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RESEARCH PAPER

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Health and Food Values of Scent Leaf (*Ocimum gratissimum* L.)

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ABSTRACT

Ocimum gratissimum also called scent leave is a perennial herbaceous, drought tolerant plant with lime-green pubescent leaves, a characteristically strong fragrance and a slight pungency. The leaves and stems contain some amount of moisture, ash, crude fibers, crude lipid, crude protein, carbohydrates and energy. It is composted of several minerals such as potassium, calcium, magnesium and copper as well as chemical contents which include thymol, euglenol, therpinene, caryophyllene and ethyl esters. The plant plays an important roles in traditional medicine preparations, include use as a stomaclric and for treatment sunstroke, headache and influenza. The plant is used in the treatment of epilepsy, high fever and diarrhea while leaf decoctions are used to treat mental illness. Other uses include the treatment of fungal infractions, fevers, colds and catarrh. The plant also has Antimicrobial and antifungal activity, antidiarrhoeal, wound healing and hair loss efficacy. Other essential uses of the plant are their use as repellent insecticides and the strong aroma in food preparation.

Keywords: Ocimum Gratissimum, Health Values, Nutritional Benefits and Other Uses.

INTRODUCTION

Many plants are consumed as vegetables. These plants have various nutritional and medicinal values. Their activities differ and their effects on man also differ. Some of these plants are more medically valid by some people while others may only know more of their nutritional value. However, it has been discovered that most of these plants are as medicinal as

nutritional. The plant *Ocimum gratissimum* is one of those plants widely known and used for both medicinal and nutritional purpose. It is a perennial plant that is widely distributed in the tropics of African and Asia. It belongs to the family labiatae and it is the most abundant of the genus *Ocimum.* The common names of the plant are Basil fever plant or tea bush and vernacular names include Daidoya tagida (Hausa), Nehonwu (Igbo), Tanmotswangiwawagi (Nupe) and Efinrin (Yourba) (Abdullahi *et al.,* 2003).

The available information on *Ocimum gratissimum* has been divided into six sections, that is, ethno pharmacology, morphology, photochemistry, pharmacology, clinical and toxicological studies. The ethno pharmacological section has been further subdivided into two sections, viz. traditional uses and alternative and complementary medicinal uses. The reports in which *O. gratissimum* have been used as a domestic remedy by common men without prescription for the treatment of various ailments have been discussed under traditional used.

African basil, *O. gratissimum* L., is a perennial herbaceous, drought tolerant plant with lime-green pubescent leaves, a characteristically strong fragrance and a slight pungency. In Nigeria and several other countries, the plant plays important roles in traditional medicine preparations (Gill, 1992), include use as a stomaclric and for treatment sunstroke, headache and influenza. In the coastal areas of Nigeria, the plant is used in the treatment of epilepsy, high fever, and diarrhea (Effraim, *et al*., 2003), while in the savannah areas leaf decoctions are used to treat mental illness (Akinmoladun *et al*., 2007). Other uses include the treatment of fungal infractions, fevers, colds, and catarrh (Ijeh *et al*., 2005). A number of other traditional uses of African basil have also been reported (Freire *et al*., 2006; Ilori *et al.,* 1996; Nadkarni, 1999; Nagassoum *et al*., 2003; Okigbo and Igwe, 2007). The plant is known to contain phenolic compounds with therapeutic potential (Vierra and Simon, 2000).

Light and water are environmental factors that can affect crop growth and yield. Reduced light can limit photosynthesis and alter plant development (Whitelam and Holliday, 2007). Water deficits results in lowered water potential, reducing the water flow and cell tungor pressure needed to maintain plant structure and promote growth (Hopkins, 1995). In the case of aromatic crops, reduced light levels and water deficits have been demonstrated to alter essential oil levels and constituency (Radusiene *et al.,* 2011, Sabih *et al*., 1999). Studies with sweet basil (*Ocimum bacilium*) have corroborated these effects for both light (Loughrim and Kasperbauer, 2003; Shiga *et al.,* 2009) and water (Mirsa and Strivastov, 2000; Simon *et al.,* 1992).

