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Research Article

Study Ethnopharmacological and Phytochemical Screening of Some Plants Involved in the Treatment of Abdominal Infections in The Department of Kouto (COTE D'IVOIRE)

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Abstract: This present work was firstly to identify plants using for the traditional treatment of abdominal pain based on the information provided by traditional healers in three villages in the department of Kouto. An experimental study carried on a phytochemical screening was then performed. The results showed that among the different species of known medicinal plants, *Uvaria chamae, Anthocleista adjalonensis, Waltheria Manilkara indica* or *multinervis* are the most commonly prescribed in the treatment of diseases associated with abdominal infections. In addition, various parts of these plants, including roots, leaves and bark are used. The phytochemical screening performed on various extracts revealed the presence of several groups of compounds including flavonoids, alkaloids, tannins and saponins which have proven microbicidal properties. This could justify the use of these plants in traditional medicine.

Keywords: Medicinal plants, phytochemical screening, abdominal infections, Kouto, Niéné North, Cote d'Ivoire

INTRODUCTION

In many African countries, due to the increasing poverty, people mainly use plants for their primary health care. According to the work of Diallo et al. [1], about 80% of Mali's population rely on traditional medicine for treatment. In Togo and South Africa, extracts of plant of the family Combretaceae are highly recommended for their antifungal activity [2, 3]. Whether in Senegal, Côte d'Ivoire and sub-Sahelian Africa, it has been shown that certain plants such as *Parkia biglobosa* (Jacq) are hypotensive [4], anti-diarrheal [5] or analgesic and anti-inflammatory [6]. Various plant organs such as leaves, flowers, bark and roots are used in traditional treatment of conditions such as bronchitis, hypertension, diarrhea, abdominal pain [7, 8].

Literature teached us that plants are powerful remedies in the treatment of abdominal infections especially dysentery, diarrhea and gastroenteritis [9, 10, 11]. Several studies have shown that diarrhea and gastroenteritis are a major cause of mortality in children under 5 years in developing countries [12, 13, 14].

For the treatment of these diseases, the plants were variously used [1, 15, 16, 17]. In this first phase of our research, our aim was to identify among the plants used in the traditional treatment of abdominal diseases, those that were commonly prescribed by traditional healers before considering studies to develop improved traditional drugs (ITD).

MATERIALS AND METHODS

Description of the study area

Canton North Niéné part of the Department of Kouto (Region Bagoué) located in northern Côte d'Ivoire. Under the new administrative division, it is made up of 20 villages including two (02) sub-prefectures (Kouto and Blésségué). It was a cosmopolitan population dominated mainly by farmers Senufo group Gur. There were also other people from neighboring countries of ECOWAS and a strong community of brotherly peoples of Côte d'Ivoire (Agni Attié; Baoulé.). The Niéné North is bordered to the south by Niéné Center (subprefecture Gbon), to the north by the department of Tengréla, to the east by the Canton Pongala (subprefecture Kaséré) and to the west by the subprefectures of Sanhala and Kolia. Recent events in the military-political crisis of September 2002 saw the closure of some existing health centers after the departure of staff. This necessarily has amplified the practice of traditional medicine in the said localities. Thus, men and women experienced in the field were made available to relieve people through the use of medicinal plants.

Methods of work

The working method was to proceed by ethnopharmacological investigations. They were held in three (03) steps in August 2010. This was a direct interview with renowned herbalists populations consist

of ten (10) men (05) women aged between 35 and 75 years. The interview was focused on abdominal and recipes recommended for treatment. After collecting information, we organized the field trip in search of the main plants used in recipes to identify them. All plant species collected were identified and confirmed in the herbarium of the National Center Floristic (CNF) from the University Felix Houphouet Boigny of Cocody by Professor Ake-Assi.

Material of phytochemical screening

The plant material consists of ten root plants (Table I). They were collected in October 2010 in grassland of Niéné the North. These root were washed under a stream of water for 5 minutes, cut into small pieces and dried in the laboratory at ambient temperature of the room for two weeks and then made into a powder.

Crude extracts were obtained by maceration in water on the one hand and 70% ethyl alcohol on the other. Thus, 100 g of powder are vigorously stirred in 1 L of distilled water or in 70% alcohol with an electric mixer. The homogenate obtained was first spun in a square of fabric, and then filtered twice successively on cotton wool and once on Whatman filter paper No. 1. The resulting filtrate was then evaporated in an oven Venticel at 50 °C [18].

