Nigerian Journal of Science and Environment 2025 Volume 23 (3) 190 – 198 ISSN: 3043 – 4440
https://doi.org/10.61448/njse2332514

COMPARATIVE STUDIES OF PHYTOCHEMICAL AND FATTY ACID COMPOSITIONS IN TWO NIGERIAN BASILS (*Ocimum basilicum* L. and *Ocimum gratissimum* L.)

***Oloyede, F.M, Adelakun, O.A. and Adegbite, V.M.**
Department of Agronomy, College of Agriculture, Osun State University, P.M.B. 4494, Osogbo, Nigeria.
*Corresponding author: funmilayooloyede@yahoo.co.uk; mary.oloyede@uniosun.edu.ng. Orchid: https://orcid.org/0000-0001-9644-8835.

Abstract

The study was carried out to evaluate the phytochemical and fatty acid compositions of two species of *Ocimum.* The result of the phytochemicals analysis revealed higher concentration of phytochemical in *Ocimum gratissimum* such as the presence of alkaloid (5.23%,), saponin (5.23%), flavonoid (11.07%), phenol (1.04%), tannin (4.13%), phytate (124.4%) and oxalate (59.9%) compared to *Ocimum basilicum*. Fatty acid analysis showed that essential oil was significantly high in *Ocimum gratissimum*. linoleic (41.7%), docosahexaenoic (0/95%) and arachidonic acid (0.77%) was more concentrated in *O. gratissimum* compared to *O. basilicum*, the concentration of α-linoleic acid is the same for both species, non-essential oil was higher in *O. gratissimum* except palmitic acid. It revealed that myristic (1.89%) margaric (0.77%), stearic (6.35%), arachidic (3.82%), pentadecanoic acid (0.98%), palmitoleic trans acid (1.52%) and behenic (4.42%) were high in *O. gratissimum* than *O. basilicum.* The result of the analyzed *Ocimum* showed that there were significant concentrations of phytochemicals and fatty acid in *Ocimum gratissimum* compared to *Ocimum basilicum* making the nutritional contents useful for valuable healthy ingredient to improve the deficiency of these phytochemicals and essential oil in human diet.

Keywords: Essential oil, Lamiaceae, *Ocimum spp.*, Phytochemicals, Underutilized crops.

Introduction

The family Lamiaceae consists of about 240 genera and 7200 species of herbs, shrubs, trees, and vines, which can be found in almost all parts of the world (Harley, 2010). Many *Ocimum* species have been cultivated for thousands of years, particularly across the Mediterranean Basin and in southern Asian regions (Bhasin, 2012). *Ocimum gratissimum* is a very variable, polymorphic species with numerous forms, many of which have previously been treated as different species and subspecies. The genus *Ocimum* consists of more than 150 species (Mondal, 2007), which are widely used in folk medicine in some countries and are great sources of essential oils used in industry (Khalid, 2006).

Ocimum gratissimum Linn. (Lamiaceae) (Fig. 1) is an herbaceous shrub notably found in tropical countries including Nigeria, where it is commonly called Clove basil, Sweet basil, Teabush, Scent leaf or fever plant; but it is also popularly known with different local names in Nigeria. Nupe: Tan-motsungiwawagi; Ebira: Ireru; Hausa: Daidoya ta gida; Yoruba: Efinrin Nla; Ibo: Ahuji or Nchanwu (Gill *et al*, 1985). It has escaped cultivation and can be found growing as a weed in disturbed sites, waste areas, pastures

and along roadsides. In this species, seeds are small, numerous and easily dispersed by gravity, animals, human activities and as a contaminant in soil and garden debris.

Ocimum gratissimum is a medicinal plant, which are of great importance to man. The leaves of this plant are widely used in folk medicine, incorporated in teas and infusion of leaves to treat cough, cold, abdominal pain, anxiety, headache, and bronchitis (Matasyoh *et al*., 2007). Several scientific reports say that *O*. *gratissimum* has potential antioxidant, antimicrobial (Joshi, 2013), anti-inflammatory (Ajayi *et al*., 2014), anthelmintic (Aderibigbe and Idowu, 2020), antimutagenic (Gontijo *et al*., 2014), antidiarrhoeal (Offiah and Chikwendu, 1999), anticancer and antidiabetic activities (Aguiyi *et al*., 2000). Hydrodistillation, steam distillation, microwave, ultrasound-assisted and supercritical fluid methods are used to extract the essential oils from plants (Azwanida *et al*. 2015).

