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THE POTENTIALS OF OCIMUM GRATISSIMUM, PENRGULARIA EXTENSA AND TETRAPLEURA TETRAPTERA AS SPICE AND FLAVOURING AGENTS

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ABSTRACT

The work reports the chemical evaluation, nutritional and flavouring properties of *Ocimum gratissimum, Pengularia extensa* and *Tetrapleura tetraptera*. The spices contain crude protein (7.44%-17.50%), crude lipid (4.98%-20.36%), crude fiber (17%-20.24%), carbohydrate (43.18%-49.06%) and food energy (234.42-379.48 g/cal). The spices are sources of minerals (calcium, phosphorus, potassium, zinc and iron). Phytochemical screening revealed the presence of tannins, phenolic compounds, saponin, alkaloids, steriods and flavenoids; these bioactive substances may be responsible for the biological properties of the plants.

Keywords: Chemical composition, Ocimum gratissimum, Pengularia extensa, *Tetrapleura tetraptera,* nutritional value, spices.

INTRODUCTION

In Nigeria, many indigenous plants are used as spices, food plants or as medicinal plants. Spices are used to add flavour, relish or piquancy to foods. Modern food processors use spices to give appealing and appetizing flavours to food[1].

Indigenous spices and herbs are used to prepare soups which exhibit hot and spicy taste which are consumed during cold season. Some forest fruits and seeds are sometimes added to food meant for pregnant and nursing mothers as medicinal spices [1,2].

It is also claimed that spices and herbs assist in the contraction, of the uterus among the post partum women [1].

In South Eastern Nigeria, spices are used in the production of beer and wine. They are used in medicine as carminative and aromatic stimulant to the gastrointestinal tract and externally as a rubefaciants and counter irritant[3]. Spices and herbs have a reputation as aphrodisiac. They are used to give aromatic hot taste to curries and various fruits and vegetable preserves [3].

In many West African Countries, spices are used as a laxative, given by rectal injection and as antidiarrhoea [5].

Considering the importance of herbs, which are commonly used as spices in flavouring food, it is necessary to investigate the properties of the indigenous spices: (*Ocimum gratissimum, Pengularia extersa* and *Tetrapleur tetraptera*) which are commonly consumed in Nigeria.

The aim of this study is to investigate the chemical composition of the spices and determine their flavouring properties and their ability to be used as food supplements and preservatives.

Ocimum, gratissimum is a herb and also a spice which grows to about six feet high with an erect stem. The whole herb, but most commonly the leaves are utilized medicinal. Inhaled aroma from hot leaf preparation is believed to heal cold and catarrh. In some parts of the Eastern States, the juice is used to treat stomach pain and sometimes applied to piles with the leaves[6].

O. gratissimum has been shown to be a valuable source of essential oils. The components include non-cyclic sesquiterpenes, phenols, carbohydrates and lipids. [6]., The isolated compounds in the oil include eugenol, thymol, alpha-pinen, camphor and terpinene[7].,

Pengularia extensa is a climber with milky latex. The whole plant is used as an external application for rheumatism and also for any eye complaint. It is used in Nigeria for regulating menstruation[8]. After circumcision, a shoot of the plant (bearing leaves) is warmed over fire, and the juice squeezed out and applied on the circumcision wound, perhaps as antiseptic, anaesthetic or analgesic[8].The whole plant is also sometimes included in fever remedies and for sores in Nigeria[8]. A poultice of the leaves is applied to boils and abscesses[7].

Tetrapleura tetraptera is a medium sized deciduous forest tree found commonly in the rain forest. The bark is smooth, greyish, very thin slash, reddish and strong smelling[2]. The fruits are brown and usually slightly curved with ridges. *Tetrapleura tetraptera* is used as tonic and stimulant[9]. Besides oil, *T. tetraptera* contains resins, fats, carbohydrates, coloring matter and fatty acids[7].Screening of the fruits of *T. tetraptera* revealed the presence of Oleanic acid, triglycoside and scopoletin, a coumarin[2]. It is perhaps, the presence of coumarin that is responsible for the aroma the fruit often imparted upon food and its ability to serve as potential condiments in soups[1]. These plants are popularly important as source of food and drugs.

