IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)
e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 2 Ver. III (Mar -Apr. 2015), PP 27-31
www.iosrjournals.org

Evaluation of the Chemical Composition of Five Nigerian Medicinal Plants

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Abstract: *Five medicinal plants belonging to two families,* Liganaecae *and* Asteraceae *were investigated for chemical constituents which included tannin, phenol, sterol, saponin, flavonoids and alkaloids. The plants screened were Anthoclerista djalorensis, Spigella anthelmia, Ageratuim conyzoides, Conyza sumatrensis and Emilia coccinea. Saponin and tannin were high in the plants and ranged from 0.49±0.00 % to 3.12±0.00 % and 0.78±0.03 mg/100g to 2.38±0.00 % respectively. Alkaloid was found to range from 0.95±0.00 % to 1.77±0.01 % while flavonoid ranged from 1.50±0.03 % to 1.82±0.00 %. The nutritional contents of the plants were also determined and contained carbohydrate (49.88±0.16 to 56.32±0.00%), crude fiber (12.66±0.05 to 15.29±0.01%), crude ash (9.46±0.02 to 14.34±0.11%) and lipid (2.19±0.00 to 3.09±0.01%). These herbs are good sources of minerals such as Ca, Na, K, Fe, Mg and P. There were also high content of ascorbic acid (29.56±0.20 to 53.84±0.01 %) and thiamine (0.16±0.00 to 0.24±0.01 %). The role of these chemical constituents was investigated with respect to their significance in herbal medicine in Nigeria.*

Keywords: *chemical composition, medicinal plants, alkaloids, phenols and proximate content.*

I. Introduction

Some chemical substances available in plants may include alkaloids, tannins, renins, phenols, flavonoids, oils, gums, hydrogen, oxygen, carbon compounds and are bioactive constituents found in medicinal plants (Pandey, 1980, Okwu *et al*., 2006). The therapeutic value of these plants in the prevention and treatment of diseases have been reported (Okwu 2004).

Alkaloids are vital constituents in drug production and are used in the production of steroidal drugs (Maxwell et al., 1995). Saponins are used as emulsifying agents in medicine while tannins have been found to possess oxidative inhibiting property (Ihekoronye *et al*., 1985).

Proximate contents of some Nigerian plants have been studied and discovered to be good sources of carbohydrate, protein, ash, crude fiber, food energy, mineral and vitamins (Aletor and Adeogun 1995, Aletor *et al*., 2002, Osuagwu, 2008). Vitamins are needed for proper body mechanism while its deficiency affects the body adversely (Okwu *et al.*, 2005).

Anthecleista djalonensis A. chev. (Fam: Loganaceae) is a forest tree of 15m tall with pale trunk on which are blunt spines. The plant is used in ethnomedicine for the treatment of ulcer, skin problems, wounds, and sores. Bark infusion of the plant is used in the treatment of stomach problems such as diarrhoea, dysentery, sexually transmitted diseases, diabetes and asthma. The root is effective in the treatment of infertility and menstrual disorder in women (Burkill 1985, NNMDA, 2008). It is used as purgative, root decocotion is used for the treatment of constipation, as an abortificients and as a wash or bath to treat leprosy and oedema.

Scrodal elephantiasis, malaria, hermia of the groin, filaril worm infections and thrush (Neuwingler 2000; Okoh *et al*., 2004). The bark of the plant contains the quinoline alkaloid brucine and the monoterpene glycoside loganoside, (Onocha *et. al*., 1995)

Spigella anthelmia Linn (Fam: Loganaceae) is an erect annual little herb of about 3m high with four leaves arranged at the top of the stem. It treats heart and eye problems and intestinal parasitic cases. It has been used in the treatment of headache. It is effective against heart related problems such as anginia, valve disorder, chest pain. Apart from its use as laxative, it possesses antibacterial qualities. It can be used in the healing of mucus membrane inflammation, serve as sleep aid, can heal toothache, common cold nerve, pain and cancer. Proper medical advice should be done before administration to avoid poisoning, dizziness, convulsion and eye problem (Akubue *et al*., 1985, Burkill 1985).

