

Ethnobotanical survey and preliminary chemical screening of 14 plants reputed antigastritis in Lubumbashi and surroundings (DR Congo)

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ABSTRACT

This study aimed to identify plants used in traditional medicine in Lubumbashi and its surroundings to treat gastritis and to carry out chemical screening of the most cited plants. During the survey, fourteen plants were identified as antigastritis. They belong to Anacardiaceae, Annonaceae, Apocynaceae, Bromeliaceae, Caricaceae, Cucurbitaceae, Fabaceae, Malvaceae, Musaceae, Phyllantaceae and Rubiaceae families. Antigastritis drugs are prepared by the maceration, the decoction, the infusion and the crushing and are administered orally. Traditional healers use roots, stems bark, leaves, fruits and flowers of plants species to treat gastritis. The chemical screening showed the presence of alkaloids, flavonoids, quinons and tannins in the plants studied. The next step of this study is to achieve antibacterial activity of the plants used.

Keywords : Gastritis, traditional medicine, phytochemical screening, survey.

1 INTRODUCTION

Gastritis, generally called "Stomach" is one of the most known diseases in Democratic Republic of the Congo (DR Congo) in general, and in Lubumbashi in particular, because of its prevalence and its chronic state [1], [2]. Most of patients suffering from it, prefer the traditional treatment to the modern one, justifying themselves by the fact that this one is not efficient for this pathology. Apart from that, the use of synthetic drugs like antacids or alkaline substances is often associated with a lot of problems such as availability, high cost and some important undesirable secondary effects [3], [4], [5].

Different studies realized in DR Congo, elsewhere in Africa, or through the world, confirm that more than 70% of the population use traditional medicine for some health troubles such as tuberculosis, malaria, epilepsy, insanity, fracture and gastritis [2], [3], [5], [6], [7]. Also, the potentials for new drugs development depend on screening, evaluation and documentation of herbal plants used for the treatment of diseases including gastritis [8], [9], [10].

This study aims to carry out an ethnobotanical survey on medicinal plants used for the treatment of gastritis in Lubumbashi, and to carry out a preliminary chemical screening in order to highlight the chemical groups, which could be responsible for this therapeutic property.

2 MATERIALS AND METHODS

2.1 Ethnobotanical survey

Using a guide questionnaire, a survey was conducted in the form of interviews with thirty-seven resource persons, from January to April 2020 in two townships of the town of Lubumbashi, namely Kenya and Lubumbashi. They were consulted on the basis of their reputations and experiences in herbal medicine. The information obtained from the interviewees provided information on the plants that treat gastritis such as the organs of the plant species used, the method of preparation and administration of the recipe as well as the vernacular names of the species.

2.2 Harvesting and identification of plant species

The selection of medicinal plants to study was carried out on the basis of the frequency of citation by traditional healers. In addition, the availability of plants was a determining factor.

The survey allowed getting information on fourteen reputable antigastritis plants from 37 traditional healers. The different plant species were collected in Kambikila, a village located about 10 km from Lubumbashi and others in the surroundings of the Lubumbashi city.

The identification of the plants was carried out by taxonomists from the Faculty of Agronomic Sciences of the University of Lubumbashi by comparing the herbaria formed with those of reference as well as by their vernacular names. During this ethnobotanical investigation, the vernacular name of the plant, the part used [Roots (**R**), stems bark (**SB**), leaves (**L**), fruits (**Fr**) and flowers (**Fl**)] to prepare the drug recipe, the preparation route and the administration route of traditional drugs were recorded [11], [12].

The various harvested organs were dried in the shade, avoiding direct sunlight and at room temperature. After that, samples were crushed into powder to increase the contact surface between vegetable drug and solvents or reactants used during the chemical screening.

2.3 Phytochemical screening

The detection of various groups of bioactive substances was based on the color and precipitation tests. The precipitation tests allowed to successively highlight the tannins and alkaloids, while the coloring tests of the extracts in solution allowed to highlight the flavonoids and quinones. Cyanogenic heterosides were detected by the change in color of the picrosodic paper [10], [11], [13], [14], [15], [16], [17], [18].

2.4 Slimy properties of crude extracts

Traditional healers have told that the extracts treating gastritis are those that are sticky or viscous. In order to verify this information, we have verified this characteristic on all available aqueous plant extracts.

3 RESULTS

3.1 Ethnobotanical survey

A total of 37 traditional medicine practitioners were interviewed and 14 plants were cited as the drug for the treatment of gastritis in Lubumbashi (Table 1).

