseases like stroke and obesity [4,5]. It enhances celebral functions [6]. Due to its affordability and reported health benefits, the research is aimed at comparing the phytochemicals and proximate contents of water leaf dried using three different processes.

MATERIALS AND METHODS

Sample Collection

Large quantity of water leaf (*Talinum triangulare*) were bought from Umuahia main market and were taken to Forestry Department of Michael Okpara University of Agriculture to be identified by a taxonomist.

Sample preparation

1000g of the leave and stem of water leaf were cut into tiny pieces, 200g was spread on a drying pan in the sun for 5 days. Also, 200g was steamed, drained and sun dried for 5 days.

Another 200g was oven dried for about 4 hours at a temperature of 65^{o}C. The different samples were milled separately, stored in a plastic contained labeled A, B, and C respectively. A is representing the Fresh sun dried sample, B is representing the steamed sun dried sample while C represents the oven dried sample. The 3 different samples were subjected to proximate and phytochemical analysis using the same procedure [7].

Phytochemical screening

Determination of alkaloids

5g of each sample was weighed into an extraction plastic bottle. 50ml of 10% ethanolic acetic acid solution was added and was shaken for 2 hours in a mechanical shaker. This was filtered through a no 1 whatman filter paper into a 50ml volumetric flask and was transferred into the beaker. Concentrated NH_4OH was added dropwise into the samples until the alkaloid formed some white precipitate which was transferred into the centrifuge tube and spinned at 2500ppm for few minutes. This was decanted into a weighed moisture tube and dried to a constant weight. The amount of alkaloid in each sample was calculated.

Determination of saponin

10g of each of the sample was weighed in an extraction tube. 100ml of 20% aqueous ethanol was added to the sample and shaken for 2hours. This was filtered through a no 1 whitman filter paper. The residue was re-extracted with another 100ml. 20% of diethyl-ether was shaken vigorously after which it was recovered. 4g of sodium chloride was added to the solution and was shaken for 30 minutes with 10ml of ethanol and was placed on the separating funnel. The saponin dish was dried in an oven to a constant weight and the weight of the crude saponins was calculated for each sample respectively.

Determination of phenol

2g of each of the sample was defatted at 100ml of petroleum ether. The defatted sample was dissolved in 5ml of concentrated petroleum ether and was transferred into a 50ml volumetric flask. About 10ml of distilled water was added to the sample. 10ml of 1% potassium ferrocyanide, 2ml of NH_4 solution and 5ml of amyl alcohol were added and allowed for 30 minutes. Another absorbance was measured at 505nm wavelength in a spectrophotometer. A set of 20mg, 30mg, 40mg,50mg working standard were prepared from phenolic acid.

Determination of flavonoid

Equal portion 10g of the dried blended samples were extracted repeatedly and separately with a 100ml solution of 80% aqueous method at room temperature with soxhlet extractor. The extracts were evaporated to dryness and dried to a constant weight in an oven. The percentage flavonoid was calculated for each of the sample..

Determination of tannins

Tannin was obtained using spectrophotometric method. 1g of each of the sample was weighed into a 150ml plastic bottle, 50ml of distilled water was added and shaken for 1 hour in a mechanical shaker. This was filtered into a 50ml volumetric flask. 5ml of the extract was pipetted into 50ml flask. At the same time 5ml of 1mg of tannic acid was pipette into another flask as standard.1ml of the colour developing reagent and 2.5 of saturated sodium carbonate solution were added and made up to mark with distilled water. This was put in an incubator at 20 - 30°C for about one and half hours and the absorbance measured in a spectrophotometer at 760 nm wavelength with the reagent blank at zero. The percentage tannin in each sample was calculated.

