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RESEARCH ARTICLE

ETHNOPHARMACOLOGY STUDY AND PHYTOCHEMICAL SCREENING OF TWELVE IVORIAN ANTIMALARIA PLANTS

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ABSTRACT

Plants provide complicated, mixed, and distinct non nutrient elements which act as the main basis of drug discovery. Plant extracts contain phytochemical constituents for miscellaneous medicinal activities which are bioactive in nature. There is growing interest in the use of plants for the treatment and prevention of malaria. Medicinal plants are currently being evaluated as source of promising antimalaria agents. In this study, we have investigated the ethnopharmacology study and phytochemical screening of twelve traditional antimalaria plants.

INTRODUCTION

Malaria has been a great challenge to humanity since time immemorial. An estimated 300–500 million people are affected by malaria throughout the world annually (WHO, 2012). This same world health organization (WHO) source indicates that 95 % of malaria-related deaths occur in sub-Saharan Africa, with children younger than five years of age and pregnant women being the most severely affected. In recent years, the burden of malaria has fallen in many parts of Africa following the introduction of more effective treatments and the scale-up of long-lasting insecticidal nets (LLIN) use (WHO, 2013). But, vector mosquito resistance to insecticides recommended for current use (Nkya *et al.,* 2014) coupled with emergence of drug-resistant parasite strains to the latest antimalarials in use (Fidock *et al.*, 2004: WHO 2015) demand for new drugs with new modes of action. Medicinal plants are considered as potential source for drug development and many novel products have reached clinical trials.

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The properties of medicinal plants are investigated in order to develop novel drugs against malaria. Currently, the proportion of the African population uses traditional medicine is estimated at over 80% (Jiofack *et al.*, 2010). In Côte d'Ivoire and elsewhere in Africa, medicinal plants occupy a place of choice in the treatment of various diseases. The survival and intensification of this practice today despite the prodigious development of modern medicine are related to several factors, among which may be mentioned economic constraints and sociocultural factors (*Kipré et al.,* 2015). The present study was designed to make botanical description and identify phytoconstituents of 12 plants traditionally used against malaria in Agboville

MATERIELS AND METHODS

Collection of plants material

The plants were collected from Agboville department. The plants material were identified by Floristic Center of Félix

Houphouët-Boigny University. A voucher herbarium specimen is deposited at the Floristic Center. The plant samples were then dried in shade left over for 15 days and powdered with the help of grinder.

Preparation of plant extract

Parts of collected plants were air-dried during 15 days in the shade at room temperature and powdered. For each plant, 100 g of material were extracted in ethanol 70% and distilled water at room temperature to obtain ethanolic extract and. aqueous extract

Phytochemical screening

The phytochemical screening was done using the standard protocols (Uddin *et al.*, 2012; Usman *et al.,* 2012).

Test for Alkaloids: 5 mL of extract was concentrated to yield a residue. Residue was dissolved in 3 mL of 2% (v/v) HCl, few drops of Mayer's reagent was added. Appearance of the dull white precipitate indicated the presence of basic alkaloids.

Test for Saponins: 2 mL extract was shaken vigorously for 30 s in a test tube. Persistence of thick forth even after 30 mins indicated the presence of saponins.

Test for Polyphenols: In 2 mL of vegetable extract is added a drop of alcoholic solution of 2% ferric chloride. The appearance of a darker or darker blue or green color indicates the presence of polyphenolic derivatives**.**

Test for Polyterpenes and sterols: 5 mL of plant extract are evaporated to dryness. The residue is dissolved hot in 1 ml of acetic anhydride and collected in a test tube. Along the tube, 0.5 ml of concentrated sulfuric acid is added. The appearance at the interphase of a purple or purple ring, turning blue and then green, indicates a positive reaction.

Test for Quinone: 1 mL of extract was taken.1 mL of conc. H2SO4 was added. Formation of red color indicated the presence of quinone.

Test for Tannins: About 0.5 g of the dried powdered samples was boiled in 20 mL of water in a test tube and then filtered.

Table 1. Indications on the methods of preparation and administration of medicines

Scientific name	Family	Used parts	Method of preparation	Mode of administration
Adenia lobata	Passifloraceae	Stem barks	Decoction	Drink
Cola gigantea	Sterculiaceae	Stem barks	Decoction/ Kneading	Drink, Bath
Entada mannii	Mimosaceae	Stem barks	Decoction	Drink
Entandrophragma angolense	Meliaceae	Stem barks	Decoction	Drink
Griffonia simplicifolia	Caesalpiniaceae	Leaf /roots	Kneading /Decoction	Bath
Jatropha curcas	Euphorbiaceae	Stem barks	Macerating	Bath
Landolphia heudelotii	Apocynaceae	Leaf	Decoction	Bath, Drink
Mitragyna ledermannii	Rubiaceae	Stem barks	Decoction/ Kneading	Drink
Parkia bicolor	Mimosaceae	Stem barks Leaf	Décoction/ Kneading	Drink, Bath
Spathodea campanulata	Bignoniaceae	Stem barks Leaf	Decoction Kneading	Drink, Bath, Purge
Uapaca guineensis	Euphorbiaceae	Stem barks	Decoction/ Kneading Infusion	Drink, Bath, Purge
Vernonia amygdalina	Asteraceae	Leaf	Decoction/ Kneading	Drink, Bath, Purge