Phytochemical screening of the aqueous leaf extract of *Ocimum gratissimum* had shown the plant to contain alkaloids, saponins, tannins, alkaloids, anthraquinone, steroids, terpenoids and cardiac glycosides (Holets *et al*., 2003; Akinyemi *et al*., 2005; Akinmoladun *et al*., 2007). In addition, essential oils from the leaves of *Ocimum gratissimum* reveal the presence of compounds such as eugenol, cineole, ocimol, tetratriacontane, gratimissin, gratimissic acid and β-caryophyllene (Sainsbury and Sofowora, 1971). *Ocimum basilicum* (Fig. 2) has whitish ovate leaves and whorls of white purple tinged flowers in terminal racemes and in the leaf axil (Bep, 1960). It is used as spice in local dishes and even earned the name curry leaf. When added to boiling meat, it gives it a very nice smell and also adds flavour to the cooked meat (Sofowora, 1982). Extracts from *Ocimum basilicum* is useful as pesticides. When planted around human habitation is used to drive snakes away from the neighborhood (Sofowora, 1982).

Fig 1: Picture showing *Ocimum gratissimum*

Fig 2: Picture showing *Ocimum basilicum*

Materials and method

Plant Propagation and Experimental Design

The experiment was carried out at the screen house of College of Agriculture (Latitude 7^0, $52'37^0$ N and Longitude 4^0, 18'13, 76^0 E), Osun State University (UNIOSUN), Nigeria. The pot experiment was set up under the temperature range of 25°C to 30°C. The experiment design used was Complete Randomized Design (CRD). The soil type was a well-drained sandy-loam. The seeds were gotten from the Department of Agronomy, UNIOSUN. Seeds were sown in the nursery by spreading them across a prepared bed, germination began within two weeks, after four weeks transplanting was done in pots. Weeds were handpicked and irrigation was done regularly until plants matured, when the plants were harvested for laboratory evaluation.

Laboratory Analyses

The harvested plants were analyzed for phytochemicals (alkaloid, flavonoid, saponin, tannin, phenol, phytic and oxalic), Essential oil (linoleic, alpha-linoleic, docosahexaenoic and arachidonic acid) and non-essential oil (myristic, palmitic, margaric, stearic, arachidic, pentadecanoic acid, palmitoleic trans acid and behenic).
This was determined according to the method of Harbone (1973). 0.5g of the sample was weighed in 96% ethanol and 20% of sulfuric acid; H_2SO_4 (1:1). 1 ml of the filtrate was added to 5 ml of 60% prepared sulphuric acid and allowed to stand for 5 min. Then; 5 ml of 0.5% Formaldehyde of 5 ml was added and allowed to stand for three hours. The absorbance of 565 nm was taken.

Determination of flavonoids

The concentration of flavonoid in the test sample was determined by the acid hydrolysis of the spectrophotometric method; 0.5 g of the sample was mixed with 5 ml of dilute hydrogen chloride (HCl), and boiled for 30 min. The boiled extract was filtered. 1 ml of the

filtrate was added to 5 ml of ethyl acetate and 5 ml of 1% ammonia (NH_3). This was then scanned from 420n-520nm for absorbance. (Harborne, 1973).

Determination of saponins

Weighed 0.5g of the samples, 20 ml of nitrate hydrochloric acid (1NHCl), and was added and boiled for four hours. After cooling, it was filtered, and 50 ml of petroleum ether was added and evaporated to dryness. 5 ml of acetone ethanol was added to the residue. 0.4 ml of the sample was taken into three different test tubes. 6 ml of ferrous sulfate reagent was added, followed by 2 ml of conc. sulfuric acid (H_2SO_4). The absorbance was taken after 10 mins at 490 nm (Oloyede, 2012).

Determination of phenols

Defatting of 2g sample was carried out for 2 hours in 100 ml of ether using a soxhlet apparatus. The defatted sample (0.50 g) was boiled for 15 minutes with 50 ml of ether for the extraction of the phenolic components. Exactly 10 ml distilled water, 2 ml of 0.1 N ammonium hydroxide solution, and 5 ml of concentrated amyl alcohol were all added to 5 ml of the extract for 30 minutes for color development. The absorbance was then measured at 505 nm. Standard curve was prepared for the phenol standard and left for 30 minutes to develop color. (Keay *et al*., 1964).

