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RESEARCH ARTICLE

PROXIMATE ANALYSIS AND PHYTOCHEMICAL SCREENING OF SOME MEDICINAL PLANTS COMMONLY USED BY GUARIS OF FCT, NIGERIA

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ABSTRACT

An ethnobotanical survey of five medicinal plants commonly used by the Gwaris of FCT was carried out in October, 2012. The plants include *Detarium microcarpum*, *Prosopis africana*, *Piliostigma thonnigii*, *Flueggea virosa* and *Entada Africana*. These plants are used by this group of people to cure different ailments such as malaria fever, jaundice, diarrhea, earache, dysentery, stomach ache etc. Phytochemical test and proximate analysis were carried out on the medicinal plants. The qualitative phytochemical analysis shows the presence of glycosides, alkaloids, tannins, flavonoids, steroids, saponins, terpenoids, phenols and resins. N-hexane tends to extract more metabolites than the other solvents (methanol and water). Aqueous extracts contain lesser metabolites. *Entada africana* extracts contain more metabolites than any of the other plants. From the proximate analysis, *Flueggea virosa* had the highest moisture content and crude proteins while *Detarium microcarpum* had the lowest. *Entada africanus* had the highest ash content; *D. microcarpum* had highest crude lipids while *F. virosa* had the lowest. *Piliostigma thonnigii* had the highest crude fibre while *Detarium* and *Prosopis* had the highest carbohydrate content. The statistical analysis of the proximate composition of these plants showed that there is a significant difference in the nutritive constituents of the leaves of the five plants (p-value at 0.05 sig. level). The results of both analyses showed that these plants are of high medicinal value and nutritionally, they compare favourably with most popularly consumed vegetables based on their moisture content, ash content, crude lipid, crude fibre, crude protein and carbohydrate.

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INTRODUCTION

During the days of the early man, plants were believed to have healing powers. Many plants synthesize substances that are useful in the maintenance of health in man and other animals. These include aromatic substance, most of which are phenols or their oxygen substituted derivativeness such as tannins, many are secondary metabolites (Louis, 2000). A medicinal plant with one or more of its organs, contains substances that can be used for therapeutic properties or which is a precursor for the synthesis of useful drugs (Adamu, 2008). The plants that possess therapeutic properties or exert beneficial pharmacological effects in the animal body are generally designated as medicinal plants. For centuries, the native Gwari people have used plants, trees and herb based remedies to treat several ailments such as dysentery, diarrhoea, eye pain, diabetes, severe pain, rashes etc. Since the beginning of human civilisation, medicinal plants have been used by mankind for its therapeutic value. Nature has been a source of medicinal agent for thousands of years and an impressive number of modern drugs have been isolated from natural sources. According to the World Health Organisation (W.H.O, 1997), a medicinal

plant is any plant which in one or more of its organ contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. This definition distinguishes those plants whose therapeutic properties and constituents have been established scientifically and plants that are regarded as medicinal but which have not yet been subjected to thorough investigation (W.H.O, 2001).

Detarium microcarpum, *Prosopis africana*, *Piliostigma thonnigii*, *Flueggea virosa* and *Entada africana* are five of the medicinal plants commonly used by Gwaris of the Federal Capital Territory, Abuja. *Detarium microcarpum* is referred to as 'tallow tree' or 'sweet detar' in English, 'gwogwori' in Gwari and it is used by the gwari's to cure dysentery and malaria. *Prosopis africana* The Gwaris uses the roots, leaves and bark in local medicine to treat a variety of ailments such as rheumatism, migraine, fever, vertigo, wound and tooth decay. Its common name in English is 'African mesquite', 'kiriya' in Hausa, 'ayan' in Yoruba, 'ubwa' in Ibo, 'achipum' in Gwari. *Piliostigma thonnigii* is used by the Gwaris as purgative and to cure dysentery. Common names in English 'camel's foot', 'kargo' in Hausa, 'tanwe' in Gwari. Common names of *Flueggea virosa* in English include 'common bushweed, whiteberry bush, snowberry tree' and 'wuwu' in Gwari. The Gwaris use the leaf sap topically against conjunctivitis and

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earache. *Entada africana* is commonly known as 'bwadaraye' in Gwari, 'ogurobe' in Yoruba, 'tawatsa' in Hausa. The Gwaris take the infusion of the leaves or bark as a tonic and for stomachache.