Ageratum conyzoides Linn (Fam: Asteraceae) is an erect softly annual herb about 70 cm high and reproduces from seed. It has a week stem, fruits are slender while flowers are tubular florets and often pale blue. *A. Conyzoides* have been found effective in the treatment of diseases such as gonorrhea (Kayode *et al*., 2011), syphilis (Boulos, 1983).

Conyza sumatrensis (Retz) Walker (Fam: Asteraceae) is an erect annual herb up to 120 cm high and reproduces by seed. It has a woody stem with variable sessile, hairy leaves. The inflorescence is long and leafy. The leaf of *C. sumatrensis* is used in the treatment of pulmonary problems. The plant is used in treating eye

problems. Sap is effective in treating paralysis, epilepsy and convulsion. It can be used in arresting fever. Leaves are used in the treatment of tuberculosis and asthma (Burkill 1985).

Emilia coccinea (Sims) G. Don (Fam: Asteraceae) is a semi-erect annual herb that grows up to 50 cm and reproduce by seed. It has a hollow stem and simple leaves. The leaves are used in the treatment of convulsions, epilepsy, and spleen enlargement. It also serves as laxative and also effective in the treatment of sore throat (NNMDA, 2008).

Medicinal plants play a major role in health care with about 80% of the world's population depending on the use of traditional medicine which is predominantly derived from plants (Owolabi, *et al*., 2007). Plant based medicines have contributed largely to human health (El-Astal, *et al*., 2005). This is because of the effective theurapetic potency of the traditional medicine system (Adebolu and Oladimeji, 2005). The safety and efficacy of medicinal plants have been expressed because of the resistance of clinically pathogenic microorganism to the antibiotics that have been produced in the last decades (Nascimento, *et al*., 2000). The use of traditional medicine in the treatment of health challenges is relatively cheap; the side effects are not harmful. They also combat resistance to microorganisms. Such research on medicinal plants can help in their ethnomedicinal usage and conservation. This work is aimed at comparing the chemical constituents of the different medicinal plants investigated. Since these plants are used in the treatment of several health problems, knowledge of their chemical compositions can aid in the formulation of vital drugs from the extract of the plants.

II. Materials And Method

Plant Material

Leaves of *A. djalonensis, S. anthelmia, A. conyzoides*, *C. sumatrensis* and *E. coccinea* were collected at various locations around Michael Okpara University of Agriculture, Umudike, Abia state environment. They were identified at the forestry department of Michael Okpara University of agriculture, Umudike. The plants were oven dried at about 55°C. They were milled with Thomas Willey milling machine and stored in an air tight container. Powder of 20g was extracted in 100 ml of distilled water for one day at room temperature to get the aqueous extract which was filled with Wattman No 1 filter paper and lyophylised to get the dry solid residue.

Phytochemical Analysis

Extracts were analyzed for the presence of alkaloids, saponins, tannins and flavonoids according to Sofowara, 1993, Trease and Evans, 1989,Yadav and Agarwala, 2011. Using 2g of each sample, isolation and determination of phenolic compounds were carried out. Using the soxhlet apparatus for 2 hrs, the samples were defatted with 100 ml of diethyl ether. The defatted samples were heated with 50 ml petroleum for the extraction of the compounds. 5 ml of the extract was pipetted into a 50 ml flask for about 15 min and 10 ml of distilled water was added to it. With addition of 5 ml amyl-alcohol and 20 ml of aqueous NH_4OH solution, the complex colour was developed. This took place for about 30 min and the absorbance read with a spectrophotometer.

Mineral elements were determined following the multiple nutrient extraction method. The method for the determination of the proximate composition of the samples was those of the association of official analytical chemists (AOAC, 1995, 1980).

Thiamine content was found by the method described by Strove and Makarova (1989) while niacin content was determined by the method described by Barakat *et al*., (1973). Riboflavin and ascorbic acid were determined by the method described by AOAC (1980).