Determination of phytate

To 4 g of grounded sample was added 100 ml of 2% hydrochloric acid (HCl). The mixture was constantly shaken for 3 h and filtered. To 25 ml of the filtrate was added 5 ml of 0.3% ammonium thiocyanate (NH_4SCN). Fifty milliliters of distilled water was added to afford the desired acidity. This solution was titrated against a 0.00195 g/ml ferric chloride solution. The end point was characterized by a persistent brownish yellow coloration. Phytate content was estimated from Equation (4) below;

$$\% \text{ Phytic acid} = \frac{8.24t \times 100}{1000 \times \text{sample mass}}$$

Where t= titer value.

Determination of oxalate

The concentration of oxalate was carried out using the method reported by (Ejikeme *et al*.,2014) ; and (Munro *et al*.,1969). Exactly 20 ml of 0.3 molar hydrochloric acid (M HCl) in the sample (2.50 g) was extracted three (3) times by warming at a temperature of 50°C for 1 hour with constant stirring using a magnetic stirrer. For oxalate estimation, 1ml of 5 M ammonium hydroxide was added to 5ml of extract to ensure alkalinity. The addition of 2 drops of phenolphthalein indicator, three drops of glacial acetic acid, and 1ml of 5% calcium chloride to make the mixture acidic before standing for 3 hours was followed by centrifugation at 3000 rpm for 15 minutes. Then 2 ml of 3 M sulphuric acid was added and the precipitate dissolved by warming in a water bath at 70°C. Freshly prepared 0.01 M potassium permanganate ($KMNO_4$) was titrated until a pink colorappeared and persisted for at least 30 seconds. The concentration of Oxalate was calculated as Oxalate= (Titre value×0.9004)mg/g.

Determination of essential and non-essential oil

The essential oil and non-essential oil of *O. basilicum* was obtained by hydrodistillation for 1 hour and analyzed using gas chromatography (GC) coupled with mass spectrometry (GC/MS). For the identification of the essential oil components, analytical gas chromatography (GC) was performed using DELSI 121 C apparatus fitted with a flame ionization detector and a

CP WAX 51 fused silica column (25 m × 0.25 mm i.d., 0.25 μm film thickness).

Results

Phytochemicals in *O. gratissimum* and *O. basilicum*

Table 1 presents species effect on the phytochemicals of *Ocimum basilicum* and *Ocimum gratissimum.* Results showed that alkloids, saponin, flavonoids and phenol are significantly higher in *Ocimum gratissimum* with a mean value of (5.23%, 5.23%, 11.07%, 1.04%) compared to *Ocimum basilicum* with a mean value of (5.04%, 5.04%, 10.15%, 0.97%) respectively. Tannins, phytates and oxalates were also higher in *Ocimum gratissimum* but not statistically significant with a mean value of (4.13%, 124.4%, 59.9%) compared to *Ocimum basilicum* with a mean value of (4.08%, 120.9%, 59.8%) respectively.

Table 1: Species effects on the phytochemicals of *O. gratissimum* and *O. basilicum*

Species	*Ocimum basilicum*	*Ocimum gratissimum*	LSD (P=0.05)
Alkaloid acid (%)	5.03750[b]	5.23333[a]	0.0526
Saponins acid (%)	5.03750[b]	5.23333[a]	0.0287
Flavonoid acid (%)	10.14750[b]	11.06667[a]	0.0984
Phenol acid (%)	0.97917[b]	1.04458[a]	0.0216
Tannins acid (%)	4.084583[b]	4.132917[a]	0.0066
Phytate acid (%)	120.94583[b]	124.36167[a]	0.1857
Oxalate acid (%)	59.84792[a]	59.93375[a]	0.1863

Essential oil in *O. gratissimum* and *O. basilicum*

Table 2 presents the species effects on the essential oil of *Ocimum gratissimum* and *Ocimum basilicum* as linoleic acid was significantly higher in *Ocimum gratissimum* (41.7%) compared to *Ocimum basilicum* (37.2%). The concentration of α-linoleic acid is the same for both species, Docosahexaenoic was significantly higher in *Ocimum gratissimum* (0.95%) compared to *Ocimum basilicum* (0.71%). Arachidonic acid was also significantly higher in *Ocimum gratissimum* (0.77%) compared to *Ocimum basilicum* (0.70%).

