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Phytochemical analysis of the selected five plant extracts

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Abstract

Herbal medicine is still the mainstay of about 75 - 80% of the whole population, and the major part of traditional therapy involves the use of plant extracts and their active constituents. Plants were collected, identified, dried then extracted using hexane, Dichloromethane/methanol and water. Identification assays to test the presence of various chemical constituents were carried out. The five plants were: *Sonchus luxurians, Ocimum americanum, Bridelia micrantha, Croton megalocarpus and Aloe secundiflora.* The Phytochemical screening of the compounds present in the plant extracts were; alkaloid, glycosides, Saponins, reducing sugar, Steroid, Flavones and Catecholics. The most common compound in all the plant extracts was Catecholics. Steroids are used in medicine to treat many diseases. The Plant extracts can be possible candidates for drug development.

Keywords: Herbal medicine, Phytochemical compounds, Traditional therapy, Plant extracts

1. Introduction

The use of medicinal plants has gained much attention in the last decade, and among those plants commonly used as medication in folk medicine, various extracts have been the subject of many pharmacological studies (Artuso, 1997). Plants are the richest resource of materials used in modern medicines, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs (Hammer *et al.,* 1999; Taylor, 2001 and Molgaard *et al*., 2001). Whereas medicinal plants have produced some very effective treatment for malaria as in case of artemisinin (Frederich *et al.*, 2002; Togola et al., 2008), few attempts have been made to evaluate antischistosomal activity of such natural plants . The importance of plants as sources of natural product bioactive molecules lies not only in their pharmacological or chemotherapeutic effect but also in their role as template molecules for the production of new drugs (Phillipson, 1994, WHO, 2002). The Phytochemical research based on ethno-pharmacological information is generally considered an effective approach in the discovery of new effective agents from plants.

2. Materials and methods

2.1 Plant Extracts

Sonchus luxurians (whole plant)*, Ocimum americanum (*whole plant*), Bridelia micrantha* (bark) *, Croton megalocarpus*(bark) *and Aloe secundiflora(*whole plant*)* were collected and placed in plastic bags. The plants were dried at room temperature for 2 months and crushed into tiny particles using Mekon Micro miller Single Phase and passed through a 0.5 mm mesh to standardize the particles. The ground plant material for each plant was divided into equal portions and separately placed in clean large container.

2.1.1 Hexane Extraction

The powdered materials (2kg) from roots, stems, leaves and were first subjected to extraction by soaking in hexane for 72 hours. The process was repeated three times in order to make sure that all non-polar materials are eluted. The contents were filtered using Whatman filter paper (No. 1, medium crystalline). The filtrates were concentrated using Rotary evaporator (RE-100 Bibby, made in Japan) at 70°C. The filtrates from hexane were subjected to drying in fume cupboards at 25°C for 1-2 weeks to remove most of the solvents from the extracts.

2.1.2 Dichloromethane / Methanol Extraction

The residues from n-hexane filtration were soaked for 72 hours in Dichloromethane (DCM) / Methanol in ratio of 1:1 to elute the medium polar materials. The process was repeated 3 times as described for n-hexane extraction.

2.1.3 Aqueous Extraction

The residues from Dichloromethane/ methanol filtrations were further re-soaked using distilled water for 72 hours in order to extract any remaining polar materials. The solutions were then filtered and subjected to freeze drying. The freeze dried materials constitute the aqueous Extract.

The plant extracts obtained were as follows; OAH- *Ocimum americanum* hexane extract, OAD- *Ocimum americanum* Dichloromethane /methanol extract DCM, OAW- *Ocimum americanum* water extract, OAC- *Ocimum americanum* crude, BMH- *Bridelia micrantha* hexane extract, BMD- *Bridelia micrantha* Dcm /Methanol extract, BMW - *Bridelia micrantha* water extract, BMC- *Bridelia micrantha* crude, SLD- *Sonchus luxurians*, Dcm /methanol extract, SLW- *Sonchus luxurians* water extract, SLC- Sonchus *luxurians* crude. CMW- *Croton megalocarpus* water extract, CMC- *Croton megalocarpus* crude, ASW- *Aloe* s*ecundiflora* water extract and ASC - *Aloe* secundiflora crude.

