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Proximate Composition and Phytochemical Constituents of Leaves of Some *Acalypha* Species

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Abstract: Proximate composition and phytochemical constituents of leaves of *Acalypha hispida*, *Acalypha marginata* and *Acalypha racemosa* were investigated. Proximate composition of leaves of *Acalypha hispida* showed that it contained moisture (11.02%), crude fat (6.15%), ash (10.32%), crude protein (13.78%), crude fibre (10.25%) and carbohydrate (44.48%). Similarly, *Acalypha marginata* showed that it contained moisture (10.83%), crude fat (5.60%), ash (15.68%), crude protein (18.15%), crude fibre (11.50%) and carbohydrate (38.24%); while *Acalypha racemosa* contained moisture (11.91%), crude fat (6.30%), ash (13.14%), crude protein (16.19%), crude fibre (7.20%) and carbohydrate (45.26%). The phytochemicals detected in both aqueous and methanolic extracts of each of the different species of leaves were the same and are phenolics, flavonoids, hydroxyanthraquinones and saponins. Steroids and phlobatannins were detected in *Acalypha hispida* and *Acalypha racemosa*, while glycoside was detected only in *Acalypha hispida*. All these results indicate that the leaves of these *Acalypha* species contains nutrients and mineral elements that may be useful in nutrition. The presence of some phytochemicals like saponins and flavonoids explained the medicinal action of the plant encountered in its therapeutic uses.

Key words: Proximate composition, phytochemical constituents, *acalypha* species

Introduction

In recent years, there has been a gradual revival of interest in the use of medicinal plants in developing countries because herbal medicines have been reported safe and without any adverse side effect especially when compared with synthetic drugs. Thus a search for new drugs with better and cheaper substitutes from plant origin are a natural choice. The medicinal value of these plants lie in some chemical substances that produce a definite physiological action on the human body (Edeoga *et al*., 2005).

The plant *Acalypha* is a genus of the family *Euphorbiaceae* and sole genus subtribe *Acalyphinae* (Ogundaini, 2005). There are 570 species (Riley, 1963), a large proportion of which are weeds while others are ornamental plants. They are found in the tropics of Africa, America and Asia. Some of the species are well known in traditional medicine usage and a few have actually appeared in homeopathic pharmacopoeia (Ogundaini, 2005).

The *Acalypha* species used in this study are *Acalypha racemosa*, *Acalypha hispida* and *Acalypha marginata*. The antifungal properties of extracts of leaves of *Acalypha hispida* has been established (Ejechi and Souzey, 1999). Similarly extracts of leaves of *Acalypha racemosa* also showed antimicrobial properties (Musa *et al*., 2000). Decoctions of leaves of *Acalypha racemosa* are traditionally used for treatment of neonatal jaundice in Ilorin metropolis of Kwara State, Nigeria.

In this study, a preliminary comparative work was done on the leaves of all three *Acalypha* species, with respect to their proximate composition and phytochemical constituents.

Materials and Methods

The plants were obtained from Pipeline Road, Tanke, Ilorin, Kwara State, Nigeria and were identified at the Herbarium Section of the Department of Plant Biology of the University of Ilorin, Ilorin, Kwara State, Nigeria as *Acalypha hispida*, *Acalypha marginata* and *Acalypha racemosa*. The leave samples were air dried for two weeks and ground into uniform powder using a blender. 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 *Acalypha* specie was prepared using the same method for the aqueous extract, but methanol was the solvent used instead of distilled water. Proximate analysis were carried out on dried samples of leaves of the three *Acalypha* species.

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

Phytochemical screening: Phytochemical screening procedures carried out were adapted from the previous

Table 1: Proximate composition of leaves of some *Acalypha* Species

	Moisture content (%)	Crude fat (%)	Total ash (%)	Crude protein (%)	Crude fiber (%)	Carbohydrate (%)
Acalypha hispida	11.02±0.20	6.15±0.10	10.32±0.15	13.78±0.11	10.25±0.11	48.48±0.07
Acalypha racemosa	11.91±0.01	6.30±0.05	13.14±0.05	16.19±0.03	7.20±0.03	45.26±0.05
Acalypha marginata	10.83±0.01	5.60±0.02	15.68±0.03	18.15±0.03	11.50±0.0	38.24±0.03

Each value is a mean of four different determination ± Standard deviation.

Table 2: Phytochemical constituents of aqueous extracts of leaves of Acalypha hispida, Acalypha racemosa and Acalypha marginata

	Alkaloid	Tannin	Phenolic	Glycosides	Flavonoids	Steroids	Phlobatanins	Saponins	Hydroxylan-traquinones
Acalypha hispida	-	-	+	+	+	+	+	+	+
Acalypha racemosa	-	-	+	-	+	+	+	+	+
Acalypha marginata	-	-	+	-	+	-	-	+	+

+Detected. -Not Detected.

Table 3: Phytochemical constituents of methanolic extracts of leaves of Acalypha hispida, Acalypha racemosa and Acalypha marginata

	Alkaloid	Tannin	Phenolic	Glycosides	Flavonoids	Steroids	Phlobatanins	Saponins	Hydroxylan-traquinones
Acalypha hispida	-	-	+	+	+	+	+	+	+
Acalypha racemosa	-	-	+	-	+	+	+	+	+
Acalypha marginata	-	-	+	-	+	-	-	+	+

+Detected. -Not Detected.

work on plant analysis (Odebiyi and Sofowora, 1979). 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.

