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Full Length Research Paper

Chemical composition of *Hyptis suaveolens* and *Ocimum gratissimum* hybrids from Nigeria

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Four medicinal plants belonging to the family Lamiaceae were chemically screened for their chemical constituents including alkaloids, tannins, saponins, flavonoids and phenols. The medicinal plants investigated were *Hyptis suaveloens* and three putative hybrids of *Ocimum gratissimum* (Hybrid A, B and C). All the plants contains high percentage yield of crude alkaloids and flavonoids ranging from 10.44 to 14.32% and 9.28 to 12.54%, respectively. Only *H. suaveloens* is devoid of saponins. Tannins and phenols were present in all plants. The nutritional values of the phytochemicals were also assessed with a view of establishing and understanding their nutritional uses. The plants contained crude protein (9.19 to 17.94%), crude fibre (4.88 to 9.04%), ash (5.68 to 6.88%), carbohydrate (66.24 to 75.87%), crude lipid (3.48 to 4.90%) and food energy (357.68 to 373.26 mg/cal). The significance of the plants in traditional medicine and the importance of the chemical constituents in the pharmaceutical industries were discussed.

Key words: Phytochemical, *Hyptis suaveolens, Ocimum gratissimum* hybrids.

INTRODUCTION

Some important chemical substances found in plants are alkaloids, carbon compounds, hydrogen, nitrogen, glycosides, essential oils, fatty oils, resins, mucilage, tannis, gums and others (Pandey, 1980). Most of these are potent bioactive compounds found in medicinal plant parts that can be used for therapeutic purpose or which are precursors for the synthesis of useful drugs (Sofowora, 1993).

The active principles differ from plants to plant due to their biodiversity and they produce a definite physiological action on the human body. Calixto (2000) reported that most of the cultivated medicinal and aromatic plants are exported as crude drugs. Ijeh et al. (2004) noted the growing interest on the medicinal properties of a number of common plants. Edeoga et al. (2003, 2005) have elucidated the importance of these medicinal plants and their importance in the pharmaceutical industry. These medicinal plants have been underutilized in orthodox medicine but have continued to be used in ethnomedicinal preparations. Today about 300 species of medicinal and aromatic plants are used world wide in the pharmaceutical, food, cosmetics and perfume industries (Robber et al., 1996).

Alkaloids are very important in medicine and constitute most of the valuable drugs. They have marked physiological effect on animals (Edeoga and Eriata, 2001). Alkaloids such as solasodine have been indicated as a starting material in the manufacture of steroidal drugs (Maxwell et al., 1995). Phenolic compounds are widely distributed in the plant kingdom and presence of phenols is considered to be potentially toxic to the growth and development of pathogen (Singh and Sawhney, 1988). Saponins are glycoside of both triterpenes and sterols and have been detected in over seventy families of plants (Basu and Rastogi, 1967). In medicine, it is used to some extent as an expectorant and emulsifying agent.

Tannins are fairly frequently encountered in food products of plant vegetable origin such as tea and many fruits. The oxidation inhibiting activity of tannis have been known for a long time and it is assumed to be due to the presence of gallic and diagallic acids (Ihekoronye and

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Table 1. Percentage of crude alkaloids, phenols, tannins, flavonoids and saponins in the studied plants.

Plant	Alkaloids (%)	Tannins (%)	Phenols (%)	Saponins (%)	Flavonoids (%)
O. gratissimum					
Hybrid A	10.44	0.598	0.026	0.590	9.97
Hybrid B	10.60	0.451	0.040	0.680	9.28
Hybrid C	11.80	0.726	0.049	0.560	11.76
H. suaveolens	14.32	0.520	0.050	0.300	12.54

Table 2. Major mineral elements composition of the plant samples.

Plant	% K	% N	% Ca	% Mg	% Na	% P
O. gratissimum						
Hybrid A	1.90	1.89	2.46	0.69	0.60	0.37
Hybrid B	1.73	1.43	1.46	0.46	0.85	0.91
Hybrid C	1.68	2.84	2.26	0.91	0.66	0.71
H. suaveolens	1.80	2.28	1.06	0.67	0.46	0.79

Ngoddy, 1985). Flavonoids are 15-carbon compounds generally distributed throughout the plant kingdom (Harborne, 1988). Some isoflavones act as allelochemics widely used in insecticides. They might also play a role in disease resistance (Salisbury and Ross, 1992).

Though much phytochemical studies have been done on *Ocimum gratissimum*, the purpose of this particular work is to compare the level of these chemical constituents among the three hybrids of *O. gratissimum* and also with *Hyptis suaveolens* which have a resemblance to *O. gratissimum* in usage.

MATERIALS AND METHODS

Plant materials

Leaves of three *O. gratissimum* hybrids and *H. suaveolens* were collected from different locations of eastern Nigeria. The hybrids of *O. gratissimum* were identified as putative hybrids at the Department of Forestry, Michael Okpara University of Agriculture. The plant materials were sun dried for 7 days before milling into powder with a clean blender.

20 g of powder was extracted in 100 ml of distilled water for 24 h at room temperature to obtain the aqueous extract. The aqueous mixture is filtered using Whatman No. 1 filter paper and then lyophylised to obtain the dry solid residue.