2.2 Identification tests to test the presence of various chemical constituents

2.2.1 Alkaloid

0.5 ml of the plant extract solution was evaporated to dryness and 2% hydrochloric acid added in the residue heated on a boiling water bath. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. The samples were then observed for the presence of turbidity or yellow precipitation (Siddiqui and Ali, 1997).

2.2.2 Glycoside

To 0.5 ml of the extract solution in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid were added. A reddish brown coloration at the junction of two layers and bluish green color in the upper layer was observed (Siddiqui and Ali, 1997).

2.2.3 Terpenoid and Steroid

Four mg of extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Concentrated solution of sulphuric acid was added slowly and red violet color was observed for terpenoid and green bluish color for steroids (Siddiqui and Ali, 1997).

2.2.4 Flavonoid

Four milliliters of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5-6 drops of concentrated hydrochloric acid was added and red color was observed for flavonoids and orange color for flavones (Siddiqui and Ali, 1997).

2.2.5 Tannins

One ml of water and 1-2 drops of ferric chloride solution was added to 0.5 ml of extract solution. Blue color was observed for Gallic tannins and green black for Catecholics tannins (Iyengar, 1995).

2.2.6 Reducing Sugar

One ml of water and 5-8 drops of Fehling's solution was added to 0.5 ml extract solution, heated and observed for brick red precipitate (Siddiqui and Ali, 1997; Harbone, 1998).

2.2.7 Saponins

The extract was diluted with 20 ml of distilled water and then agitated in a graduated cylinder for 15 minutes. The formation of 1 cm layer of foam showed presence of Saponins. The frothing was mixed with 3 drops of olive oil and shaken vigorously. Presence of Saponins results in formation of an emulsion (Siddiqui and Ali, 1997).

3. Results

The composition of five plant extracts is shown on the Table 1.The Hexane and Dichloromethane/Methanol extracts of the five plants were semi- solid or sticky composition while water extracts were powder, pellets and semi- solid or sticky form respectively.

The presence of the chemical constituents on five extracts was observed. *Ocimum americanum* plant extracts shown on Table 2 indicated the presence of Steroid, flavones and Catecholics (Tannins). In Table 3 *Bridelia micrantha* plant extract showed; Alkaloid, Catecholics, Glycosides, Saponins and reducing sugar were present. *Sonchus luxurians* plant extracts shown in Table 4 Glycosides, steroid and Catecholics were present. *Croton megalocarpus* plant extracts shown in Table 5 Terpenoid, Flavonoid and reducing sugar were present. *Aloe secundiflora* plant extract shown in Table 6 Catecholics was present.

4. Discussion

Presence of Phytochemical compounds in these extracts illustrates the bioactive compounds in the extracts. Steroid, flavones and Catecholics were common in the *Ocimum americanum* plant extracts while Flavonoid, Gallic and Saponins were absent. Alkaloid, Catecholics, Glycosides, Saponins and reducing sugar were present in all the *Bridelia micrantha* plant extracts. The above compounds able to bind physically to cell walls thereby preventing the adhesion of pathogens to human cell walls hence have antimicrobial activity (Nostro *et al*., 2000). Glycosides, steroid and Catecholics were present in all *Sonchus luxurians* plant extracts. Terpenoid, Flavonoid and reducing sugar were present in all *Croton megalocarpus* plant extracts.

Catecholics was present in two of *Aloe secundiflora* plant extract however, Terpenoid, Saponins and Gallic were absent. The most common compound in all the plant extracts was Catecholics. Phytochemical studies of the plant preparations are necessary for standardization, which helps in understanding the significance of phytoconstituents in terms of their observed activities.