Table 1. Ethnobotanical profile of plants used for the treatment of gastritis in Lubumbashi

Botanical Name (Family)	Vernacular Name	Part used	Preparation route	Administration route	Frequency of citation
<i>Acacia polyacantha</i> Wild. (Fabaceae)	Munga (Luba)	R	Decoction	Drinking	10
<i>Annona senegalensis</i> Pers. (Annonaceae)	Mulolo (Luba)	R, SB	Decoction	Drinking	11
<i>Ananas comosus</i> (L.) Merr. (Bromeliaceae)	Ananas (French)	Fr	Crushing, Maceration Infusion	Drinking	10
<i>Carica papaya</i> L. (Caricaceae)	Kipapayi (Luba, Swahili)	L, R	Decoction Maceration	Drinking	20
<i>Hibiscus esculentus</i> L. (Malvaceae)	Mulenda (Luba, Swahili)	Fr	Crushing, Maceration	Drinking	29
<i>Hibiscus rosa-sinensis</i> L. (Malvaceae)	Mulenda ya karibu na midi (Swahili)	L	Crushing, Maceration	Drinking	10

Table 1. Continued

Botanical Name (Family)	Vernacular Name	Part used	Preparation route	Administration route	Frequency of citation
<i>Baphia bequaertii</i> De Wild. (Fabaceae)	Tshitshihitshihi (Luba)	R	Decoction	Drinking	9
<i>Bobgounia madagascariensis</i> (Desv) J.H.Kirkbr. & Wiersema (Fabaceae)	Mpampi (Swahili)	R, SB	Maceration	Drinking	12
<i>Diplorhynchus condylocarpon</i> (Müll.Arg.) Pichon (Apocynaceae)	Mbubu (Luba)	R, SB	Decoction	Drinking	15
<i>Crossopteryx febrifuga</i> (Afz. Ex G. Don) Benth. (Rubiaceae)	Mutotshi (Luba)	R, SB	Decoction	Drinking	5
<i>Luffa cylindrica</i> Mill. (Cucurbitaceae)	Kikendambaya (Luba)	R, L	Maceration	Drinking	7
<i>Mangifera indica</i> L. (Anacardiaceae)	Manguier (French)	SB	Maceration	Drinking	8
<i>Musa acuminata</i> Dwarf Cavendish. (Musaceae)	Bananier (French)	Fr, Fl	Maceration	Drinking	3
<i>Phyllanthus muellerianus</i> (Kuntze) Exell. (Phyllantaceae)	Mulembalemba (Hemba)	R, L	Decoction	Drinking	25

Fourteen plant species reputed antigestitis are grouped into 11 families, including Anacardiaceae, Annonaceae, Apocynaceae, Bromeliaceae, Caricaceae, Cucurbitaceae, Fabaceae, Malvaceae, Musaceae, Phyllantaceae and Rubiaceae. The Fabaceae is the most widely represented family of species with three species. The Malvaceae family (2 species) follows. The other plant families are represented by a single species each.

Traditional healers use the roots, bark of stems, leaves, fruits and flowers to treat gastritis. The most common organ in the preparation of medicinal recipes is the root, followed by the stems bark.

Four modes are used in the preparation of drug recipes. These are the decoction, the crushing, the maceration and the infusion. The maceration is the most commonly used preparation route, followed by decoction. Concerning the administration route, all recipes regardless of the method of preparation, it is administered orally (Drink).

According to the frequency of citation, *Hibiscus esculentus* (29 times cited), *Phyllanthus muellerianus* (25 times cited) and *Carica papaya* (20 times cited) were the most plants cited in the preparation of anti-gastritis recipes.

3.2 Chemical screening

Taking into account the availability of plants, chemical screening was carried out only on 7 available plants out of the 14 plants provided during ethnobotanical survey.

For the chemical screening, two results are expected (Table 2), either the group of bioactive substances is present or highlighted [**Positive Result (+)**], or the group is not detected [**Negative Result (-)**]. For the stickiness of the extract, it can be slimy (s), or not slimy (ns).

Table 2. Phytochemical constituents of plants studied and the slimy characteristics of extracts

Plant	Organ	Alkaloid	Flavonoid	Quinon	Tannin	Hcn	Slimy
<i>Acacia polyacantha</i>	R	-	-	+	+	-	Ns
<i>Annona senegalensis</i>	R	+	+	+	+	-	Ns
<i>Bobgounia madagascariensis</i>	ET	-	+	-	+	-	Ns
	R	-	-	+	+	-	Ns
<i>Luffa cylindrica</i>	F	+	+	-	+	-	S
<i>Diplorhynchus condylocarpon</i>	ET	-	+	+	+	-	Ns
	R	-	+	+	+	-	Ns
<i>Hibiscus esculentus</i>	Fr	+	+	-	+	-	S
<i>Phyllanthys muellerianus</i>	F	-	+	-	+	-	Ns
	R	-	+	-	+	-	Ns

Hcn: cyanogenic heteroside

After the chemical screening, it appeared that the alkaloids were present in *Annona senegalensis* roots, in *Luffa cylindrica* leaves, and in *Hibiscus esculentus* fruits. Flavonoids were present in all organs studied except in the roots of *Acacia polyacantha* and *Bobgounia madagascariensis*. Quinones were identified in *Acacia polyacantha* roots, *Annona senegalensis* roots and *Bobgounia madagascariensis* roots as well as in the stems bark and roots of *Diplorhynchus condylocarpon*. In addition, tannins were present in all organs studied while cyanogenic heterosides were not identified.