Table 2: Species effects on the essential oil of *O. gratissimum* and *O. basilicum*

Essential oil (%)	*Ocimum basilicum*	*Ocimum gratissimum*	LSD (P=0.05)
Linoleic acid	37.2392[b]	41.6692[a]	0.2404
α-linoleic acid	9.24792[a]	9.26667[a]	0.0395
Docosahexaenoic	0.70583[b]	0.95271[a]	0.0369
Arachidilenic acid	0.700208[b]	0.771250[a]	0.0107

Non-essential oil in *O. gratissimum* and *O. basilicum*

Table 3 presents the species effect on non-essential oil of *O. basilicum* and *O. gratissimum.* It shows that *O. gratissimum* (6.35%) has a higher amount of stearic acid compared to *O. basilicum* (5.76%). Similarly, *O. gratissimum* has a significant amount of myristic acid (1.89%) than *O. basilicum* (1.80%). Palmitic acid was significantly higher in *Ocimum basilicum* (40.45%) compared to *Ocimum gratissimum* (39.89%). *Ocimum gratissimum*

(0.77%) has a higher amount of margaric acid compared to *Ocimum basilicum* (0.63%). Arachid acid was significantly higher in *O. gratissimum* (3.82%) compared to *O. basilicum* (3.38%). *Ocimum gratissimum* (8.91%) has a significantly higher amount of oleic acid compared to *Ocimum basilicum* (8.33%). Pentadecanoic acid was significantly higher in *Ocimum gratissimum* (0.98%) compared to *Ocimum basilicum* (0.88%). *Ocimum gratissimum* (1.52%) also contain a higher significant amount of palmitoleic acid compared to *Ocimum basilicum* (1.19%). Behenic acid was significantly higher in *Ocimum gratissimum* (4.42%) compared to *O. basilicum* (4.12%)

Table 3: Species effects on non-essential oil of *O. gratissimum* and *O. basilicum*

Species	*Ocimum basilicum*	*Ocimum gratissimum*	LSD (P=0.05)
Stearic acid (%)	5.75625[b]	6.35375[a]	0.1172
Myristic acid (%)	1.79833[b]	1.89458[a]	0.0273
Palmitic acid (%)	40.4463[a]	39.8869[b]	0.2203
Margaric acid (%)	0.626458[b]	0.765833[a]	0.0141
Arachidic acid (%)	3.37875[b]	3.81604[a]	0.096
Oleic acid (%)	8.33063[b]	8.90729[a]	0.0289
Pentadecanoic acid (%)	0.87833[b]	0.98417[a]	0.0245
Palmitoleic trans acid (%)	1.192083[b]	1.520208[a]	0.0107
Behenic acid (%)	4.12958[b]	4.42333[a]	0.1161

Discussion

The results of the phytochemical screening of *O. basilicum and O. gratissimum* revealed the presence of phenolics, saponins, alkaloids, flavonoids and tannins. On the contrast, Nadeem *et al*., (2022) reported absence of saponin in *O. basilicum.* This study also provided estimated amounts of essential oil such as linolic, alpha-linolic, docosahexanoic and arachidonic acid and non-essential oil such as margaric, myristic, myristoleic, oleic, arachidic, palmitoleic, palmitic, pentadecanoic, stearic and behenic acid present in the *Ocimum* leaf. Saponin, flavonoids are significantly higher in *Ocimum gratissimum* compared to *Ocimum basilicum.* The presence of saponins in plants is responsible for the various biological benefits like anti-inflammatory, anti-diabetic, anti-HIV and anti-atherosclerosis. It is very effective in maintaining liver function, lowering blood cholesterol, preventing peptic ulcer. (Kashiwada *et al.*, 2019). The phytochemicals in medicinal plants have been reported to be the active principles responsible for the pharmacological potentials of medicinal plants (Edeoga *et al*., 2005). Tannin and phytate was also higher in *Ocimum gratissimum* compared to *Ocimum basilicum.* The concentration of oxalates in the leaves of *Ocimum gratissimum* as observed in this study was higher than *Ocimum basilicum*. *Ocimum* is therefore likely to be a better source of antioxidants than some other wild vegetables. Das *et al*., (2020).