Ocimum gratissimum is a shrub up to 1.9m in height with stems that are branched. The leaves measured up to 10 x 5cm, and are ovate to ovate-lanceolate, sub-acuminate to a acuminate at apex, cuneate and decurrent at base with a coarselycrenate, serrate margin, pubescent and dotted on both the sides. The leaves show the presences of covering and glandular trichomes. Stomata are rare or absent on the upper surface while they are present on the lower surface. Ordinary trichomes are few, while the ion up to 6- celled are present on the margins mostly; the short ones which are 2 celled, are mostly found on the lamina petioles are up to 6cm long and racemes up to 18cm long. The peduncles are densely pubescent. Calyx is up to 5mm long campanulate and 5-7m long, greenish-white to greenish-yellow in

colour. Nutrients are mucilaginous when n they are wet.

Fruit consisting of 4, dry, 1-seeded little nuts enclosed in the persistent sepal. The little nuts are slightly spherical size, 1.5mmlong, wrinkled and brown. The outer wall of ripened fruit does not become mucilaginous in water. The plant grows widely in tropical African. It is also grown in South-East Asia, largely in India and Hawaii. The native areas of the plant are mostly found to be regions that are 1500m above sea level altitude in coastal scrub, lakeshores, coastal lands, sub-moutane forest/region, savanna vegetation and disturbed land. It is not frequently found in open locations like road sides and

FOOD VALUES OF *Ocimum gratissimum*

Proximate composition

The proximate composition of the leaves and stems of *O.grastissimum* has been studied by various researchers (Idris et al., 2011). The leaves and stems contain some amount of moisture, ash, crude fibers, crude lipid, crude protein, carbohydrates and energy. These proximate compositions are essential in formation of bones, teeth, hair, and the outer layer of the skin and help to maintain the blood vessels and other tissue in the body of humans and animals (Lintas, 1992).

Table 1.Proximate composition of the leaves and stems of *Ocimum gratissimum*

Parameter	Concentration (%) (Dry weight)	
	Leaves	**Stems**
Moisture content	82.60±0.01	82.60±0.11
Ash	13.67±0.13	13.67±0.02
Crude protein	3.33±0.07	1.65±0.02
Crude lipid	8.50±0.04	3.00±0.15
Crude fiber	9.52±0.01	19.65±0.03
Carbohydrate	64.98±0.01	62.03±0.04
Energy (kcal/100g)	343.08±0.01	278.42±0.011

Source: Lintas (1992).

Table 2. Mineral composition of the leaves and stems of *O.gratisimum.*

Mineral element	Concentration (mg/100g dry matter)	
	Leaves	**Stems**
K	1479.88±0.01	2150.01±0.11
Na	75.85±0.23	163.37±0.13
Ca	5.20±0.02	3.73±0.01
P	4.25±017	3.05±0.03
Mg	0.53±0.01	0.33±0.12
Cu	1.17±0.11	1.60±0.03
Fe	13.92±0.03	6.67±0.01
Mn	7.62±0.15	19.17±0.05
Zn	12.84±0.01	34.17±0.14

Sources: Lintas(1992).

Table 3. Chemical composition of the essential oil of leaves and seeds of *O. gratisimum.*

Chemical compounds	Retention Times (min)	Percentage composition (%)	
		Leaves	Seeds
γ–Terpinene	2.20	52.86	–
α–Puriene	2.22	–	48.19
p-Cymenene	22.29	7.16	-
(2) β-terpineol	2.34	-	0.92
1,3,8-p-Menthatriene	2.42	-	0.51
(4)-Terpineol	2.92	-	1.39
Thymol methyl ester	3.45	3.65	3.29
Unbellulone	3.91	1.57	1.23
Methoxy mesitylene	4.72	-	1.11
m-Eugenol	5.34	-	0.96
α-Cubebene	5.87	-	0.67
β-Elemene	6.15	-	2.11
Caryophellene	6.66	10.37	10.71
1-Ethy1-3-(propen-1-yl) adamantine	6.94	-	1.03
α-Caryophyllene	7.17	1.42	1.70
2-Tery-Butyl-4-hydroxyanisole	7.81	13.93	-
3-Tert-Buty-4-hydroxyanisole	7.81	-	11.14
γ-Selinene	8.01	3.4	-
α-Selinene	8.04	-	4.0
α-Panasinsen	8.34	-	0.64
Caryophyllene oxide	9.45	2.68	3.45
2-methylene-6,8,8-trimethyl tricycle (5.2.2.0) (1,6) Undecan-3-ol	11.87	-	0.60
Monoamide, N-(3-acetylphenyl)benzene-1,2-dicarboxylic acid	17.51	-	0.99
3,4-xylenol	18.43	-	0.65
Trimethyl-8-(-1-methyle-thyl)-2,4(1H,3H)-phenanthrendione	22.93	-	0.93
2-(4-Hydroxy-3-methoxyphenyl)-3,7-dimethoxy-4H-chromen-4-one	22.95	2.96	-