Determination of phytate

A measured weight of each of the sample of about 10g was extracted with 0.2 N HC1 solution and filtered to obtain the extract. 0.5ml of the extract was mixed with 1ml of diluted ferric chloride solution in a separate test tube to serve as blank and standard solution respectively. The content of each tube was heated for 30minutes and cooled in an ice for 15minutes and allowed to attain room temperature. They were centrifuged at 3000g to remove precipitate and supernant was used for analysis. 1ml of the supernant from each test tube was mixed with 1.5 ml of bipyridin, it was shaked and allowed to stand for 10 minutes before their absorbance was measured in a spectrophotometer at 519nm wavelength.

The phytate content was determined in each sample.

Proximate determination

Determination of crude fibre

This was obtained using modified Weende or proximate analysis [8]. 3g of the samples were weighed. 150ml of 1.25% H_2SO_4 was measured using a measuring cylinder and was poured into the samples in the beaker. The mixture was heated for 30minutes. This was removed and filtered using a muslin cloth. It was rinsed and heated again with 150ml of 1.25% of NaOH for 30minutes. It was filtered and rinsed with distilled water. The samples were first weighed in a crucible and then transferred to the oven for drying. The weight of the dried samples were also taken and the crude fibre was calculated.

Determination of moisture content

The moisture content was determined using gravimetric method. The dish was weighed and each of the sample was placed in the dish to take the weight of the sample. The sample was dried in an oven at 70-80°C for 2hours and at 100- 135°C for the next 4 hours and reweighed until the weight was constant. The readings were replicated three times after which the sample was cooled in a desiccator and the weight of the sample was taken and calculated.

Determination of fat content

The soxhlet extractor method was used. 5g of the samples were weighed in an ether extracting timble and were placed on the soxhlet reflux connected to a round bottom flask on a heating mantle filled with about 250ml of petroleum ether and the oil was extracted by reflux system. After a series of refluxing, a clear solution was obtained and the samples were removed. The heating continued and the ether was separated from the extracted oil. The round bottom flask containing the oil was finally dried in an oven and weighed. The percentage weight of the oil was calculated for each sample.

Determination of ash

3g of the each of the sample was weighed in a porcelain crucible and was placed on a heater. The sample was transferred in a pre-heated furnace at 550 °C and was allowed for 2 hours until a light gray ash results was obtained. The residue was black, water was added to the sample to dissolve the salts present. This was dried in an oven and repeated and was cooled in a dessicator. The percentage ash for each sample was calculated.

Carbohydrate determination

Carbohydrate extract can be determined by calculating the nitrogen free extract. And the percentage carbohydrate for each sample was calculated.

Determination of crude protien

The kjelhdal method [9] was used in the determination of protein. 2g of each of the sample was weighed into a kjelhdal flask. Little quantity of selenium catalyst with little quantity of distilled water and 5ml of concentrated H_2SO_4 were added and the mixture was allowed to digest and cool after digestion. It was transferred to a 100ml volumetric flask and was made up to the mark. 10ml of the digest was introduced into a markham apparatus for distillation.10ml of 45% NaOH was added to the sample and about 50ml distillate was introduced and was received in 10ml of 45% boric acid. The distillate was titrated with 0.02N H_2SO_4 using mazauzage indicator. Percentage crude protein for each sample was determined.

Determination of calories

This was determined by calculating the percentage composition of the proximate (carbohydrate, protein and fat) for each sample respectively.

RESULTS AND DISCUSSION

TABLE 1. Phytochemical composition of *Talinum triangulare.*

Phytochemical	Fresh sun dried sample(%)	Steam sun dried sample(%)	Oven dried sample(%)
SAPONIN	1.097±0.001	0.927±0.001	1.172±0.001
TANNIN	0.250±0.001	0.197±0.001	0.345±0.001
ALKALOIDS	3.972±	4.700±0.002	3.410±0.002
FLAVONOIDS	0.740±0.001	0.623±0.001	0.685±0.001
PHENOLS	0.072±0.001	0.017±0.001	0.051±0.001
PHYTATE	0.056±0.001	0.451±0.001	0.527±0.001

