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Short Communication

Traditional therapeutic uses and phytochemical screening of some selected indigenous medicinal plants from Northwest Ethiopia

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Background: Medicinal plants including *Achyranthes aspera*, *Brucea antidysentrica* and *Croton macrostachyus* in the Zegie and Lake Tana area are among the main herbal agents traditionally used to treat various illnesses. However, scientific investigations including their phytochemical screening have not been conducted.

Objective: To survey the use of these selected medicinal plants by traditional healers and/or herbal medicine users in the Zegie and Lake Tana areas, and conduct phytochemical screening of such commonly used herbal agents.

Methodology: Detailed interviews about the therapeutic uses of *Achyranthes aspera*, *Brucea antidysentrica* and *Croton macrostachyus* were conducted among the traditional healers and users in the study area. The plants were collected and separately extracted using water and ethanol and the crude extracts screened for phytochemical components by using standard procedures.

Results: The interview results from the traditional healers and users in the study area on the selected medicinal plants pointed to the therapeutic usage of these herbal agents for a variety of disease conditions, including infectious and non-communicable diseases. Plant extracts from *Achyranthes aspera* and *Brucea antidysentrica* showed the presence of flavonoids, carbohydrates and vitamin C but the absence of saponins and proteins (peptides). *Croton macrostachyus* was found to have most of the screened phytochemical constituents (including saponins, flavonoids, carbohydrates, free amino acids and vitamin C) except proteins.

Discussion: The herbal agents were found to have a variety of therapeutic uses for various illnesses in the area. The presence of the above mentioned phytoconstituents detected may be responsible for the therapeutic activities of these herbal agents.

Key words*:* Traditional medicines, phytochemicals, *Achyranthes aspera*, *Brucea antidysentrica*, *Croton macrostachyus*

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1. Introduction

The documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Cox and Balick, 1996; Flaster, 1996). Herbal medicines have been important sources of products for the developing countries in treating commonly occurring diseases and overcome the problems of resistance and side effects of the currently available conventional agents.

Traditional medicine still remains the main resource for a large majority (80%) of the people in Ethiopia for treating health problems and a traditional medical consultancy including the consumption of the medicinal plants has a much lower cost than modern medical

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attention. In Ethiopia, about 800 species of plants are used in the traditional health care system to treat nearly 300 mental and physical disorders. The use of plants in religious ceremonies as well as for magic and medicinal purposes is very common and widespread. Based upon strong primitive roots, the art of native medicine is still widely practiced (Abebe and Hagos, 1991; Asfaw et al, 1999; Addis et al, 2001; Pankhurst, 2001).

The study of Ethiopian medicinal plants has not been realized as fully as that of China, India or other traditional communities elsewhere (Iwu, 1993). Though there have been some organized ethnomedicinal survey studies (Teklehaymanot and Giday, 2007; Abebe and Ayehu, 1993; Abbink, 1995), there is limited preservation of medicinal herbs, scientific screening/confirmation and development of their therapeutic products. Ethnomedicinal surveys in Ethiopia and other parts of the world have indicated that among many medicinal plants, some of the species identified in this study such as *Croton macrostachyus* (Euphorbiaceae), *Achyranthes aspera* (Amaranthaceae), and *Brucea antidysenterica* (Simaroubaceae) have been traditionally used for many therapeutic roles.

Ethnobotanical studies of many medicinal plants in Zegie and Lake Tana areas has been studied by Teklehaymanot and Gidey (2007) though it lacks further scientific investigations on the specific traditional therapeutic practices, phytochemical screenings, effectiveness of therapeutic plant extracts, side effects and development of the active plant extracts. Considering the rich diversity of plants in Zegie and Lake Tana areas, it is necessary to screen plants for their medicinal importance. The present investigation was designed to survey the traditional therapeutic usage by local healers, extract from the selected plant specimens by using different solvents, evaluate the extract results and describe some unique features of these selected plant extracts (phytochemical components) and their putative association with potential therapeutic effects in the day-to-day practice of traditional medicine.