III. Result

The results of the phytochemical content, proximate composition mineral and vitamin contents of the leaves of *A. djalonensis, S. anthelmia, A. conyzoides, C. sumatrensis* and *E. coccinea* are summarized in tables 1 – 4.

Table 1: Percntage phytochemical composition of the plants investigated .

Plants	Tannin	Phenol	Sterol	Saponin	Flavonoid	Alkaloid
S. djalonensis	1.70±0.02	0.64±0.00	0.93±0.01	2.95±0.00	1.59±0.01	0.95±0.00
S. anthelmia	2.13±0.01	0.69±0.00	0.76±0.00	2.79±0.01	1.63±0.01	1.34±0.01
A. conyzoides	2.38±0.00	0.84±0.01	0.85±0.01	3.12±0.00	1.82±0.00	1.43±0.02
C. sumatrensis	1.95±0.01	0.83±0.02	0.69±0.01	1.64±0.01	1.50±0.03	1.78±0.03
E. coccinea	0.78±0.03	0.54±0.00	0.54±0.00	0.49±0.00	1.73±0.02	1.77±0.01

According to table 1, alkaloid content was high in the Asteraceae plants (*A. conyzoides, C. sumatrensis* and *E. coccinea*) compared to those of the Loganaceae family (*A. djalonensis* and *S. anthelmia*). Apart from alkaloid, all the other phytochemical constituents were more in *A. conyzoides* compared to the other species investigated (Table 1).

Table 2: Percentage proximate composition of the plants investigated

Plants	MC	DM	Ash	CF	EE	CP	CHO
S. djalonensis	11.46±0.02	88.53±0.02	9.46±0.02	15.29±0.01	3.09±0.01	17.28±0.17	54.89±0.22
S. anthelmia	11.69±0.01	88.31±0.01	10.73±0.01	14.780.03	2.32±0.00	15.85±0.01	56.32±0.00
A. conyzoides	12.48±0.17	87.52±0.17	12.13±0.01	13.83±0.02	2.26±0.00	18.62±0.13	53.15±0.13
C. sumatrensis	10.69±0.06	89.30±0.06	14.34±0.11	12.66±0.05	2.19±0.00	17.45±0.24	53.35±0.37
E. coccinea	11.89±0.08	88.10±0.08	13.23±0.03	14.87±0.04	2.52±0.11	19.49±0.01	49.88±0.16

MC = Moisture content, DM = Dry matter, CF = Crude fibre, EE = Ether extract, CP = crude protein, CHO = carbohydrate.

Crude protein content was high and ranged from 15.85±0.01% in *S. anthelmia* to 19.49±0.01% in *E. coccinea.* Carbohydrate content in the leaves of the plants studied was also high and ranged from 49.88±0.16% in *E. coccinea* to 56.32±0.00% in *S. anthelmia.* Crude fibre was relatively high and ranged from 12.66±0.05% in *C. sumatrensis* to 15.29±0.01% in *A. djalonensis*

Table 3: Percentage mineral composition of the plants investigated .

Plants	Ca	Na	K	Fe	Mg	P
S. djalonensis	12.57±0.18	6.69±0.22	15.21±0.04	1.83±0.01	13.57±0.04	47.62±0.31
S. anthelmia	10.61±0.01	6.34±0.08	12.78±0.03	1.71±0.01	12.71±0.01	45.59±0.43
A. conyzoides	15.79±0.01	5.95±0.01	16.10±0.02	2.77±0.04	12.65±0.00	52.43±0.38
C. sumatrensis	12.46±0.05	4.75±0.04	13.37±0.18	1.68±0.06	16.24±0.08	38.28±0.17
E. coccinea	8.90±0.06	5.83±0.10	12.31±0.01	2.67±0.06	13.42±0.04	29.56±0.06

Apart from Na (5.95±0.01%) and Mg (12.65±0.00%), all the minerals were highest in *A. conyzoides* while all the mineral constituents were low in *E. coccinea* except Na (5.83±0.10%) and Mg (13.42±0.04%). Ca and P were found to be high in the plants investigated while Fe content was low.