Alkaloid was significantly higher in *Ocimum gratissimum* compared to *Ocimum basilicum*. The concentration of alkaloid in the leaves as shown in this study could contribute to the use of the

leaves as an insect repellant. Nadeem *et al*., (2022) reported that *O basilicum* which are traditionally used in folklore medicine contain higher trace amounts of phytochemical.

Linoleic acid, docosahexaenoic, arachidonic acid was significantly higher in *Ocimum gratissimum* compared to *Ocimum basilicum.*

The non-essential oil analysis of the leaves of *Ocimum basilicum* revealed a considerable high level of palmitic acid compared to *Ocimum gratissimum*, which represents about 45% of the total non-essential oil. Palmitic is used in the cosmetics industry and also because it is inexpensive, it is used as natural additive in organic products. The concentration of stearic, myristic, margaric, arachid, pentadecanoic, behenic, palmitoleic and oleic acid was more in *Ocimum gratissimum* compared to *Ocimum basilicum.* Its content in *Ocimum* leaves as observed in this study makes the plant a rich source of essential oil over some convectional vegetables (Antia *et al*., 2006; Akubugwo *et al*., 2007).

Conclusion

The leaves of *O. gratissimum* and *O. basilicum* contain abundant amount of flavonoids, saponins tannins, phenolics and alkaloids. However, *Ocimum gratissimum* contained higher amount of phytochemicals than *Ocimum basilicum.* Essential oil and non-essential oil analysis of the *Ocimum* species revealed *O. gratissimum* has a higher percentage of linoleic acid, docosahexaenoic, arachidonic acid, stearic, myristic, margaric, arachid, pentadecanoic, behenic, palmitoleic and oleic acid except palmitic thereby indicating that there are higher concentrations of the evaluated phytochemicals and fatty acids in *O. gratissimum.*

Conflicts of interest

The authors declared that there is no conflict of interest.

Competing Interests

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Author Contributions

FMO: Conceptualized the research idea and managed all aspects of the manuscript. **AOO:** Collected field data, did laboratory evaluation and wrote the first draft of the manuscript. **VMA** reviewed and edited the manuscript draft.

Acknowledgements

Authors acknowledge their various institution for provision of conducive environment for this research.

References

Aderibigbe, S.A., and Idowu, S. O. (2020). Anthelmintic activity of *Ocimum gratissimum* and Cymbopogon citratus leaf extracts against Haemonchus placei adult worm. *Journal of Pharmacy and Bioresources*, **17**(1), 8-12. https://doi.org/10.4314/jpb.v17i1.2

Aguiyi, J. C., Obi, C. I., Gang, S. S. and Igweh, A. C. (2000). Hypoglycaemic activity of *Ocimum gratissimum* in rats. *Fitoterapia*, **71**(4), 444-446. https://doi.org/10.1016/S0367-326X(00)00143-X

Ajayi, A. M., Tanayen, J. K., Ezeonwumelu, J., Dare, S., Okwanachi, A., Adzu, B., and Ademowo, O. G. (2014). Anti-inflammatory, Anti-nociceptive and Total polyphenolic Content of Hydroethanolic Extract of *Ocimum gratissimum* L. Leaves. *African journal of medicine and medical sciences*, **43**(Suppl.1), 215–224.

https://pubmed.ncbi.nlm.nih.gov/26689550/

Akinmoladun, A. C., Ibukun, E.O., Afor, E., Obuotor, E.M., and Farombi, E.o (2007). Phytochemical constituent and antioxidant activity of extract from the leaves of *Ocimum gratissimum*. *Scientific Research and Essays*, **2**(5), 163-166.

Akubugwo I.E, Obasi N.A, Chinyere G.C, Ugbogu AE (2007). Nutritional and chemical value of *Amaranthus hybridus* L. leaves from Nigeria. *African Journal of Biotechnology*, **6**(24):2833-2839. https://doi.org/10.5897/AJB2007.000-2452

Aluko, B.T., Oloyede, O., and Afolayan, Afolayan, A.j. (2012). Phytochemical and nutrient compositions of the leaves of *Ocimum canum Sims*. *African Journal of Biotechnology*, **11**(63), 12697-12701. https://doi.org/10.5897/AJB11.3418