MATERIALS AND METHODS

Study area

The Federal Capital Territory is located in the Central Nigeria lying between latitude 8 degree 25' and 9 degree 25' north of Equator and longitude 6 degree 45' and 7 degree 45' east of Greenwich Meridian. The territory covers an area of about 8000 square kilometers and occupies about 0.87% of Nigeria.

Sample collection

The leaves of *Detarium microcarpum*, *Entada africana*, *Prosopis africana*, *Flueggea virosa* and *Piliostigma thonnigii* were collected in the fields at Giri, Gwagwalada. The leaves were identified and authenticated by a taxonomist in the Biotechnology unit, Department of Biological Sciences, Faculty of Science, University of Abuja, Nigeria.

Preparation of plant extract

The leaves were air-dried for three weeks. The dried leaves were pulverised into powder by the use of wooden mortar and pestle. This was kept in a tight container and labelled prior to analysis. The aqueous extract of each sample was prepared by soaking 100 grams of dried powdered samples in 500ml of distilled water for 12 hours. The filtrate was used for phytochemical screening. The methanolic extracts of the leaves of each species was prepared using the same method for the aqueous extract, but methanol was the solvent used instead of distilled water. About 50 g dried powdered samples each of the plants were extracted at room temperature for 48 hrs with 95% n-hexane (200 mL) using a Soxhlet extraction method. The mixtures were then filtered using Whatman No. 1 filter paper. The filtrates of each extraction were concentrated to dryness *in vacuo* using a rotary evaporator to remove the n-hexane. The concentrated extracts were then allowed to dry at room temperature to a constant weight. Proximate analyses were carried out on dried samples of leaves of the five plants.

Proximate analysis

Proximate analyses were carried out according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 1990). This constitutes the class of food present in samples such as carbohydrate, protein, fat, crude fiber, ash content and moisture content.

Phytochemical screening

Phytochemical screening procedures carried out were adapted from the previous work on plant analysis (Brain and Turner, 1975; Odebiyi and Sofowora, 1979, Trease and Evans, 1978; 1983; Oyeleke and Manga, 2008). This analysis determines the biologically active non-nutritive compounds that contribute to the flavor, colour and other characteristics of plant parts.

Examples of these are alkaloids, tannins, glycosides, hydroxyanthraquinones, phenolics, steroids, saponins, flavonoids and phlobatannins.

Statistical analysis

Data from the procedure were summarized in frequency tables and two-way ANOVA was used to analyze the proximate analysis results.

RESULTS AND DISCUSSION

The phytochemical and proximate analyses carried out on the five medicinal plants commonly used by Gwaris of the federal capital territory of Nigeria shows that these plants contain vital secondary metabolites and nutrients. From the proximate analysis *Flueggea virosa* had the highest moisture content and crude proteins while *Detarium microcarpum* had the lowest. *Entada africana* had the highest ash content, *D. microcarpum* had highest crude lipids while *F. virosa* had the lowest. *Piliostigma thonnigii* had the highest crude fibre while *Detarium* and *Prosopis* had the highest carbohydrate content. Tannins, steroids and saponins were found in the three different extracts i.e. N-hexane, methanolic and aqueous extracts of the five plants except in *Flueggea virosa* methanolic and aqueous extracts. Cardiac glycoside was found only in the N-hexane extract of *E. africana* and methanolic extract of *P. africana*. Alkaloids were found to be present in the three extracts of *E. africana* but absent in other plant extracts except *D. microcarpum* N-hexane extract and *P. thonnigii* N-hexane and methanolic extracts. From the result obtained N-hexane, tends to extract more metabolites than the other solvents. Aqueous extracts contain lesser metabolites. *Entada africana* extracts contain more metabolites than any of the other plants. 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). The presence of these chemicals in the leaves of these plants justifies the local uses of these plants for the treatment of various ailments. Flavonoids are compounds that are biologically active against liver toxins, microorganisms, inflammation, tumor and free radicals (Okwu, 2004). Saponins are natural glycosides that act as hypoglycemic, antifungal and serum cholesterol lowering agents in animals (Sapna *et al.*, 2009). Saponins are essential elements in ensuring hormonal balance and synthesis of sex hormones (Okwu, 2003). Tannins are bitter polyphenolic compounds that hasten the healing of wounds. They also possess anti-diuretic and anti-diarrhea properties (Okwu, 2004).

