

COMPARATIVE STUDY ON THE MEDICINAL AND FOOD VALUES OF OCIMUM GRATISSIMUM (SCENT LEAF), VERNONIA AMYGDALINA (BITTER LEAF) AND TELFARIA OCCIDENTALIS (UGU LEAF)

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ABSTRACT: Vegetable possesses both nutritional and medicinal properties and are daily consumed as food in form of beverages or health supplement. The aim of this study is to compare the medicinal and food values of the three vegetables used and the following parameters were determined these are; proximate, mineral, vitamin and phytochemical (secondary metabolites) compositions. Standard analytical methods of analysis were used. Results revealed that moisture, ash and crude fibre contents were higher in (Ugu leaf) Telfaria occidentalis (80%, 13.48% and 14.77% respectively). Crude protein was the highest in (Bitter leaf) Vernonia amygdalina (13.38%). Ocimum gratissimum (scent) had the highest amount of crude fat and carbohydrate contents (14.93% and 53.74% respectively). The mineral analysis showed that Ocimum gratissimum contained the highest concentration of calcium (55.65 ± 0.02 mg/g), while other minerals were present in traces from iron to manganese. Vitamin analysis revealed that vitamin A and C were present in highest concentrations in Ocimum gratissimum (41.72±0.1 mg/g and 2.19±0.02 mg/g respectively). All other vitamins were present in traces in the three vegetables except vitamin E that was not detected in Telfaria occidentalis. The presence of minerals and vitamins in the vegetables are indications that the studied vegetables (especially Telfaria occidentalis) could enhance blood production in the human body system and could serve as anti anaemic agents.

KEYWORDS: Ocimum Gratissimum, Vernonia Amygdalina, Telfaria Occidentalis, Vegetable

INTRODUCTION

Leafy vegetables are taken as medicinal food and are always added to diets in many homes in Africa as soups or stews especially in Southeastern Nigeria. In Nigeria, uses of these vegetables are regionalized, in the Southeast these three vegetables are combined in their diet as soup but in the Southwest, they are separately used as decoction or infusion and therefore taking as medicine and sparingly used in their soup. They contained nutrients in the right proportions which could make them be referred to as balanced diets; therefore, people are encouraged to eat vegetables especially when sick.

Olaposi and Adunni (2010) reported that vegetables were rich in vitamins, minerals, fibers, carbohydrates and secondary metabolites.



These three vegetables; *Ocimum gratissimum* (Scent leaf), *Vernonia amygdalina* (Bitter leaf) and *Telfaria occidentalis* (Ugu leaf) are used as food and medicine. They are also reported to possess antidiabetics, antidiarrhoea, antimalarial and antibiotics properties (Agbankpe *et al.*, 2014). *Vernonia amygdalina* is the common bitter leaf and it belongs to *Asteraceae* family of the plant kingdom. It is locally called Onugbu or Olubu (Igbo), Ewuro (Yoruba), Chusar-doki or Shikawa (Hausa) and Oriwo (Edo) (Igile *et al.*, 1995).

The leaves are eaten as vegetables and have stimulating effect on the digestive system, reduce fever and serves as local medicine, boiling decreases the level of phytochemical compounds present in the leaves to make it palatable. The bitter taste of *V.amygdalina* could be due to the phytochemical compounds in the leaves (Ologunde *et al.*, 1992). This vegetable is regarded as medicinal plant because of is uses in the treatment of diabetics, alleviating fever, kidney disorder and hiccups (Challand and Willcox, 2009). It is also known to possess antihelmintics, antiasthmatics, carminative and antitumor properties (Masaba, 2000; Abosi and Raserika, 2003; Izevbigie *et al.*, 2004). *V.amygdalina* has been used as liver tonic, analgesics, anti-inflammatory, antianaemic, antibacterial and antiulcerogenic agents (Jucelia *et al.*, 2013). Most traditional medicine practitioners have claimed to have used *V. amygdalina* for the treatment ailments such as; skin infections (ringworms and acne), stomach ache, cancer, insomnia, hepatitis, toothache, tuberculosis, wounds, arthritis, stroke, fatigue, cough and malaria (Akah and Ekekwe, 1995).

The roots are pounded and boiled with water to make decoction for the treatment of stomach and gastro intestinal problems, gingivitis and toothache due to its proven antimicrobial activity. The stem is used as chew sticks for oral hygiene and for the management of some dental problems and the leaf decoction is used for breast feeding mother to take regularly to increase milk production and quality (Anslie, 2001). *V.amygdalina* possessess hypoglycaemic and hypolipidaemic properties when demonstrated on experimental animals in the laboratory (Nwanjo, 2005).