MATERIALA AND METHODS

Raw Materials

The leaves of the study plants *Ocimum gratissimum, Pengularia* extensa and fruits of *Tetrapleura tetraptera* were collected from Ubakala in Umuahia South Local Government Area, Abia State, Nigeria. The samples were deposited in the chemistry laboratory for further preparation and analysis.About 400g each of the leaves of *Ocimum gratissimum, Pengularia extensa* and fruits of *Tetrapleura tetraptera* were each weighed . The materials were dried in the oven at 65^0C for 12 hours. The dried materials were ground into powder and used for analysis.

Chemical Analysis

Total nitrogen content was determined by using kjeldahl apparatus[10]. The protein content was calculated by (N X 6.25). The lipids were extracted from the samples with ether under reflux for 24 hours. The ether was evaporated using a rotavapour. Crude fiber, and ash content were determined according to the method of AOAC[11].. Total carbohydrate was estimated by the method of Muller and Tobin [12]. The gross food energy was estimated by multiplying the crude protein, crude fat and total crude carbohydrates contents by factors of 4, 9 and 4 respectively [13].

The product from the powdered plant samples was digested with perchloric and nitric acids using Johnson and Ulrich method [14]. Following the digestion, the mineral contents were determined by atomic absorption spectrophotometer after the development of color with ammonium molybdate. The result was expressed on dry matter basis.

Phytochemical Screening

The plants were screened for tannins, flavonoids, phenolic compounds, alkaloids, steriods and saponins using the methods of sofowora[8] and Trease and Evans[15]

RESULTS

Table 1 showed the proximate composition of the leaves of *O. gratissimum, P. extensa* and fruits of *T. tetraptera*.

P. extensa had the highest amount of crude protein (17.50%), followed by *O. gratissimum* 17.28% and the least was *T. tetraptera* (7.44%). The value of fat and oil were also high *with T. tetraptera* (20.36%), *P. extensa* (11.18%) and *O. gratissimum* having (4.98%).fat content

The total carbohydrate available in the spices are very high, with *T. tetraptera* recording the highest value of 49.06%, followed *by O. gratissimum* (47.40%) and *P.extensa* 43.18%. The energy value of *T. tetraptera* was 379.48g/cal, *P.extensa* was 273.34 g/cal and *O. gratissimum* have energy value of 234.42 g/cal. The value of crude fiber is also high with *P. extensa* (20.24%), *T. tetraptera* was 18.14% while *O.gratissimum* was 17% crude fiber

Table 2 showed the mineral contents of the plants. These samples have comparatively low amount of sodium with the higher quantity being found in the leaves of *P. extensa* (0.50%). Other elements such as potasium magnessium, iron and phosphorus were detected as seen in table 2.

Phytochemical screening of *O.gratissimum, P. extensa and T. tetraptera* revealed the presence of tannins, phenolic compounds and saponins (Table 3). Alkaloids were not present in *T. tetraptera* and *O. gratissimum* but available in *P. extensa* while flavonoids were absent in *P. extensa* (Table 3).

DISCUSSION

Generally, these spices contained appreciable amounts of the basic food nutrients; protein, fats, carbohydrates and fiber. Plant protein may be consumed as whole plant or leaves, raw, dried or cooked [1].

The spices are not only rich in protein but also in calories. *T. tetraptera* has the highest food energy of 329.48 g/cal. The higher energy value in *T. tetraptera* might have been due to its high lipid content of 20.36%. This high inclusion of lipid in *T.tetraptera* is an indication of its potential as a source of vegetable oil.

The spices provide dietary fiber, which among other things promotes bowel regularity, and enhance frequent waste elimination, including bile acids, sterols and fat [16]. Fiber has a physiological effect on the gastrointestinal function of promoting the reduction of tracolonic pressure, which is beneficial in diverticular disease. This disease is characterized by small "blow out type" protrusion lesions on the large intestine, which progress to inflammation that may eventually burst, thus producing infection and cancer of the colon[16,17].