The proximate analyses of *Detarium microcarpum*, *Flueggea virosa*, *Piliostigma thonnigii*, *Entada africana* and *Prosopis africana* show low moisture contents of 0.8%, 12.8%, 1.1%, 4.2% and 2.5% respectively. This indicates that the plants have a long shelf life and are quite succulent. The plants possess ash contents of 4.91%, 7.01%, 7.01%, 13.3% and 5.92% respectively. The pH level of our internal fluids affects every living cell in our bodies. The effect that over-acidification can have upon overall health is immense. A chronically over acidic pH creates an extremely negative environment that then affects all cellular functions from the beatings of the heart to the

Table 1. Local uses and native names of the plants

S.No.	Medicinal plants	Native names	Local uses by Gwaris
1	<i>Detarium microcarpum</i>	'Gwogwori' in Gwari, 'Ofor' in Igbo, 'Arira' in Yoruba.	It is used locally to treat sore throat, diarrhea, dysentery and malaria.
2	<i>Flueggea virosa</i>	'Wuwu' in Gwari	Locally used in the treatment of eye pain (conjunctivitis) and ear ache.
3	<i>Piliostigma thonnigii</i>	'Tanwe' in Gwari, 'Abefe' in Yoruba, 'Kalgo' in Hausa.	It is used as a purgative and to cure dysentery.
4	<i>Entada africana</i>	'Bwadaraye' in Gwari, Ogoro in Yoruba, 'Tawatsa' in Hausa.	It is used as a decoction to cure malaria fever, dysentery, stomach ache and used as tonic.
5	<i>Prosopis africana</i>	'Achipum' in Gwari, 'kiriya' in Hausa 'Ayan in Yoruba ubwa in Igbo	It is used in the treatment of stomach cramps, rheumatism, migraine fever, vertigo, wound and toothache.

Table 2. Phytochemical analysis of the five plants

metabolites	Carbohydr	alkaloids	Tannins	Steroids	Saponins	Glycosides	Cardiac glycoside	resins	Phenol	flavonoids	terpenoids
Solvents	Plants										
N	<i>Detarium microcarpum</i>	+	+	+	+	-	-	-	-	-	-
H	<i>Flueggea virosa</i>	-	-	+	-	+	-	+	+	+	+
E	<i>Piliostigma thonnigii</i>	-	+	+	+	+	-	-	-	-	+
X	<i>Entada africana</i>	+	+	+	+	+	+	+	-	+	-
A	<i>Prosopis africana</i>	+	-	+	+	+	-	-	+	-	+
M	<i>Detarium microcarpum</i>	+	-	+	+	-	-	+	-	+	-
E	<i>Flueggea virosa</i>	-	-	-	+	-	-	-	-	+	+
T	<i>Piliostigma thonnigii</i>	-	+	+	-	+	-	+	-	+	-
H	<i>Entada africana</i>	+	+	+	+	+	-	-	+	-	+
A	<i>Prosopis Africana</i>	-	-	+	+	+	+	-	-	-	+
A	<i>Detarium microcarpum</i>	-	-	+	+	+	-	-	-	-	-
Q	<i>Flueggea virosa</i>	-	-	-	-	+	-	-	-	-	+
U	<i>Piliostigma thonnigii</i>	-	-	+	-	+	-	-	-	-	+
E	<i>Entada africana</i>	-	+	-	+	+	-	-	-	-	-
O	<i>Prosopis africana</i>	-	-	+	+	+	-	-	-	-	+

KEY- present= +, absent= -
THE SOLVENTS- NHEXA= N-HEXANE, METHA= METHANOL, AQUEO= AQUEOUS