Results

The proximate composition of leaves of the three *Acalypha* Species are presented in Table 1. The result showed that leaves of all the three species of *Acalypha* contained a relatively high percentage of carbohydrate when compared with other compositions of each of the leaves. The phytochemicals tested for in the aqueous and methanolic extracts of the leaves and those detected for each *Acalypha* specie are summarized in Table 2 and Table 3 respectively. There was no difference in the phytochemicals detected or absent in both aqueous and methanolic leave extracts. Phenolics, flavonoids, hydroxyanthraquinones and saponins were detected in both extracts of leaves of all three species of *Acalypha*. Steroids and phlobatannins were detected in *Acalypha hispida* and *Acalypha racemosa*, while glycoside was detected only in *Acalypha hispida*.

Discussion

The results obtained from proximate analysis of leaves of all three *Acalypha* species establishes that they can be ranked as carbohydrate rich leaves due to their relatively high carbohydrate content when compared with the other components of the leaves. The low moisture content of the leaves would hinder the growth of micro organisms and the storage life would be high (Adeyeye and Ayejuyo, 1994). The crude protein content of the leaves are: 13.78%, 16.19% and 18.15% for *Acalypha hispida*, *Acalypha racemosa* and *Acalypha manginata* respectively and they compare favourably with *Heinsia crinita* (14.7%), but they are relatively low when compared with *Amaranthus caudatus* (20.59%) (Etuk *et al.*, 1998, Akindahunsi and Salawu, 2005), cassava leaves (*Manihot utilisima*), 24.88%, *Piper Guineeses* 29.78% and *Talinum triangulare* 31.00%. (Akindahunsi and Salawu, 2005). The values for ash content were 10.32%, 13.14% and 15.68% for the leaves of the three *Acalypha* species respectively. This requires investigation to ascertain the species of mineral elements as they are essential for tissue functioning and a necessity in daily requirement for human nutrition. The ash content of the leaves were lower than that of some leafy vegetables commonly consumed in Nigeria such as *Talinum triangulare* (20.05%). They are however higher than some other vegetables such as *Occimum graticimum* (8.00%) and *Hibiscus esculentus* (8.00%) (Akindahunsi and Salawu, 2005). The high ash content is a reflection of the mineral contents preserved in the food materials. The result therefore suggests a high deposit of mineral elements in the leaves (Antia *et al.*, 2006). The value of the crude fat for the leaves of the three respective *Acalypha* species were moderate when compared to those of *Talinum triangulare* (5.90%), *Baseila alba* (8.71%), *Amaranthus hybridus* (4.80%), *Calchorus africanum* (4.20%) (Ifon and Bassir, 1979; Akindahunsi and Salawu, 2005). Dietary fats function in the increase of palatability of food by absorbing and retaining flavours (Antia *et al.*, 2006). A diet providing 1-2% of its caloric of energy as fat is said to be sufficient to human beings as excess fat consumption is implicated in certain cardiovascular disorders such as atherosclerosis, cancer and aging (Antia *et al.*, 2006).

The crude fibre content of 10.25%, 7.20% and 11.50% for a *Acalypha hispada, Acalypha* racemosa and *Acalypha* marginata respectively were high compared with *Talinum triangulare* (6.20%), *Piper guineeses* (6.40%), *Corchorus olitorius* (7.0%), bitter leaves (*Vernonia amygdalina),* 6.5% (Akindahunsi and Salawu, 2005), Non-starchy vegetables are the richest sources of dietary fibre (Agostoni *et al.*, 1995) and are employed in the treatment of diseases such as obesity, diabetes, cancer and gastrointestinal disorders (Saldanha, 1995). The phytochemical screening showed that all leaves contain phenolics, flavonoid, hydroxyanthraquinones and Saponins. These are known to exhibit medicinal activity as well as physiological activity (Sofowora, 1993). The absence of alkaloid in *Acalypha racemosa* in this study is inconsistent with the Opinion of Musa *et al.*, 2000 who noted the presence of alkaloids in the leaves of *Acalypha racemosa*. Flavonoids have been shown to have antibacterial, anti-inflammatory, antiallergic, antimutagenic, antiviral, antineoplastic, anti-thrombotic and vasodilatory activity (Alan and Miller, 1996). The potent antioxidant activity of flavonoids their ability to scavenge hydroxyl radicals, superoxide anions and lipid peroxy radicals may be the most important function of flavonoids (Alan and Miller, 1996). Steroids and phlobatanins were detected in *Acalypha hispida* and *Acalypha racemosa*. Steroidal compounds are of importance and interest in pharmacy due to their relationship with such compounds as sex hormones (Okwu, 2001). The presence of other phytochemicals in aqueous extracts of leaves of leaves of *Acalypha racemosa* agrees with the results of Musa *et al.*, 2000. Various Studies have shown that Saponins although non toxic can generate adverse physiological responses in animals that consumes them. They exhibit cytotoxic effect and growth inhibition against a variety of cell making them have anti-inflammatory and anticancer properties. They also show tumour inhibiting activity on animals (Akindahunsi and Salawu, 2005). From the above results, these leaves may serve as a constituent of human diet supplying the body with minerals, protein and energy. The presence of secondary plant products in the leaves of these three *Acalypha* species that are biologically important e.g. saponins and flavonoids contributes to its medicinal value thus they can be potential sources of useful drugs.

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