Sources: Idris *et al*. (2010*)*

Mineral composition

Ocimum gratisimum is composted of several minerals. This includes potassium, which is necessary for the function of all living cells and thus present in plants and animals tissue. Calcium is a major component of all healthy diet and a mineral necessary for life. Other components include phosphorous which is necessary in the formation of bones and teeth's.

Magnesium is essential to all living cells and plays a major role in the functions of important biological polyphosphate compounds like ATP, DNA and RNA. Copper, which helps to produces red and white blood cells and triggers the release of iron to form haemoglobin, the substances that carry oxygen around the body. Also iron is another component of *O.gratissimum* which is important in a number of physiologic processes as a constituent of some enzymes and an activation of other enzymes (NRC 1989; Guil-Guerrero *et al.,* 1998).

Chemical composition

Numerous publications have presented data on the composition of the essential oils of *O.gratissimum*. In early investigations of the Nigeria variety of *O.gratissimum*, the essential oil was found to possess appreciable antibacterial activity against a wide range of organism (El-Said *et al.,* 1969). Thymol was identified as the major principal which was responsible for the antibacterial activity of *O.gratissimum* from Europe contain eugenol as the dominant component as well as traces of *Ocimene* and *Myrcene* (Ekundayo, 1986). Analysis of this leaves and flowers volatile oils from different locations in Nigeria confirmed the occurrence of thymol as the main constituent and eugenol was not detected (Sofowora, 1970). However, a recent study of the central Nigeria grown *O.gratissimum* essential oil yielded eugenol (61.9%) as the most abundant compound (Saliu *et al*., 2011).

Health benefits of *Ocimum gratissimum*

Traditional Uses

Ocimum gratissimum has been used extensively in the traditional system of medicine in many countries. In the Northeast of Brazil, it is used for medicinal, condiment and culinary purpose. The flowers and the leaves of this plant are rich in essential oils so it is used in preparation of teas and infusion (Rabelo *et al.*, 2003). In the coastal areas of Nigeria, the plant is used in the treatment of epilepsy, high fever, and diarrhea (Effraim *et al.*, 2003). In the savannah areas decoctions of the leaves are used to treats mental illness (Akinmoladum *et al.*, 2007). *Ocimum gratissimum* is used by the Ibos of southeastern Nigeria in the management of the baby's cord to keep the wound surface sterile. It is also used in the treatment of fungal infections, fever, cold and catarrh (Ijeh *et al.*, 2005). Brazilian tropical forest inhabitants use a decoction of *O.gratissimum* roots as a sedative for children (Cristiana *et al.*, 2006). People in Kenyan and sub Saharan African communities use this plant for various purpose and sniffed as a treatment for blocked nostrils. They are also used for abdominal pains, sore eyes, ear infections, coughs, barrenness, fever, convulsions and tooth gargle, regulation of menstruation and as a cure for prolapsed of the rectum (Matasyoh *et al.*, 2007). In India, the whole plant has been used for the treatment of sunstroke, headache, influenza, as a diaphoretic, antipyretic and for its anti-inflammatory activity (Prajapati, 2003; Oliver, 1980, Ta'nia Ueda, 2006).