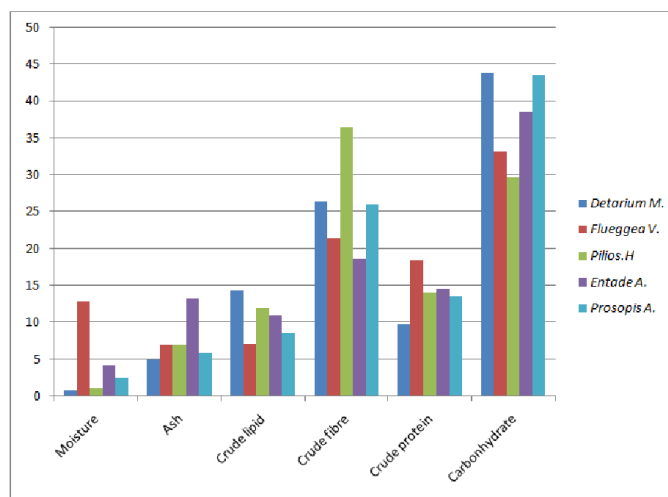


Figure 1. The proximate composition of the five plants

SUMMARY

	Count	Sum	Average	Variance
Moisture	5	21.4	4.28	24.497
Ash	5	38.15	7.63	10.81005
Crude lipid	5	52.81	10.562	7.94297
Crude fibre	5	128.72	25.744	46.11133
Crude protein	5	70.3	14.06	9.72385
Carbonhydrate				
D. microcarpum				
F. virosa	6	100	16.66667	254.9906
P. thonnigii	6	100	16.66667	99.15763
E. Africana	6	100	16.66667	184.8087
P. Africana	6	100.05	16.675	136.824
	6	100	16.66667	240.5919

Source of Variation	SS	df	MS	F	P-value	F crit
Prox. comp	4026.915	5	805.383	29.02546	1.62E-08	2.71089
Plant	0.000333	4	8.33E-05	3E-06	1	2.866081
Error	554.9494	20	27.74747			
Total	4581.865	29				

Since the calculated value is greater than the critical value, there is a significant difference in the nutritive constituents of the leaves.

neural workings of the brain. Overall health depends on an alkaline environment, created by eating foods with high ash content (Dicenso, 2013). Adequate crude lipid of 14.3%, 7.15%, 11.85%, 10.9% and 8.56% respectively were present. The crude lipid contents of these five plants were greater than the range (8.30-27.0%) reported for some vegetables consumed in Nigeria (Nesamvuni *et al.*, 2001; Mottram *et al.*, 2002) Crude lipids contribute greatly to the energy value of food and also slow down the utilization of carbohydrates. It helps lubricates the intestines. High crude fibre of 26.4%, 21.43%, 36.41%, 18.56% and 25.92% which indicates they are good sources of dietary fibre. The crude fibre content in the plants were more than the reported values (8.50-20.90%) from some Nigerian vegetables (Ali, 2010). Dietary fiber means the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine (Misurcova *et al.*, 2010). Certain physiological responses have been associated with the consumption of dietary fibre such as increase in faecal bulk, lowering of plasma cholesterol, a blunting of the post-anal increase in plasma glucose and a lowering of nutrients bioavailability (Ene-Obong *et al.*, 1982). Crude protein of 9.73%, 18.48%, 13.99%, 14.6% and 13.5% respectively which indicates that the amino acids producers which helps in body building and replacement of worn out tissues are present in the plants. Plant food that provides more than 12% of their calorific value from protein is a good source of protein (Ali, 2010). The five plants possess carbohydrates values of 43.81%, 33.13%, 29.64%, 38.44% and 43.6% respectively. From the statistical analysis of the proximate composition of these plants, there are significant differences in the nutritive constituents of the leaves of the five plants (p-value at 0.05 sig. level).

Conclusion

The phytochemical screening of *Detarium microcarpum*, *Flueggea virosa*, *Piliostigma thonnigii*, *Entada africana* and *Propolis africana* have revealed the presence of active pharmacological compounds such as carbohydrate, alkaloids, tannins, steroids, saponins, glycosides, cardiac glycosides, resins, phenol, flavonoids and terpenoids. These results conclude that these plants are of high medicinal value. Nutritionally, they compare favourably with most popularly consumed vegetables based on their moisture content, ash content, crude lipid, crude fibre, crude protein and carbohydrate.

The result suggests that the plant leaves if consumed in sufficient amount could contribute greatly towards meeting human nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition. Apart from their medicinal values, these five plant leaves are recommended for continuous use for nutritional purposes considering the amount of and diversity of nutrients they contain.

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