While preparing the extracts it was found that only the aqueous extract of *Luffa cylindrica* leaves, and that of *Hibiscus esculentus* fruits exhibited a slimy characteristic.

4 DISCUSSION

Identified plant species belong to Anacardiaceae, Annonaceae, Apocynaceae, Bromeliaceae, Caricaceae, Cucurbitaceae, Fabaceae, Malvaceae, Musaceae, Phyllantaceae and Rubiaceae families. It emerges that the Fabaceae and the Malvaceae were the most families represented. The majority of ethnobotanical surveys carried out in Democratic Republic of Congo, particularly in the center, in the south and in the east of the country indicated that among the families most used in folk medicine, there are especially the Fabaceae, the Asteraceae and the Euphorbiaceae families [15], [16], [17] [19], [20], [21], [22], [23], [24], [25], [26].

Generally, in the preparation of drugs, roots, the bark stem and the leaves are mainly used because they are the most available organs for plants throughout the year [15], [16], [17] [19], [20], [21],

[22]. But fruits and flowers were rarely used because they are not available during certain times of the year.

This ethnobotanical survey has shown that four preparation routes of drugs were used by traditional healers (Maceration, decoction, infusion and grinding). The maceration, a preparation route in a cold solvent at defined time but the decoction is a hot preparation route. These two methods are the most used by traditional healers in the preparation of medicinal recipes against gastritis. From previous studies, it was observed that the decoction constitutes an ideal method for the preparation of medicinal recipes in folk medicine, because it allows detoxifying the recipe by evaporation of toxic substances [16], [17] [24]. It remains equally true that the rise in temperature during the decoction allows rapid extraction of the active ingredients in the herbal drug.

According to the method of administration, the oral route was recommended, since the passage of the active substance through the stomach is a good option for manifesting its effect. Indeed, the oral route is the easiest mode of drug administration in folk medicine [20], [21], [22], [23], [24]. In the case of gastritis, this would be justified by the direct contact to be favored between the active product and the affected organ, which is none other than the stomach.

For reasons of availability, seven plants, the most cited, were then selected and screened for phytochemical constituents. The chemical screening revealed that some of the studied plant species contain alkaloids, polyphenolic compounds, including flavonoids and tannins and quinons.

According to the most studies, the treatment of gastritis is based either on tampon effect by avoiding the change of the pH in stomach, or on antibacterial activity against *Helicobacter pylori*, for the pathology can be caused by acidity in stomach medium or by the presence of *Helicobacter pylori* or other bacteria species [6], [7]. Therefore, the plant extracts that treat gastritis must contain basic substances capable of neutralizing acidity, in particular alkaloids and polyphenolic compounds (Flavonoids and tannins). In this context, *Annona senegalensis*, *Hibiscus esculentus* and *Luffa cylindrica* could be the best plants species indicated in the treatment of gastritis, because some of their organs contain alkaloids and phenolic compounds, which have a potential to increase pH in stomach medium. However, if gastritis is due to the presence of bacteria, extracts containing antibacterial substances such as alkaloids, flavonoids and quinons could justify the use of these plants as medicinal ones [16], [26]. And, at a certain stage of the disease, the gastritis can lead to ulceration that can lead to stomach cancer. Then, plant species whose extracts contain tannins would also be indicated in this case, because tannins are known for their healing properties [27]. This property could be exploited in the treatment of gastritis because in some cases, the mucosa of stomach can be wounded.

Among the antigastritis plants, *Ananas comosus* has an acidic juice that can worsen hyperacidity. However, previous studies have shown that despite the presence of citric acid in pineapple juice, it is biochemically basic [28].

In-depth studies can be carried out on the antigastritis plants identified in the present survey to investigate their antiulcer potency, which could be a solution to the treatment of cancers of the stomach, colon, throat, and esophagus.

5 CONCLUSION

The present survey showed that traditional healers in Lubumbashi and its surroundings treat gastritis in addition to many other pathologies and symptoms. Thus, the rest of this study will be focused on the evaluation of the anti-*Helicobacter pylori* and anticancer activities of the extracts of plants listed.

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