2. Methodology

2.1 Study area

The study was conducted on the commonly used herbal plants of Zegie and Lake Tana monatstries in Northwest Ethiopia.

Lake Tana which is the largest lake in Ethiopia and source of Blue Nile is found in North West high lands of Ethiopia, particularly in the Amhara National Regional State (ANRS). It is situated with the altitude of 1830 meters above sea level.

Zegie Peninsula is located 600 km Northwest of Addis Ababa in the country's northwest highlands, at an altitude of approximately 1800 meters above sea level. It is partly surrounded by Lake Tana. There are seven monasteries on the peninsula. The monasteries of Zegie are different from the island monasteries in that they are not highly isolated from the local communities. They are also surrounded by the residents who are leading a non-monastic life (ANRS Tourism office, 2005).

2.2 Interviews with traditional healers and users

Interviews with seven traditional healers and ten herbal medicine users were conducted about the therapeutic uses and effectiveness of the selected medicinal plants for treating various disease problems. Semi-structured questionnaires were presented to the traditional healers and users translated them to the local language. Purposive selection of the respondents/interviewees was done along with community informants and leaders. Since the study area is very specific and not vast, almost all the traditional healers practicing in the area were contacted to collect information. Those who declined to be involved in the study were excluded.

The investigators of this study undertook the interviews and discussions during family involvement with the respondents. Despite there being many other herbal agents being used for therapeutic purposes in the area, the selection of these three specific medicinal plants for this study was based on their high availability and frequent use for treating commonly occurring disease problems. All the relevant responses were collected and documented during the study.

2.3 Plant collection, botanical identification and preparation of plant extracts

The selected medicinal plants (*Croton macrostachyus*, *Achyranthes aspera*, and *Brucea antidysenterica*) were collected from Zegie and Lake Tana areas. The botanical identification of the herbal agents was made by the National Herbarium of Addis Ababa University, Faculty of Science, Department of Plant Biology and Biodiversity, where voucher specimens were deposited with voucher numbers **ETH 006** (*Croton macrostachyus*), **ETH 007** (*Achyranthes aspera*) and **ETH 008** (*Brucea antidysentrica*).

2.4 Preparation of plant extracts

Plant materials (leaves) pf the selected plants were collected from the study area and washed under running tap water to remove adhering dust, air dried under shade for7 days and then powdered using a grinding mill. The plant extracts from the plant materials (leaf) were prepared by using organic and inorganic solvents (ethanol and distilled water) as described below (Uddin et al, 2011; Uhegbu et al, 2005).

About 100 g of powdered material of the plant samples were taken in a large, clean beaker/flask and soaked in 500 mL of 99% ethanol. The beakers were covered with aluminum foil and kept for a period of one week, with occasional shaking and stirring. The solutions were then filtered twice, firstly with clean cloth (four fold) and then with Whatman's filters paper (Whatman No.1) and finally the filtrates were concentrated by using a rotary evaporator at 40 °C and then to dried in a hot air oven at 40 °C). The dry crude extracts were weighed and placed in a refrigerator at -4 °C in sealed glass bottles until use. The yields of different plant extracts were calculated as percent (%) weight-by weight (w/w) of the dried material used.

Separately, about 100 g of each powdered sample of the herbs were extracted by soaking in 300 mL of distilled water in a beaker. The mixtures were stirred and heated

at 99 °C for 15-20 min in water bath and then left to stand overnight. Thereafter, the solutions were filtered using filter paper (Whatman No. 1) and the filtrates were concentrated with a rotary evaporator and then to dryness in hot air oven as described above for ethanol extract. The dried extracts were weighed and placed in a refrigerator at -4 °C until use. The yields of different plant extracts with distilled water as a solvent were also measured in % w/w of the dried material used.

2.5 Preliminary phytochemical screening

Preliminary phytochemical studies for the presence of active principles in the selected plants were conducted following standard procedures (Bhandary et al, 2012; Harborne, 2005; Raman, 2006). Extracts of the plant samples were tested for the presence of active principles such as saponins, flavonoids, proteins, free amino acids, carbohydrates and vitamin C.