The tribals of Nigeria use the leaf extract in treatment of diarrhea, while the cold leaf infusions are used for the relief of stomach upset and haemorrhoids (Kabir

et al., 2005). The plant is commonly used in folk medicine to treat different diseases such as upper respiratory tract infections, diarrhea, headache, diseases of the eye, skin diseases, pneumonia, cough, fever and conjuctivities (Adebolu and Salau, 2005). The infusion of *O.gratissimum* leaves is used as pulmonary antisepticum, antitussivum and antispasmodicum (Ngassoum *et al.*, 2003).

Antimicrobial and antifungal activity

An investigation of antifungal activity of the essential oil obtained by steam-distillation (1.1%w/w) of the aerial parts of *O.gratissimum* and of an ethanolic extract from the steam-distillation residue was carried out using the agar diffusion method. The result revealed that the essential oil inhibited the growth of all fungi tested, including the phytopathogens, *Botryosphaeria rhodina, and Rhizoctonia* spp. and two strains of alternaris sp., while the extract from the residue was inactive. The antifungal activity of eugenol was evaluated against a species of alternaria isolated from tomato and *Penicillium chrysogenum.* The minimal inhibitory concentrations of eugenol were 0.16 and 0.31mg/disc for *Alternaria* sp. and *P. chrysogenum*, respectively (Terezinha *et al.*, 2006).

Cryptococcal infection had an increased incidence in last few years due to the explosion of acquired immunodeficiency syndrome. *O.gratissimum* has been reported earlier with invitro activity against some bacteria and dermatophytes. In vitro activity of the ethanolic crude extract, ethylacetate, hexane, chloroform fractions, essential oil, and eugenol of *O.gratissimum* was studied using an agar dilution susceptibility method towards 25 isolates of *Cryptococus neoformans*. All the extracts of *O.gratissimum* studied showed activity invitro towards *C.neoformans* based on the minimal inhibitory concentration values the most significant result were observed that the chloroform fraction inhibited 23 isolates (92%) of *C.neoformans* at a concentration of 62.5μg/ml (Janine *et al.*, 2005).

The antibacterial activity of different extracts from the leaves of *O.gratissimum* was tested against *Staphylococcus aureus*, *Escherichia coli,* and *Salmonella typhi* and salmonella typhimurium, pathogenic bacterial that causes diarrrhoea. Extracts evaluated included cold water extract, hot water extract and steam distillation extract. Only the steam distillation extract had inhibitory effects on the selected bacterial and the minimum I hibitory concentration ranged from 0.1% for *S. aureus* to 0.01% for *E.coli* and *S.typhimurium,* and 0.001% for *S.typhi* (Adebolu and Salau, 2005).

The essential oil of *O.gratissimum* inhibited *S.aureus* at a concentration of 0.75mg/ml. the essential oil was also active against members of the family enterobacteriaceae. The minimal inhibitory concentrations (MICS) for *Shigella flexineri*, *Salmonella enteritis, Escherichia coli, Klebsiella* sp., and protein mirabilis were at concentrations ranging from 3 to 12μg/ml. the minimum bactericidal concentration of the essential oil was within a twofold dilution of the MIC for this organism. The compound that showed antibacterial activity in the essential oil of *O.gratissimum* was identified as eugenol (Orafidiya *et al.*, 2006).The Lima *et al.* (1993) tested vitro antifungal activity of thirteen essential oils obtained from plants against dermatophytes of the tested oils. *O.gratissimum* was found to be more active, inhibiting 80% of the dermatophyte strains tested and producing zones greater than 10mm in diameter (Lima *et al.,* 1993).Hydro-distilled volatile oils from the leaves of *O.gratissimum* from meru district in

eastern Kenya were evaluated for antimicrobial activity. The antimicrobial activity of the essential oils were evaluated against both gram positive (*S.aureus,* Bacillus spp.) and gram negative *(E.coli, P.aeruinosae, S.typhi, K.pneumoniae, P.mirabilis)* bacterial and a pathogenic fungus *Candida albicans*. The minimum inhibitory concentration of oil for gram negative bacterial ranged from 107 to 750mg/ml and 93.7 to 150mg/ml for gram positive bacterial. The minimum inhibitory concentration for the fungus *C.albicans* was 50mg/ml. the minimum inhibitory concentration values for chloramphenicol ranged from 22.5 to 31.3mg/ml. the oil had pronounced antibacterial and antifungal activities on all the microbes (Matasyoh *et al*., 2007).