Table 1: Some medicinal plants involved in the treatment of abdominal infections

Sl. No.	Local name	Species	Family	P u	Fr	%
1	Dyirédonon	*Cassia sieberiana*	*Caesalpiniaceae*	R	02	4
2	Niga'm	*Anogeissus leiocarpa*	*Combretaceaea*	B	03	13
3	Kôdin'm	*Securinega virosa*	*Euphorbiaceae*	R	02	4
4	**Kamidio'hou**	*Anthocleista adjalonensis*	*Loganiaceae*	R	**08**	**32**
5	**Foualo'm**	*Manilkara multinervis*	*Sapotaceae*	L	**07**	**29**
6	Dogui	*Eriosema griseum*	*Fabaceae*	R	01	04
7	**Séboun toc gui**	*Waltheria indica*	*Sterculiaceae*	R	**07**	**29**
8	Kagbo' hou	*Tapinanthus dodoneifolia*	*Loranthaceae*	R	02	4
9	Nigalazo gui	*Chasmanthera dependens*	*Menispermaceae*	R	02	4
10	**Lô'm-yangue**	*Uvaria chamae*	*Annonaceae*	R	**06**	**24**

P.u : Part used; Fr : Frequency; R: Root ; L : leaves; B : Bark

Phytochemical screening

The phytochemical analysis is performed on the basis of tests of color characteristics for highlight major chemicals. It focused on the aqueous and ethanolic extracts 70% of the plants listed. For this purpose, several types of reagents were used. All testing was performed according to the analytical techniques described by [19, 20, 21, 22, 23, 24]. The results will be sorted by: Positive reaction: + + +, moderately positive reaction: + + Negative test: -

Identification of alkaloids (revelation by Draggendorf reagent)

A few drops of Draggendorf reagent compound of a mixture of 0.80 g of basic bismuth nitrate, 10 ml of glacial acetic acid and 40 mL of distilled water are introduced into a test tube containing 2 mL of the solution of extract. The formation of an orange-red precipitate indicated the presence of alkaloids.

Highlighting saponins (foam index)

0.1 g of extract is dissolved in a test tube containing 10 mL of distilled water. The tube is shaken vigorously for 30-45 seconds in the lengthwise and then allowed to stand for 15 minutes. The foam height is measured. The persistence of foam more than 1 cm high indicated the presence of saponins.

Identification of flavonoids (test with soda)

In a tube, add to a few ml of the extract solution, a few drops of a solution of soda to 1/10. The yellow-orange characterizes the presence of flavonoids.

Highlighting tannins (ferric chloride 1% reaction)

To 1 ml of extract contained in a test tube is added 2 mL of water and then one to two drops of ferric chloride 1%. The appearance of a blue color, black or blue-black indicated the presence of gallic tannins. The green or dark green indicated the presence of catechin tannins.

Highlighting Quinones (reagent Borntraeger)

An aliquot of extract was dissolved in 5 mL of HCl diluted to 1/5 and heated in a boiling water bath for 30 minutes and then extracted with 20 mL of $CHCl_3$ after cooling. To the organic phase was added 0.5 mL diluted to 50% NH_2OH. The appearance of a color ranging from red to purple indicated a positive reaction.

Identification of sterols and polyterpenes (reaction of Liebermann)

0.1 g of extract was dissolved in 1 ml of hot acetic anhydride in a capsule and then taken up in a test tube in which 0.5 mL are poured concentrated H_2SO_4. The appearance of a purple color that turns blue to green indicated the presence of sterols and triterpenes.

Identification of cardiac glycosides (test of Keller-Kiliani)

This reaction is exothermic. It took place in mid-glacial. To 2 mL of aqueous extract was added 1 ml of glacial acetic acid and 1 mL of concentrated sulfuric acid. The addition of 2 to 3 drops of $FeCl_3$ (2%) gave a bluish-green color which characterizes the presence of cardiac glycosides.

Statistical analysis

The data are presented as mean ± SEM. All the data were analyzed by one-way ANOVA and differences between the means were assessed with Neuman-Keuls's multiple comparison tests. Differences were considered significant *at* $p < 0.05$. All analyses were carried out using Graph Pad software, version 5.01 (USA).

RESULTS AND DISCUSSION

Ethnopharmacological study

The interview we had with the traditional healers of Kouto allowed us to identify 25 plant species distributed among 25 genera and 20 families of which 10 were selected for the present study (Table 1). According to our sources, these medicinal plants treated several diseases associated with abdominal infections. This is the case of pancreatitis, acute peritonitis, gastroenteritis, diarrhea and dysentery. Analysis of the results indicated that the plants commonly used were the ten selected *Anthocleista adjalonensis, Waltheria indica, Manilkara multinervis* and *Uvaria chamae* respectively in the proportions 32%, 29%, 29% and 24%.

Outside the department of Kouto, therapeutic indications of these plants as drug recipes in the treatment of abdominal infections are also reported by other peoples of Africa including Mali and Nigeria [16, 25, 26]. In addition, information received with traditional healers had revealed various origins and various abdominal infections. Indeed, it may be according to them, stomach ulcers or ulcer called internal wounds that could be digestive disorders or intestinal. It could also be a stomach ache after eating a food (gastroenteritis) or dysentery or diarrhea yet. In addition, we also found that in each case, drug recipes and dosages might be different from one informant to another and from one plant to another. Indeed, in the North Niéné, *Waltheria indica* was prescribed in the case of treatment of dysentery and diarrhea accompanied by acute mucus while *Anthocleista adjalonensis* is most often recommended in the treatment of acute gastroenteritis and painful menstruation.

About *Manilkara multinervis* and *Uvaria chamae*, these plants were proposed respectively in the treatment of ulcers and stomach aches. Similar results have been reported by several researchers who, through their work, gave virtually identical requirements to those proposed in the North Niéné [17, 27, 28].