Phytochemical analysis

The extracts were evaluated for the presence of alkaloids, tannins, saponins and flavonoids as earlier described (Sofowora, 1993; Trease and Evans, 1989; Harbonne, 1973). Isolation and estimation of phenolic compounds were specifically done by using 2 g of each sample. The samples were defatted with 100 ml of diethyl ether using the soxhlet apparatus for 2 h. The fat-free samples were boiled with 50 ml of petroleum for the extraction of the compounds for about 15 min. 5 ml of the extract was pipetted into a 50 ml flask and 10 ml of distilled water was added. The complex colour developed with addition of 5 ml amyl-alcohol and 20 ml of aqueous NH_4OH solution. The samples were allowed to stand for 30 min for the colour development. The absorbance was then read with a spectrophotometer.

Mineral elements were determined using the multiple nutrient extraction method. The procedures for the determination of the proximate composition of the samples were those of the Association of Official Analytical Chemists (AOAC, 1980).

RESULTS AND DISCUSSION

The results of phytochemical analysis of the *H. suaveolens* and *O. gratissimum* hybrids investigated are summarized in Tables 1 to 3. The results show that the plants are rich in such chemical bases as alkaloids, flavonoids, saponins and tannins. The presence of these bases in the investigated plants account for their usefulness as medicinal plants. *H. suaveolens* had the highest percentage of alkaloids (14.32%). Alkaloids are known to play some metabolic role and control development in living system. They also have a protective role in animals (Edeoga and Eriata, 2001). They are used in medicine especially the steroidal alkaloids. *O. gratissimum* hybrids contained higher percentage of tannin (0.726%). The presence of tannin in this plant may be the reason why most animals do not graze on the plant.

H. suaveolens not only had the highest alkaloid content it also contained higher percentage of phenols and flavonoids compared to the other plants (0.050% and 12.54%, respectively). There was absence of saponin in *H. suaveolens*, but was present in the O*. gratissimum* hybrids (Table 1). Saponins as sugar derivatives may be

Table 3. Proximate composition of the studied plant samples.

Plant	Moisture content (%)	Dry matter (%)	Crude fibre (%)	Crude protein (%)	Ash content (%)	Lipid	Carbohydrate (%)	Food energy (mg/cal)
O. gratissimum								
Hybrid A	7.195	92.805	8.48	11.81	6.871	4.90	67.94	363.10
Hybrid B	4.10	95.90	5.72	9.19	5.74	3.48	75.87	357.68
Hybrid C	5.532	94.468	4.88	17.94	6.88	1.06	66.24	373.26
H. suaveolens	4.70	95.30	9.04	14.22	5.68	4.46	66.61	363.43

steroidal or triterpenoids. Steroidal nucleus of glycosides have been confirmed in the fruit of *O. gratissimum* (Akundu, 1984). The occurrence of steroidal saponins from various studies indicate their importance and interest in pharmacy due to their relationship with such compounds such as sex hormones especially in development of the female contraceptive pill. This may be the reason why the infusion of the leaves of *O. gratissimum* are given to expectant mothers and breast feeding mothers to ensure their hormonal balance since steroidal structures could serve as potent starting material in the synthesis of these hormones. These spices are used to prepare food for nursing mothers as medicinal spices in contain parts of Eastern Nigeria. Saponin is useful in medicine and pharmaceutical industry due to its foaming ability that produces frothy effect. Saponin is used also in the manufacture of shampoos, insecticides and various drug preparation and synthesis of steroid hormones (Okwu, 2003).

The *O. gratissimum* hybrids had low phenolic content. The presence of the phenolic compounds in these studied samples proves that they have anti-microbial and antifungal effect. Phenols and phenolic compounds had been used in disinfections and remain the standard with which other bactericides are compared. The oils there have therapeutic, anti-septic or bactericidal properties. It is believed they prevent several forms of infection. Flavonoids is contained in reasonable amount in all the investigated medicinal plants and this may be the reason of their peculiar scent, especially in *O. gratissimum,* which gives it the common name “scent leaf” and its bitter taste may be due to alkaloids content. Tannins are responsible for colour changes in food. They give unripe fruits the astringent flavour of tea. Little wonder why *H. suaveolens* is given the common name “bush tea” because it contained more of flavonoids and tannins.

The mineral elements contained in these plants are very important in human nutrition (Table 2). Calcium, potassium, magnesium, nitrogen in the plant samples are required for repair of worn out cells, strong bones and teeth in humans, building of red blood cells and for body mechanisms (WHO, 1996). The high levels of these element show that the leaves of the plants could provide alternative sources of calcium and potassium in diet. Their absence in diet might result in weak, stunted growth (Ekpa, 1996) and poor bone development.

Generally, these medicinal plants contained appreciable amount of the basic food nutrients; protein, fats carbohydrates and fibre (Table 3). These medicinal plants contain high protein content (9.19 - 17.94%). *O. gratissimum* hybrid C has the highest food energy. The plants contained varied moisture contents. The moisture content of these leaves agrees with definitions of vegetables, which were characterized with high water content (Edeoga and Gomina, 2000).

Medicinal plants provide dietary supplements, and some may promote bowel regularity and enhance frequent waste elimination including bile acid. *H suaveolens* had the higher percentage of crude fibre (9.04%). Fibre has a physiological effect on the gastrointestinal function of promoting the reduction of tracolonic pressure which is beneficial in diverticular disease. Fibre also has a biochemical effect on the absorption and re-absorption of bile acids and consequently the absorption of dietary fats and cholesterol. All the plant samples investigated also have high lipid content.

The extract of the leaves of the samples were found to contain the required major elements and other nutritive compounds needed by the pharmaceutical companies as well as in food supplements. The quantitative analysis of the trace elements of these plants will be an interesting area for further study.

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