Table 2. Phytochemical screening of aqueous extracts and ethanolic extracts of twelve antimalaria plants

Plantes	Extract	*Polyterpenes and sterols*	*Polyphenols*	*Flavonoids*	*Tannins*	*Quinone*	*Alkaloids*:	*Saponins*
Adenia lobata	Eaq	++	+	+	+	+	++	+
	Eeth	++	-	-	-	+	++	-
Cola gigantea	Eaq	+	-	-	-	+	++	++
	Eeth	++	-	-	-	-	++	-
Entada mannii	Eaq	+	++	++	-	-	++	+
	Eeth	++	++	++	-	-	+	-
Entandrophragma	Eaq	+	+	+	++	+	++	++
angolense	Eeth	++	++	+	-	-	+	-
Griffonia simplicifolia	Eaq	+	-	-	-	+	+	+
	Eeth	++	-	-	-	++	++	-
Jatropha curcas	Eaq	+	-	-	-	+	++	+
	Eeth	++	-	-	-	-	++	-
Landolphia heudelotii	Eaq	+	+	+	-	-	++	+
	Eeth	++	++	++	-	-	+	-
Parkia bicolor	Eaq	+	++	+	-	-	+	++
	Eeth	++	++	++	-	-	+	-
Mitragyna	Eaq	++	+	+	-	-	+	-
ledermannii	Eeth	++	++	++	-	-	+	-
Spathodea	Eaq	+	+	++	+	+	++	-
campanulata	Eeth	++	++	++	-	-	+	-
Uapaca guineensis	Eaq	-	+	+	-	-	++	-
	Eeth	+	++	++	-	+	+	-
Vernonia amygdalina	Eaq	+	+	+	+	-	++	++
	Eeth	++	++	+	-	-	+	-

Eaq: Aqueous exract +: present
Eeth: Ethanolic extract + +: Abundantly present - : Absent

Few drops of 0.1% Ferric Chloride was added and observed for brownish green or a blue-black coloration.

Test for Flavonoids: A portion of the powdered plant sample was heated with 10 mL of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 mL of the filtrate was shaken with 1 mL of dilute Ammonia solution. A yellow coloration was observed indicating a positive test for flavonoids.

RESULTS AND DISCUSSION

Ethnomedicinal investigations

The ethnomedicinal investigation was conducted in the Department of Agboville (Côte-d'Ivoire) on 12 species of plants are used by Abbey people for the treatment of malaria.
The drugs (stem barks, root barks and leaves) are used to develop many medicinal preparations by decoction wich is the often used methods. The drinking is the most widespread mode of administration (Table 1). The following organs are used as drugs: leaf, stem bark, root bark and whole plant. There are different methods of sampling these organs: for roots, the sampling is made with a hoe; leaves are usually picked by hand; concerning the stem and roots bark, the sampling is done with machetes. Methods of sampling are very important; they must prevent plant species extinction (Anoma and Aké-Assi, 1989). There are different modes of preparation: decoction, kneading, macerating and infusion. In this study decoction and kneading are the most widespread method of preparation. The drink is the most used method of administration. Of the 12 receipts, 9 (75 %) are made with stem bark.

Phytochemical screening

Before the evaluation of candidate plant materials for pharmacological activities, the characterization of their chemical nature is essential. Phytochemical screening of 24 extracts showed the presence of several secondary metabolites which are summarized in Table 2. In the phytochemical screening, Aqueous extracts and ethanolic extracts were shown to have different compositions. Aqueous extracts of *Adenia lobata* and *Entandrophragma angolense* contain all of the phytoconstituents that were tested in this study. The Alkaloids are the constituents present in all extracts. Alkaloids have been reported as one of the important groups of phytoconstituents obtained from natural sources. It plays an important role in the ecology of organisms which synthesize them. Alkaloids play an important role in the defence systems against pathogens and animals (Patel *et al.,* 2012). The applications of alkaloids are not limited to biological control of herbivores but also have pharmacological, veterinary and medical importance. Alkaloids belonging to beta-carboline group possess antimicrobial, anti-HIV and antiparasitic activities (Bouayad *et al.*, 2011).

Conclusion

The search for new antimalarial drugs has become increasingly urgent due to plasmodial resistance to existing drugs. As part of this global effort, the present study aimed at doing the phytochemical screening of twelve traditionally used medicinal plants against the disease.

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