2.6 Data analysis

The yield of the crude plant extracts were expressed in percent (%w/w) and mean ± standard error (SE).

Qualitative data from traditional healers as well as the phytochemical screening were compiled and tabulated.

2.7 Ethical approval

Ethical clearance was obtained from the Biotechnology Research Institute of Bahir Dar University (BDU).

All the traditional healers and study participants were informed about the purpose of the study and finally their informed consent was obtained before interviewing. The information provided by each respondent was kept confidential.

3. Results

3.1 Therapeutic use of the selected medicinal plants

Detailed interviews and discussion results from seven traditional healers and about ten herbal medicine users in the study area about these traditionally used medicinal plants indicated the effectiveness of these herbal agents for a variety of infectious as well as non-communicable diseases. The fruit and leaf parts of *Brucea antidysenterica* were explained to be used against weight loss, fever, dysentery (local name 'kuruba'), diarrhea (local name 'bullad') and hemorrhoids. *Croton macrostachyus* was reported to be effective for wounds (local name 'kusil'), dysentery, stomach disorder and fungal infections (local name 'quaqucha'). The leaf parts of *Achyranthes aspera* were also mentioned to have therapeutic use for blood clotting and herpes zoster (local name 'shererit') problems. The summary of the traditional medicinal application of the specific medicinal plants and parts of the plant parts used are presented in **Table 1**.

3.2 Plant extraction results and extracts percentage yields

The percent yields found from the different plant materials in this study was compared with the solvent types used (ethanol vs distilled water). The % extract from *Croton macrostachyus* with ethanol was higher than that of water. Ethanolic extracts also showed higher % yields for both *Achyranthes aspera* and *Brucea antidysentrica*. Comparison of ethanolic extracts in the three species of herbal agents showed the highest % yields from *Croton macrostachyus*, followed by *Brucea antidysentrica* and the least was found from *Achyranthes aspera* as shown on **Table 2**.

Table 1: Some selected medicinal plants and their therapeutic uses by local healers and users

Species name	Therapeutic uses (incl. local name)	Plant parts used and therapeutic preparations
Brucea antidysenterica JF. Mill.	Dysentry ('Kuruba')	Juice of leaf is taken orally in the morning
	Hemorrhoids	Fruit or leaf powder mixed with milk is taken orally for three days
	Weight loss, fever, itching, and diarrhea ('Bullad')	Leaf/fruit powder mixed with honey and fermented for seven days is taken orally until cure
Croton macrostachyus Del.	Wounds ('Kusil'/'Ekek')	Dressing with the powders of leaves mixed with butter
	Dysentery or diarrhea ('Kuruba') and stomach disorder)	Leaves are eaten with food or leaf powder mixed with water is drunk
	Fungal infections of skin/*Tinea versicolor* ('Quaqucha')	Rubbing and covering with leaves at the affected area
Achyranthes aspera L.	Blood clotting	Dressing with fresh leaves
	Herpes zoster ('Shererit')	Chewing fresh leaves

Table 2: Percent yield of extracts with different solvents of the selected medicinal plants in this study.

Solvent extraction	Plant species	% yield (w/w) (Mean ±SE)*
Ethanol extract	*Croton macrostachyus*	6.63± 0.546
	Achyranthes aspera	2.90±0.152
	Brucea antidysentrica	4.10±0.261
Water extract	*Croton macrostachyus*	4.40±0.264
	Achyranthes aspera	2.67±0.067
	Brucea antidysentrica	3.37±0.088

*: *Yield determination was carried out in triplicates for each plant species and the solvent types used*

Table 3: Phytochemical screenings conducted and results on the selected medicinal plant leaf extracts with ethanol and water solvents