Ocimum gratissimum(Scent leaf) is a plant belonging to the family of *Labiatae*. It is locally called Efirin (Yoruba), Nehonwu (Igbo) and Daidoya tagida (Hausa) (Abdullahi *et al.*, 2003).

O.gratissimum is good for the treatment of infections, fever, cold, catarrh and convulsion, also the oil from the leaves possess antiseptics, antifungal and antibacterial properties (Edeoga and Eriata, 2001).

Telfaria occidentalis or fluted pumpkin is known locally as Ugu (Igbo), Kabewa (Hausa), Sokoyokoto (Yoruba). Fluted Pumpkin Leaves (Ugu) is mainly grown in the Southern part of Nigeria where it is used in various local cuisines and soup, but it is also grown in other West African countries like Ghana, Sierra Leona and others. The seed can be found in the gourd and is edible, as it can be used as snacks by roasting or boiling it. In some cases, it can serve as a soup thickener by drying and grinding it into fine particles. The seeds are beneficial as well and contain oil (fats), and other vital minerals and nutrients like protein, carbohydrates, fibre and more. It is used in preventing abdominal pains, gastro intestinal obstruction, and skin diseases. The leaves also possess antianaemic, antidiabetics and antimicrobial properties (Oboh *et al.*, 2006).

Fluted pumpkin leaves are generally considered safe as there are no recorded proven side effects. Fluted Pumpkin leaves help in protecting the body against disease as well improving



the overall health. Therefore, it has to form a part of our daily meal in order to gain these necessary benefits that it offers. It boosts blood level because of the rich presence of iron and vitamins; therefore, it is an addictive in the cure of anaemia and it is always recommended for nursing mothers. Minerals like calcium, iron, manganese are present in the Fluted pumpkin while vitamins such as A, B C and E are also present (Elinge *et al.*, 2012).

These three vegetables of interest in this study are being used differently in many homes because of the believe that their nutritional and medicinal functions are the same, therefore, this study focuses on the concentrations of proximate, minerals, vitamins and secondary metabolites compositions present in each of the vegetable leaf in order to determine the medicinal and food values of the vegetable and to recommend their intake and uses.

MATERIALS AND METHODS

Sample Collections

Fresh vegetable samples of *Ocimum gratissimum* (scent leaf), *Vernonia amygdalina* (bitter leaf) and *Telfaria occidentalis* (Ugu leaf) were collected from a personal garden situated at Osuru area of Ogbomoso South Local Government area, Oyo State, Nigeria and taking to the laboratory in polythene bags for analysis.

Sample preparation

Each of the vegetable samples was washed with distilled water which contained bleach (in ratio 1:100) and dried in the laboratory at room temperature for 30 days. The dried leaves were ground using a mechanical grinder. The obtained powders were sieved to obtain coarse/fine powders and stored in sterile containers at laboratory temperature until needed for use.

Methods of Determinations of Parameters

Proximate Analysis

The proximate composition was determined using the method of AOAC, (2005).

Mineral Analysis

Atomic Absorption Spectrophotometric (AAS) and flame photometric methods were used. Major elements such as calcium, magnesium, sodium and potassium were determined using flame photometric method while minor elements such as: iron, zinc, manganese and copper were determined by atomic absorption spectrophotometric method (Ayoola *et al.*, 2011).

Vitamin Analysis

Vitamins were determined in accordance with their polarity, the water-soluble vitamins (B and C) were determined by the method of Scalar analyzer (2000), while fat soluble vitamins (A and E) were determined using the method reported by the AOAC, (2005).

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Phytochemical Analysis

The standard methods described by Sofowara (1993) was used for determination of Alkaloid, saponin, tannin, flavonoid and phenol.

RESULTS AND DISCUSSION

Table 1 show that *Telfaria occidentalis* leaf has the highest amount of moisture, crude fiber and ash contents (80%, 14.77% and 13.43%). The high moisture content is an indication that the leaves are prone to quick spoilage (short shelf life). The *Ocimum gratissimum* leaves had the highest amount of crude fat and carbohydrate contents (14.93% and 53.74%), The higher carbohydrate content could be a contributing factor for the possession of anti diabetic property of the plant and can be said to be a good source of carbohydrate (Pamela *et al.*, 2005), while crude protein content (13.38%) was the highest in *Vernonia amygdalina* leaves. The plant could be a source of protein and in combination with animal protein may result to nutritional value judging from the amount present in the plant.

Table 2 shows that *Ocimum gratissimum* (scent leaves) had the highest concentration of calcium $(55.65\pm0.02 \text{ mg/g})$ while *Vernonia amygdalina* (bitter leaves) was the next in concentration $(38.61\pm0.01 \text{ mg/g})$ and the least concentration was *Telfaria occidentalis* (Ugu leaves) with 24.03 mg/g of calcium. Calcium is very important in blood clotting, muscle contraction, proper functioning of the heart and nervous system and also aid in the formation of bones and teeth (Gbolahan, 2001).