± = error of the mean of triplicate analysis

Table 2. Proximate composition of *Talinum triangulare.*

Proximate	Fresh sun dried sample (%)	Steam sun dried sample (%)	Oven dried sample (%)
MOISTURE	29.35±0.03	35.25 ±0.05	14.60 ±0.02
ASH	21.36±0.02	24.95±0.03	28.70±0.03
CRUDE PROTEIN	21.66±0.02	21.66±0.03	20.65±0.02
CRUDE FIBRE	10.59±0.01	9.33±0.01	11.81±0.01
FATS	11.12±0.02	9.15±0.01	10.90±0.01
CARBOHYDRATES	35.27±0.05	34.06±0.04	27.94±0.03
CALORIES	327.08±0.08	305.23±0.07	292.40±0.06

± = error of the mean of triplicate analysis

DISCUSSION

From the results of the phytochemicals, alkaloid has the highest value in the three samples showing that *Talinum triangulare* has high alkaloid content and this account for it's use as medicinal herb in the treatment of some diseases. Alkaloids are toxic and are used as basic medicinal agents for analgesic and antispasmodic and bacteria effects [10]. Saponin content which is equally high justified the reason why it foams. The order of the percentage content of the phytochemicals is as follows; saponin and tannin proved best in the oven dried process, followed by the sun dried and then the steam sun- dried method. For flavonoid and phenols, they proved best in fresh sun-dried, followed by oven dried, then the steam sun dried. Alkaloid showed best level in steam sun dried, followed by fresh sun-dried and oven sun-dried. Phytate content is highest in oven dried, followed by the steam sun- dried, finally by fresh sun-dried. The highest content of saponin, tannin and phytate in oven dried process could be attributed to the higher rapid inactivation of enzymes [11]. Oven drying may be a good method for drying and preserving phytochemicals in *Talinum triangulare*, in that it can be completed in a shorter time and under more closely monitored conditions than the other drying methods. This suggestion was also made [12] on the effect of different drying methods on Ceylon cinnamon. Steam-sun dried method does not prove to be a better process for all the phytochemicals except in the alkaloid. Reduction in the total flavonoid and phenol with steam sun-dried method could be as a result of high temperatures which lead to the oxidation of bioactive compound that are associated to antioxidant capacity [13] and this could account for the losses in tannin, saponin and phytate in the steam sun-dried sample. Low levels of saponin, tannin, alkaloid and phytate resulting from fresh sun-dried could be attributed to enzymatic degradation due to the longer period it took to dry at low temperature [14]. Generally, photochemical analysis of *talinum triangulare* reveals an appreciable amount of bioactive compound especially when oven-dried. Moreso, this proves the use of this vegetable in the ethno-medicine for the management of various ailments. The proximate composition of *talinum triangulare* showed that the vegetable is a rich source of food nutrients such as protein, carbohydrate, fibre and fats. The steam sun dried leaves contained higher amount of moisture compared to the other two samples (raw sun dried and oven dried). The fresh sun dried sample is rich in calories, carbohydrate, fats and indicated equal amount of crude protein with the steam sun dried sample. Carbohydrates showed the highest value in the three samples which indicated that the leaf has high carbohydrate content. Some of the low proximate contents of the steam sun dried sample such as crude fibre, fat and calories when compared to the raw sun dried sample could be as a result of steaming process which enhanced losses in the nutritional values of the steam sun dried sample. Moreso, reduction in the total flavonoid, tannin, saponin, phytate and phenol with steam sun-dried method could result in the low content of fat, caborhydrates, fibre, ash and calories due to the oxidation of the bioactive compounds[15]. Therefore freshly sun dried sample is better than the steam sun dried and oven dried samples. Similar result has been reported in the analysis of bungu leaves [16].

Conclusion:

The study revealed that freshly sun dried samples are better compared to processed samples in proximate analysis while in phytochemical, oven dried process proved better. Water leaf is a nutritious vegetable that is affordable, it should be included in our diets.

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