Phytochemical tests	Plant species and Extracts used					
	Croton macrostachyus		*Achyranthes aspera*		*Brucea antidysentrica*	
	Ethanol	Water	Ethanol	Water	Ethanol	Water
Saponins test	+	+	-	-	-	-
Flavonoids test						
Ferric chloride test	+	+	+	+	+	+
NaOH test	+	+	+	+	+	+
Lead acetate test	+	+	-	-	+	+
Buiret test	-	-	-	-	-	-
Carbohydrate tests						
Molisch test	+	+	+	+	+	+
Benedict's test	+	+	+	+	+	+
Test for free amino acids	+	+	-	-	+	+
Test for vitamin C	+	+	+	+	+	+

All tests were performed in duplicate

3.3 Phytochemical analysis of different crude extracts

Extracts were tested for the presence of active principles such as saponins, flavonoids, proteins, free amino acids, carbohydrates and vitamin C. The phytochemical screening revealed the presence of saponins (in *Croton macrostachyus*), flavonoids (in *Croton macrostachyus*, *Achyranthes aspera* and *Brucea antidysentrica*), carbohydrates (in *Croton macrostachyus*, *Achyranthes aspera* and *Brucea antidysentrica*), free amino acids (in *Croton macrostachyus* and *Brucea antidysentrica*), and vitamin C (*Croton macrostachyus*, *Achyranthes aspera* and *Brucea antidysentrica*) in their leaf extracts. The present study also indicated the absence of free amino acids in *Achyranthes aspera* and proteins (peptides) in all the three leaf extracts of the studied herbal agents. The results for these preliminary screening tests are presented in **Table 3**.

4. Discussion

The interview and discussion data on the traditional use of these currently studied medicinal plants by local healers and users in the study area indicated therapeutic use against various illnesses mentioned. Other previous studies conducted (Teklehaymanot and Giday, 2007; Abebe and Ayehu, 1993; Abbink, 1995) also reported similar findings with these and other herbal agents. The preliminary phytoconstituents found in this study could be responsible for such therapeutic effectiveness although further analysis studies are

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required. Besides, the associated low side effects were also explained in this study by the users.

The yield of medicinal plant extracts which contain the bioactive metabolites vary considerably with plant species and the method or solvent used for extraction in this study.

The preliminary phytochemical screenings conducted on the selected medicinal plants in this study indicated the presence of various active principles including saponins, flavonoids, carbohydrates, free amino acids and vitamin C which may be associated with the effectiveness of these herbal agents for healing specific disease problems including wound healing, anti-infective, anti-inflammatory and anti-haemorrhagic effects (Bhandary et al, 2012; Nishijima et al, 2009). For example, flavonoids are phenolic compounds and plant phenolics are a major group of compounds that act as primary antioxidants or free radical scavengers, anti-inflammatory and anti-ulcerogenic agents. Plant products are potential wound healing agents, and largely preferred because of their widespread availability, non-toxicity, absence of unwarranted side-effects and effectiveness as crude preparations. The anti-haemorrhagic effects of plant-derived extracts are also associated with their rich contents in triterpenoid saponins, polysaccharides, coumarins and flavonoids which have a powerful anti-haemorrhagic effects (Nishijimaet al, 2009). Flavonoids are also known to be involved in vascular protection, by decreasing the vascular permeability and inhibitory activity of several enzymes such as metallo-proteinases by chelating ions such as zinc.

The preliminary phytochemical screening tests may be useful in the detection of the bioactive principles and subsequently may lead to potential candidates for drug discovery and development. Furthermore, these tests facilitate the quantitative estimation and qualitative separation of pharmacologically active components (Bharat et al, 2010; Naqvi et al, 1991).

5. Conclusion

The presence of different phytoconstituents (mainly saponins, flavonoids, carbohydrates, free amino acids and vitamin C) in the different indigenous medicinal plant extracts may be responsible for the therapeutic properties of these herbal agents by traditional healers. Meanwhile, *Croton macrostachyus* among the three studied herbal agents was found to have most of the screened phytochemical constituents (including saponins, flavonoids, carbohydrates, free amino acids and vitamin C) except proteins/peptides were absent.

To further confirm their effectiveness and pharmacological effects, further investigations are recommended including *in vivo* and *in vitro* investigations.

Conflict of Interest declaration

The authors declare no conflict of interest.

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