The presence of iron in moderate quantity in *Telfaria occidentalis* (Ugu leaves) and *Vernonia amygdalina* (bitter leaves) is an indication that the leaves could be effective in any blood related disorderliness such as anemia and when mix with cream milk which has been used locally as blood tonic. Other minerals such as magnesium, manganese, zinc, chromium and copper were also present in minute quantity but considering the usefulness of these minerals in bone management and metabolic processes they are worthy of mentioning (Dahl, 1972).

Copper, although in minute quantity (*Ocimum gratissimum* contained 0.47 ± 0.01 mg/g and *Vernonia amygdalina and Telfaria occidentalis* contained 0.08 ± 0.02 and 0.07 ± 0.02 mg/g respectively), therefore copper absorbs iron, it is naturally seeing with iron and is also important for cellular defence and protection of the mucous membrane. Therefore, copper can also be said to be anti-anaemic and essential for the formation of haemoglobin from iron.

Manganese is present in all the vegetables, therefore, considering the usefulness of manganese in the management of diabetes, functioning of the pituitary gland, the pineal gland, the brain and also for growth all these vegetables are medicinal viable for all these conditions (Claude and Paule,1979). Zinc was present in equal amount in all the vegetables, it is a well-known fact that zinc is important for normal sexual development (especially for the development of testes and ovaries), essential for reproduction, stimulates the activity of vitamins, formation of red and white corpuscle, healthy functioning of the heart and normal growth.

Table 3 shows the vitamin compositions of the three vegetable leaves. Vitamin A was the most abundant and the amount present in each of the vegetables are in the following; *Ocimum*



gratissimum (scent leaves)> Telfaria occidentalis (Ugu leaves)> Vernonia amygdalina (bitter leaves). Vitamin C (ascorbic acid) was the next high amount present in the vegetable leaves according to the following expression; Ocimum gratissimum (scent leaves)> Telfaria occidentalis (Ugu leaves)> Vernonia amygdalina (bitter leaves). Vitamin A helps to maintain good vision and prevents diseases of the eyes. The presence of vitamin C (ascorbic acid) in all the vegetable leaves is an indication that they are medicinal and have both prophylactic and therapeutic properties, some uses of vitamin C include, treatment of common cold, prostate cancer and infections (Okwu and Okwu, 2004). Also, as an antioxidant, vitamin C (ascorbic acid), prevent the formation of carcinogenic substances from dietary material. Deficiency of ascorbic acid is always showing symptom such as pains in the joint, anemia, manifestation of scurvy and haemorrhage from mucous membrane of the mouth and gastrointestinal tract (Elizabeth, 1994). Other vitamins, such as vitamin B and E, though in minute quantity, are essential for body metabolism and fertility.

The phytochemical (secondary metabolites) results are shown in Table 4, this shows that the studied vegetables are rich in secondary metabolites which is the main source of pharmaceutical raw materials. Alkaloids was the most prominent in all the vegetable leaves and is according to the following expression, Ocimum gratissimum(scent leaves)> Vernonia amygdalina (bitter leaves)>Telfaria occidentalis (Ugu leaves). Saponins was the next abundant in the following quantity; Vernonia amygdalina (bitter leaves)>Telfaria occidentalis (Ugu leaves)>Ocimum gratissimum(scent leaves). Tannins was also present in high amount according to the vegetable leaves concerned; Ocimum gratissimum> Telfaria occidentalis (Ugu leaves)>Vernonia amvgdalina (bitter leaves). Flavonoids was present in moderate quantity according to the following expression; Telfaria occidentalis (Ugu leaves)>Ocimum gratissimum (scent leaves)>Vernonia amygdalina (bitter leaves). Total phenol was also present in moderate amount according to the following mathematical expression; Telfaria occidentalis (Ugu leaves)>Ocimum gratissimum (scent leaves)>Vernonia amygdalina (bitter leaves). Alkaloids are the most efficient plant substances used pharmaceutically and therapeutically (Igboko, 1983). Alkaloids possess analgesic, antispasmodic and bactericidal properties (Stray, 1998). Tannins were present in all the vegetables, considering the importance of tannins in the healing of hemorrhoids (piles), frost bite and varicose ulcers in traditional medicine (Maduiyi, 1983). They have astringent properties which is responsible for the quickening of wound healing and inflamed mucous membrane (Farquar, 1996). Saponins have expectorant action (David, 1983). The use of flavonoids includes protection against allergies, inflammation, ulcers, virus, and tumor and cancer (Okwu, 2004).