Antidiarrhoeal effect The antidiarrhoeal activities of leaf extracts of O.gratissimum were investigated by disc diffusion and tube dilution methods. The extracts were active against *Aeromonas sobria*, *E.coli, Plesiomonas shigelloides, S.typhi* and *Shigella dysenteriae.* The leaf extracts were most active against *S.dysenteriae* and least active against *S.typhi.* The sensitivity of the organisms measured in terms of zone of inhibitory ranged from 8.00 to 19.50mm. The minimum inhibitory concentration was from 4 to 50mg/ml, while the minimum bactericidal concentration ranged from 8.00 to 62mg/ml (Ilori *et al.*, 1996). *Ocimum gratissimum* leaf extracts have been extensively demonstrated to be effective against the various aetiologic agents of diarrhea, including shigella. Study investigated the effects of *O.gratissimum* essential oil at sub-inhibitory concentration of 0.74 and 1.0μg/ml on virulent and multidrug-resistant strains of 22 shigella isolates from Nigeria compared with untreated shigella strains. *O. gratissimum* caused significant.

Wound healing

Persistent micro vascular hyper permeability to plasma proteins is a characteristic feature of normal wound healing. Evans blue dye (20mg/kg body weight) in normal saline was administered intravenously through marginal ear vein of experimental rabbits (n=5). Each animal served as its own control. One hour after Evans blue dye administration, 0.1ml each of *O.gratissimum* oil, histamine *dihydrochloride* (30μg/ml) and normal saline were randomly administered by intra–dermal injection at the prepared sites on each of the animals. Increase in vascular permeability was assessed by dye effusion test. Analysis of the differences in vascular permeability between treatment groups showed that, *O.gratissimum* oil, in intensity and duration was significantly ($p<0.05$) more effective in increasing cutaneous capillary permeability over a 24hour period after treatment. The ability of *O.gratissimum* oil in increasing vascular permeability maybe one of the factors that contributes to its wound healing property (Orafidiya *et al.,* 2005; Pandey, 2005).

Hair loss

Hair loss is one of the most feared side effects of cancer chemotherapy. Preliminary study investigated showed the efficacy of the leaf essential of *ocimum gratisimum (ocimum* oil) in promoting hair growth in cyclophosphamide induced hair loss.

Other uses of *Ocimum gratissimum* include the following*: Ocimum gratisimum* can be used to prevent meat spoilage, prolonging shelf life and providing a natural alternative (or supplement) to chemical preservatives for this purpose; it is more practical to use the oil rather than the entire plant, as its antimicrobial components works best when highly concentrated 2. Flavor *Ocimum gratissimum* contains eugenol, which

imparts a clove-like fragrance that sets it apart from meditorranean sweet basil and South-East Asia cultivors, which can resemble camphor, some varieties are also rich in thymol, which resembles thyme, linalool, which is floral and spicy, ethyl cinnamate, which smell like lemon or geraniol, which resembles roses. The unique flavor profiles can be imparted to meat during processing in a number of ways. Nigeria chefs sometimes boil the meat with *ocimum gratissimum* aerial parts, though it is more common to use the leaves exclusively, whether by grinding them directly into a sausage or by wrapping the meat in them to impart the flavor.

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CONCLUSION

This review has covered the morphology, natural products, pharmacology and clinical studies of the plant *ocimum gratissimum. Ocimum gratissimum* is a plant with much potential and is useful in many diseases. Hence this work will be useful to those interested in validating the hidden truth which has not been scientifically validated.

Presently there is an increasing interest worldwide in herbal medicines accompanied by increased laboratory investigation into the pharmacological properties of the bioactive ingredients and their ability to treat various diseases. Numerous drugs have entered the international market through exploration of ethno pharmacology and traditional medicine. Although scientific studies have been done on a large number of marketable drugs or photochemical entities have entered the evidence based therapeutics.

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