Phytochemical screening

The two solvents used for extractions, ethanol 70% produced the highest yield with 13.349% against 10.281% observed with distilled water. These results suggested ethanol was the best solvent for the extraction of natural chemicals from plants. Such observations have been made during the extraction of *Morinda morindoides* Baker (Rubiaceae) [29, 30]. These results were also consistent with those obtained with *Annona senegalensis* Pers (Annonaceae) and *Pericopsis laxiflora* (Benth) [31, 32].

The phytochemical results on different extracts of plants studied were listed in Tables 2 and 3. Phytochemical screening highlighted that chemical compounds were variously present in different plant extracts studied. Indeed, whatever the extract, *Chasmanthera dependens* was the plant that contains less chemicals compared to *Anthocleista adjalonensis* and *Manilkara multinervis* which contained almost all of these chemicals. As for other plant species, they had chemical groups in relatively low and variable rates. In addition, there were a absence of quinones in different aqueous extracts of the plants tested except that of *Anthocleista adjalonensis*. In contrast, the presence of tannins, flavonoids, glycosides, saponins, and to a lesser degree of alkaloids was observed in most other extracts.

In general, when these chemicals were present, they were more abundant in the ethanolic extract that the aqueous extract. This means that the ethanol concentrated better active(s) principle (s) of plants than water. This observation is supported by several studies, including those of Moroh et al. [33] and Bagré et al. [29] showed that ethanol allowed a greater concentration of active ingredients of *Morindoides Morinda* (Baker) compared to water.

Tannins were been detected using an aqueous solution of 1% $FeCl_3$. The appearance of a blue-black coloration indicated the presence of tannoid series of gallic acid. The existence of real tannins was confirmed by the appearance of a green-black that could be seen in the presence of a darker color (blue-black). For this purpose, we performed the test to concentrated hydrochloric acid (specific tannins true) after which we observed the formation of a red precipitate. This allowed us to confirm the presence of real tannins series catechins.

Overall, the phytochemical screening revealed the presence of various chemicals such as tannins,

flavonoids, saponins, glycosides and alkaloids with antimicrobial properties those have been already proven by several research [34, 35, 36 , 37, 38, 39]. Thereby, the ethanolic extracts should therefore provide more effective microbicidal properties compared to aqueous extracts.

Moreover, through this study, we suggest that *Manilkara multinervis Anthocleista adjalonensis* could present more interesting antimicrobial activities than other plants subjected to study. In addition, the overall results of the phytochemical screening rationally would explain the popularity of traditional healers of North Niéné to use medicinal plants including *Uvaria chamae, Anthocleista adjalonensis, Waltheria Manilkara indica* or *multinervis* to treat abdominal infections. The results of biological studies will allow us to confirm or refute this assertion.

Table 2: Phytochemical screening of aqueous extracts

	Alk	Sapo	Flav	Tan	Quin	S T	Car G
C. sieberiana	-	+++	+	+	-	-	+
A. leiopcarpa	+	+++	++	+	-	+	+
S. virosa	-	-	+	+++	-	-	+
E. griseum	+	+	++	++	-	+	+
T. dodoneifolia	+	+++	+	+++	-	+	+
C. dependens	-	-	-	+	-	-	-
W. indica	+	++	+	+	-	-	++
U. chamae	-	++	++	++	-	-	+
M. multinervis	+	+	+	+	-	++	+
A. adjalonensis	+	++	+	++	+	+	++

Alk: Alkaloid, Sapo: Saponin; Flav: Flavonoid; Tan: Tannins, Quin: Quinone; S T: Sterol Terpene; Car G: cardiotonic glycoside

Table 3: Phytochemical screening of ethanolic extracts

	Alk	Sapo	Flav	Tan	Quin	S T	Car G
C. sieberiana	-	+++	+	+	-	-	+
A. leiopcarpa	+	+++	+++	+	+	+++	++
S. virosa	-	-	+	+++	-	-	+
E. griseum	+	+	++	++	-	++	+++
T. dodoneifolia	-	+++	+	+++	-	+++	++
C. dependens	-	-	-	+	+	-	-
W. indica	+	++	+	+	++	-	++
U. chamae	++	++	++	++	-	-	+++
M. multinervis	++	+	+	+	+	+++	++
A. adjalonensis	-	+++	+	+++	-	+	++

Alk: Alkaloid, Sapo: Saponin; Flav: Flavonoid; Tan: Tannins, Quin: Quinone; S T: Sterol Terpene; Car G: cardiotonic glycoside

CONCLUSION

The ethnopharmacological study coupled with phytochemical screening conducted in three (03) villages of North Niéné in the department of Kouto showed that *Uvaria chamae, Anthocleista adjalonensis, Waltheria Manilkara indica and multinervis* were best indicated for the treatment of abdominal infections among twenty-five (25) plant species identified. The phytochemical screening on extracts of these plants showed that they also contained different groups of chemical compounds that are the cause of their biological activities. The results of sorting biological allowed us to select one or them for our research.

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