5. Conclusions

Catecholics is tannin and tannins compounds are widely distributed in many species of plants, where they play a role in protection from predation, and perhaps also as pesticides. Of particular interest is the use of Saponins against the vector of the disease schistosomiasis. Steroids are used in medicine to treat many diseases. The five plant extracts can be possible candidates for drug development.

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Table 1: The state of the five plant extracts

EXTRACT	**STATE**		
	Hexane	**Dichloromethane/methanol**	**Water**
Ocimum americanum	Semi- solid and sticky	Semi- solid and sticky	powder
Bridelia micrantha	Semi- solid	Semi- solid	pellet
Sonchus luxurians	Semi- solid	Semi-solid	powder
Croton megalocarpus	Semi- solid	Semi-solid	powder
Aloe secundiflora	Semi- solid and sticky	Semi-solid and sticky	Semi- solid and sticky

Table 2: Presence of the active chemical constituents in *Ocimum americanum* plant extracts

	Alkaloid	Glycosides	Terpenoid	Steroid	Flavonoid		Tannins		Reducing sugar	saponins
					Flavonoid	flavones	Gallic	catecholic		
OAH	-	-	-	+	-	-	-	-	-	-
OAD	-	-	-	+	-	+	-	+	Trace	-
OAW	+	+	+	-	-	+	-	+	+	-

Table 3: Presence of the active chemical constituents in *Bridelia micrantha* plant extracts

	Alkaloid	Glycosides	Terpenoid	Steroid	Flavonoid		Tannins		Reducing sugar	saponins
					Flavonoid	flavones	Gallic	catecholic		
BMH	+	+	-	+	-	+	-	+	-	-
BMD	+	+	+	-	-	-	-	+	+	+
BMW	+	Trace	+	-	+	-	-	+	+	+

Table 4: Presence of the active chemical constituents in *Sonchus luxurians* plant extracts

	Alkaloid	Glycosides	Terpenoid	Steroid	Flavonoid		Tannins		Reducing sugar	Saponins
					Flavonoid	flavones	Gallic	catecholic		
SLH	-	+	-	+	-	-	-	-	-	-
SLD	-	+	-	+	+	-	-	+	-	Trace
SLW	+	+	+	-	-	-	-	+	-	Trace

Key:

OAH- Ocimum americanum hexane extract, **OAD**- Ocimum americanum, dichloromethane/methanol extract, **OAW**- Ocimum americanum water extract; **BMH**- *Bridelia micrantha* hexane extract, **BMD**- *Bridelia micrantha* dichloromethane/methanol extract, **BMW**- *Bridelia micrantha* water extract; **SLH-** *Sonchus luxurians* hexane extract, **SLD**- *Sonchus luxurians* dichloromethane/methanol extract, **SLW**- *Sonchus luxurians* water extract.

Table 5: Presence of the active chemical constituents in *Croton megalocarpus* plant extracts

	Alkaloid	Glycosides	Terpenoid	Steroid	Flavonoid		Tannins		Reducing sugar	Saponins
					Flavonoid	flavones	Gallic	catecholic		
CMH	-	-	+	-	+	-	-	-	-	-
CMD	-	-	+	-	+	-	-	-	+	-
CMW	+	+	+	-	-	+	-	-	+	+

Table 6: Presence of the active chemical constituents in Aloe *secundiflora* Plant extracts

	Alkaloid	Glycosides	Terpenoid	Steroid	Flavonoid		Tannins		Reducing sugar	Saponins
					Flavonoid	flavones	Gallic	catecholic		
ASH	-	-	-	-	-	-	-	-	-	-
ASD	-	-	-	-	-	+	-	+	-	-
ASW	+	+	-	-	+	-	-	+	traces	-

Key:

CMH- Croton megalocarpus hexane, **CMD**-*Croton megalocarpus* Dichloromethane/ methanol extract, **CMW**-*Croton megalocarpus* water extracts; **ASH**-*Aloe secundiflora* hexane extract, **ASD**- *Aloe secundiflora* Dichoromethane / methanol, **ASW**-*Aloe secundiflora* water extract.