Table 4: Percentage vitamin composition of the plants investigated .

Plants	Thiamine	Riboflavin	Niacin	Ascorbic acid
S. djalonensis	0.16±0.00	0.09±0.00	0.08±0.04	53.84±0.01
S. anthelmia	0.24±0.01	0.13±0.00	0.18±0.00	29.56±0.20
A. conyzoides	0.20±0.01	0.12±0.01	0.07±0.01	41.83±0.09
C. sumatrensis	0.13±0.00	0.16±0.01	0.08±0.01	26.87±0.04
E. coccinea	0.19±0.00	0.17±0.01	0.06±0.00	32.42±0.04

Ascorbic acid were high in the plants investigated and ranged from 29.56±0.20 % in *S. anthelmia* to 53.84±0.01 % in *A. djalonensis*. Thiamine was also high in the plants and ranged from 0.13±0.00 % in *C. sumatrensis* to 0.24±0.01 % in *S. anthelmia.*

IV. Discussion

The investigation of the plants revealed the presence of tannin, phenol, sterol, saponin, flavonoid and alkaloids. The presence of these phytochemicals depicts their pharmaceutical and therapeutic value. Phenolic compounds possess antimicrobial property (Ofokansi *et al.*, 2005), while alkaloids and their synthetic derivative are used as medicinal agents for analgesic and bactericidal effects (Stray, 1998; Okwu and Okwu 2004). Flavonoids on the other hand possess anticancer effect and lower the risk of heart diseases when present in intestinal tract (Salah *et al*., 1995; Dei-Rio *et al.,* 1997). Antidiabetic activities of flavonoids and phenolic compounds have been reported by several authors (Weiss *et al*., 2011, Seo *et al.,* 2013 and Goufo *et al*., 2014b).

These medicinal plants contain moderate amount of food nutrients; protein, carbohydrate, fat and fiber (Table 2). The amount of moisture contents in the plants were in line with the characteristics of vegetables (Edeoga and Gomina, 2000).

The mineral elements present in the plants investigated are relevant in human nutrition (Table 3). Calcium, potassium and magnesium are needed for the repair of worn out tissues, strong bones and teeth and for body mechanization in human (WHO, 1996). The high content of these elements can provide an alternative source of vital mineral elements such as calcium and potassium in food. The plants investigated are good sources of thiamine, riboflavin, niacin and ascorbic acid (Table 4) apart from its anti-scurvy role, ascorbic acid also helps in the growth and repair of tissues, synthesis of collagen, an important protein for making skin, blood vessels, cartilages, repair and maintenance of bones and teeth. (Kompauer *et al*., 2006; Canter *et al*., 2007). Niacin helps to lower cholesterol levels, stabilize blood sugar and support genetic processes in the culls (Alvarsson et al., 1996; Ames 1999).

Studies of antimicrobial activities have been done on these plants which include; *Anthocleista djalorensis* (Okoli and Iroegbu, 2004; Esimone *et. al*., 2009 and Leke *et al*.,2012), *Ageratum conyzoides*

(Moody *et al*., 2004; Okwori, *et al*.,2006 and Kamboj,*et al*., 2008), *Euphorbia pulcherrima* (Sharf *et al*. 2015), *Emilia coccinea* (Teke,*et. al*.,2007 and Okiei, *et. al*.,2009), *Allium sativum* (Salam *et al*., 2015) and *Conyza sumatrensis* (Jack and Okorosaye-Orubite, 2009). This study has made available some biochemical platform for the ethnomedical use of plants as remedies of diseases and health challenges. They can also be used in drug production because of the presence of phytochemicals, minerals and vitamins in these plants

Acknowledgement

The authors are grateful to Mr O.W. Nwokeocha of the Department of Plant Science and Biotechnology, Michael Okpara University of Agriculture Umudike, Abia State for his technical support.

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