Implication to Research and Practice

- (i) The vegetable of interest is consumed as food, especially for the sick ones
- (ii) They are used to compliment some food items giving to nursing mothers
- (iii) They are used as medicine in form of herbal tea to prevent and treat some minor ailments.
- (iv) They are used in controlling some diseases due to mineral or vitamin deficiencies



CONCLUSION

This study has revealed that the vegetable leaves are both medicinally and nutritionally effective in our health management, therefore, it is advisable to eat these vegetable leaves in combined form or as mixtures in a controlled ratio. Also, they could be packaged and drink as infusion in the form tea for good health.

Recommendation for Future Work

Further research work could be embarked upon to isolate, characterize and purify bioactive compounds present in each of the vegetable so that it would be easy for pharmaceutical companies to make use of the compound in the formulation and production of drugs.

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APPENDIX

Table 1: Proximate Compositions of Ocimum gratissimum, Vernonia amygdalina and Telfaria occidentalis Leaves

Ocimum gratissimum (Scent leaf)	<i>Vernonia amygdalina</i> (Bitter leaf)	<i>Telfaria</i> occidentalis (Ugu leaf)
78±0.01	78±0.05	80±0.02
12.94±0.02	12.43±0.1	13.43±0.01
14.20±0.02	13.48±0.01	14.77±0.02
14.93±0.01	12.93±0.02	14.50±0.01
4.19±0.01	13.38±0.01	9.38±0.2
53.74±0.01	47.78±0.04	47.92±0.2
	Ocimum gratissimum (Scent leaf) 78±0.01 12.94±0.02 14.20±0.02 14.93±0.01 4.19±0.01 53.74±0.01	Ocimum gratissimum (Scent leaf) Vernonia amygdalina (Bitter leaf) 78±0.01 78±0.05 12.94±0.02 12.43±0.1 14.20±0.02 13.48±0.01 14.93±0.01 12.93±0.02 4.19±0.01 13.38±0.01 53.74±0.01 47.78±0.04

Values are means ±*standard deviations of triplicate determinations*

Table 2: Mineral Compositions of Ocimum gratissimum, Vernonia amygdalina and Telfaria occidentalis Leaves

Parameter (Mineral) (mg/g)	Ocimum gratissimum (Scopt loof)	Vernonia amygdalina (Bittor loof)	Telfaria occidentalis (Ugu loof)
Calcium	55.65±0.02	38.61±0.01	24.03±0.01
Magnesium	0.13±0.05	0.13±0.02	0.14±0.02
Manganese	0.01±0.01	0.014±0.02	0.01±0.02
Iron	0.80±0.02	1.26±0.01	1.60±0.01
Zinc	0.07±0.01	0.07±0.01	0.07±0.01
Chromium	0.057±0.01	0.057±0.01	0.057±0.01
Copper	0.47±0.01	0.08±0.02	0.07±0.02

Values are means ±standard derivations of triplicate determinations



Parameter (Vitamin) (mg/g)	Ocimum gratissimum (Scent leaf)	<i>Vernonia amygdalina</i> (Bitter leaf)	<i>Telfaria</i> occidentalis (Ugu leaf)
А	41.72±0.01	26.22±0.01	40.76±0.01
B ₂	0.011±0.01	0.010±0.01	0.025±0.01
B ₃	0.042±0.02	0.22±0.01	0.02±0.01
B ₆	0.184±0.01	0.162±0.01	0.21±0.02
B 9	0.383±0.01	0.185±0.02	0.151±0.01
B ₁₂	0.009±0.01	0.009±0.02	0.01±0.02
С	2.19±0.02	1.31±0.03	1.50±0.08
E	0.65±0.1	0.65±0.2	0.403±0.05

Table 3: Vitamin Compositions of Ocimum gratissimum, Vernonia amygdalina and Telfaria occidentalis Leaves

Values are means ±*standard derivations of triplicate determinations*

Table 4: Secondary Metabolite Compositions of Ocimum gratissimum, Vernoniaamygdalina and Telfaria occidentalis Leaves

Parameter (%)	Ocimum gratissimum (Scent leaf)	<i>Vernonia</i> <i>amygdalina</i> (Bitter leaf)	<i>Telfaria</i> occidentalis (Ugu leaf)
Alkaloids	16.02±0.01	14.99±0.08	12.01±0.02
Flavonoids	5.96±0.02	4.96±0.01	7.99±0.02
Saponins	4.99±0.02	14.69±0.01	10.99±0.02
Tannins	12.07±0.02	5.08±0.01	10.92±0.01
Total phenols	9.84±0.01	6.01±0.01	10.37±0.02

Values are means ±standard derivations of triplicate determinations