Azwanida, N. N. (2015). A review on the extraction methods use in medicinal plants: Principle, strength and limitation. *Medicinal & Aromatic Plants*, **4**(1), 3–8. doi: 10.4172/2167-0412.1000196

Bhasin, M. (2012). *Ocimum*-Taxonomy, medicinal potentialities and economic value of essential oil. *Journal of Biosphere*, **1**(1), 48-50

Das, S., Barman, S., Teron, R., Bhattacharya, S.S., and Kim, K.-H. (2020). Secondary metabolites and anti-microbial/anti-oxidant profiles in *Ocimum spp*.: Role of soil physico-chemical characteristics as eliciting factors. *Environmental Research*, *188*, 109749. https://doi.org/10.1016/j.envres.2020.109749

Edeoga H. O., Okoye D.E., Mbabie, B.O. (2005). Phytochemical constituents of some Nigerian Medicinal plant. *African Journal of Biotechnology*. **4**(7):685-688. https://doi.org/10.5897/AJB2005.000-3127

Gill, L.S.(1992), *Ethnomedical uses of plants in Nigeria*. Uniben press.

Gontijo, D. C., Fietto, L. C., and Leite, J. P. V. (2014). Phytochemical assessment and antioxidant, antimutagenic and toxicological activity of *Ocimum gratissimum* L. leaf aqueous extract. *Revista Brasileira de Plantas Medicinais*, **16**(4), 874-882. https://doi.org/10.1590/0102-695X2014000400019

Harley R.M, França F., and Santos E.P (2010). *Lamiaceae*. In M.C Labaque (Ed.), *Catálogo* de *plantas e fungos* do Brasil. (pp. 1130-1146).

Joshi, R. K. (2013). Chemical composition, in vitro antimicrobial and antioxidant activities of the essential oils of *Ocimum gratissimum*, *O. sanctum* and their major constituents. *Indian Journal of Pharmaceutical Sciences*, **75**(4), 457-462. https://doi.org/10.4103/0250-474X.119834

Kashiwada Y., Wang H.K, Nagao, T., Kitanaka, S., Yasuda I., and Fujioka T.(2009). Anti-AIDS agents, 30: Anti-HIV activity of oleanolic acid, pomolic acid and structurally related triterpenoids. Journal of Natural Products, 72(6): 1090-1095. https://doi.org/10.1021/np9800710

Khalid, K.A. (2006). Influence of water stress on growth, essential oil, and chemical composition of herbs (*Ocimum sp*.). *International Agro physics.* **20**(4): 289-296.

Matasyoh, L.G., Matasyoh, J. C., Wachira, F. N., Kinyua, M. G., Muigai, A. W. T. and Mukiama, T. K. (2007). Chemical composition and antimicrobial activity of the essential oil of *Ocimum gratissimum* L. growing in Eastern Kenya. *African Journal of Biotechnology*, **6**(6), 760-765. https://doi.org/10.5897/AJB2007.00-4097

Mondal S, Mahapatra S, Naik S, Mirdha B. Antimicrobial activities of essential oils obtained from fresh and dried leaves of *Ocimum sanctum* (L.) against enteric bacteria and yeast. *Acta Horticulture.* 2007; **756**(2007): 267-70.

Nadeem, .R., Akhtar, S., Sestili, P., Ismail, T., and Neugart, S. (2022). Toxicity, antioxidant activity, and phytochemicals of basil (*Ocimum basilicum* L.) leaves cultivated in Southern Punjab, Pakistan. Foods, **11**(9), 1239. https://doi.org/10.3390/foods11091239

Offiah, V.N, and Chikwendu, U.A. (1999). Antidiarrhoeal effects of *Ocimum gratissimum* leaf extract in experimental animals. *Journal of Ethnopharmacol*, **2**(1), 327-330. https://doi.org/10.1016/S0378-8741(99)00100-2

Sainsbury, M., and Sofowora, E.A. (1971). Essential oil from the leaves and inflorescence of *Ocimum gratissimum*. *Phytochemistry*, 10(12), 3309-3310. https://doi.org/10.1016/S0031-9422(00)97406-5

Singh A. K. Seedling morphology of four species of *Ocimum* L. (*Lamiaceae*) and its taxonomic significance. *Bangla J Plant Taxon* 2012;19:89-92.

Sofowora A (1982). Medicinal plants and traditional medicine in Africa. John Wiley, Chichester pp. 179.