Fiber also has a biochemical effect on the absorption and re-absorption of bile acids and consequently the absorption of dietary fat cholesterol. This in turn, lowers the cholesterol pool and prevents the formation of plaque whose components are cholesterol, some fats and protein [16, 17]. Rural communities, which consume large quantity of roughage, have lower incidence of diverticular disease as against their city counterparts[16,17]. The reduction of cholesterol through consumption of food with high roughage value is therefore a healthy thing to do. It is therefore important that high fiber plant foods such as *P. extensa*, and *T. tetraptera* should continue to form part of our diet in this part of the world.

Phytochemical screening revealed that the plants are rich in such bases as tannins, saponins and phenolic compounds. The presence of these bases in *T. tetraptera, O. gratissimum and P. extensa* accounts for their usefulness as medicinal plants[8].

Tannins are responsible for color changes in food. They give unripe fruits their astringent flavour, which is slowly lost during ripening owing to the effect of enzymes on the tannin. As sugars are released in the process, the loss of astringency is accompanied by an increase in sweetness. Tannins are responsible for the colour and some of the flavour of tea [18]

Saponins, as glycosides and various sugar derivatives may be steriodal or triterpenoid. Steroidal nucleus of glycosides have been confirmed in whole fruit of *T. tetraptera* and *O. gratissium*[19]. Advances made in our understanding of the structures and functions of hormones have had many repercussions. Among the most important has been the development of the female contraceptive pill. Steriodial saponines are of great importance and interest in pharmacy due to their relationship with such compounds as sex hormones. This may be the reason why the infusions of the fruits of *T. tetraptera* and the leaves of *O. gratissimum* are often given to expectant mothers or breast feeding mother to ensure their hormonal balance since steriodial structure could serve as potent starting material in synthesis of these hormones [1] It has been reported[1] that these spices are used to prepare

food meant for pregnant and nursing mothers as medicinal spices. Some of the properties of saponins have been put to use in medicine, pharmaceutical industry and technologically. The foaming ability has been use to produce the frothy effect in the food industry[20]. In addition, some countries have also included them in the list of flavouring agents [20,21].

Moreover, saponins are used in the manufacture of shampoos, insecticides and various drug preparations and synthesis of steroid hormones[22].

The presence of phenolic compounds in these samples indicates that they might be an antimicrobial agents. Phenols and phenolic compounds had been extensively used as disinfection and remain the standard with which other bactericides are compared. The oils therefore have therapeutic, antiseptic or bactericidal properties[1]. It is believed, that they strengthen and heal the walls of the uterus. *P. extensa* is used to treat the navel of new born babies. It not only heals it fast but also prevents any form of infection.

The outcome of this investigation has greatly elucidated the nutritive composition of the spices as quality food with good medicinal properties. They can serve as potent nutritious food supplements and drugs.

Table 1 Proximate composition of Ocimum gratissimum, pongularia extensa and Tetrapleura tetraptera

Costituents	Ocimum gratissimum	Pongularia extensa	Tetrapleura tetraptera
Parts screened	leaf	Leaf	fruit
Crude protein %(N%6.25)	17.28	17.50	7.44
Lipids % (%)	4.98	11.18	28.36
Fiber (%)	17.00	20.24	18.14
Ash (%)	13.35	8.40	5.00
Carbohydrate (%)	47.40	43.18	49.06
Food energy(g/cal)	234.42	273.34	379.48

Values are means of three determinations

Table 2: Mineral composition of Ocimum Gratissimum, Pongularia extensa and Tetrapleura tetraptera

	Ocimum gratissimum	Pongularia extensa	Tetrapleura tetraptera
	Parts screened		
Costituents	leaf	Leaf	fruit
Magnesium %	1.09	0.85	0.49
Calcium %	2.70	2.20	1.30
Potassium %	3.50	2.88	1.12
Sodium %	0.38	0.50	0.38
Zinc %	0.70	0.18	0.22
Iron %	2.73	2.41	3.10

Table 3 Phytochemical screening of Ocimum Gratissimum, Pongularia extensa and Tetrapleura tetraptera

Constituents	Ocimum Gratissimum	Pongularia extensa	Tetrapleura tetraptera
Saponin	+	+	+
Flavonoid	+	+	-
Tannin		+	+ +
Alkaloid	-	-	+
Phenols		+	+ +
Steroids	+	+	+

+ Presence of constituent tested

Absence of constituents tested

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