Ethnobotanical survey of medicinal plants used to treat gastrointestinal parasites in human and livestock in four geographic areas of Burkina Faso (West Africa)

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ABSTRACT

In four (4) areas (Bobo-Dioulasso, Boni, Fada-N’Gourma and Pobé-Mengao) belonging to three (3) regions of Burkina Faso, a survey of medicinal plants used by traditional healers for treatment of gastrointestinal parasites in both human and animals has been carried out from 2005 to 2006. Interview approach was used to document indigenous knowledge and uses of plant species as remedies. A total of 58 traditional healers constituted of 79.3% by men and 20.7% by women were interviewed for their knowledge on the use of plants for the treatment of gastrointestinal (GI) parasites. 12, 16, 18 and 12 respondents were met respectively at Bobo-Dioulasso, Boni, FadaN’Gourma and Pobé-Mengao. Twenty five (25) plants used in both humans and animals have been reported. 36% of these plants are commonly used in all the 4 study sites for the treatment of gastrointestinal parasites. Results obtained showed that Cassia sieberiana, Anogeissus leocarpus, Daniellia oliveri, Balanites aegyptiaca, Sabasenegalensis, Securidaca longepetulata, Senna alata and Accassianilotica var. adansonii were the most cited plants. Cassia sieberiana, Balanites aegyptiaca, Daniellia oliveri, Zizyphus mucronata and Accassianilotica var. adansonii were the most used plants for animals. Leaves and root bark were the main plant parts used when decoction was the main mode of preparation of the remedies.

Key words: Medicinal plants, gastrointestinal parasites, traditional healers, Burkina Faso.

INTRODUCTION

Intestinal parasites affect more than 1 billion people and are the cause of 155000 deaths annually. These diseases are in general widespread in tropical regions and their high frequency represents more than 40% of tropical health problems excluding malaria [1]. Both in human and animals, they are the causes of high mortality and reduced productivity, in particular in developing countries where hygiene and sanitary conditions are poor.

In human, helmintiasis is a major constraint to productivity, manpower and working capacity of adults; it also reduce growth and mental development of children leading to increased poverty[2]. In animals, parasites constitute a major problem. For example in Nigeria, small ruminant’s productivity losses due to parasites were estimated above at least 9 billion CFA annually [3]. In Burkina Faso where small ruminants holding contributes to improve the living conditions of rural populations, the occurrence of helmintiasis is very high and close to 100% of the herd during the rainy season [4][5][6]. Then, this infection rate is a major obstruction to the productivity of the livestock sector. In human, a study conducted by Cissé[7] among public health centres of Burkina Faso revealed a global prevalence of gastrointestinal parasites infections of 54.7%.
Unfortunately, rural populations have limited access to health services and to antiparasitic substances used for GI parasites control, due to poverty. On another hand, most of the existing drugs produce side effects such as abdominal pain, loss of appetite, nausea, vomiting, head ache and diarrhea[8]. Thus, they use traditional medicine and pharmacopoeia without any side effects[9] as alternative to modern drugs supply for their care. Numerous plants are used as remedies with antiparasitic properties both in human and animals [10][11][12].

In this study, a survey was performed with the aim to carry out an inventory of natural plants used for preparation of remedies against GI parasites by the healers in four (04) areas within 3 regions of Burkina Faso.

MATERIALS AND METHODS

-The study sites
The survey was carried out from May 2005 to January 2006 in the 4 towns and their surroundings within 3 regions of Burkina Faso: Bobo-Dioulasso and Boni in the Hauts - Bassins Region,(wet to sub-humid climate), Pobe-Mengao (Sahel Region, dry and harsh areas) and FadaN’Gourma (East Region, sudanian climate) (figure 1).

Figure 1Maps showing the location of Burkina Faso in the West Africa region (upper part) and the geographical location of the 4 study sites in Burkina Faso where the surveys were conducted (lower part)

The Hauts Bassins region is located in the west of the country. It covers 25 479 Km² and has 1 352 781 inhabitants. The climate is of tropical north-sudanian and tropical south sudanian type. The region is marked by 2 main seasons: a rainy season from May to October and a dry season from November to April. The main economic activities are agriculture, livestock holding, handcraft and tourism[13].
Located in the north of the country, Sahel Region covers 36 166 km² and has 912796 inhabitants. The climate is of sahelian and Sudan – sahelian type. The dry season is about 9 months (from October to June) and the temperatures reach 43°C and above. The rainy season is about 3 months (from July to September). The main activities of the populations are agriculture, livestock holding and handcraft[14].

The East Region is located in the East part and covers 46 694 km² with a total population estimated at 1 137 744 inhabitants. The climate is the south - sudanian type. The dry season is about 7 months (from October to April) and the rainy season is about 5 months (from May to September). Agriculture and livestock holding (21.8% of the national livestock) are the main activities in this region[15].

Field survey
Surveys were conducted to collect information from traditional healers in the 4 sites. A structured questionnaire was used. Collected information carried on data on the farmer's profile, the plants used to treat GI parasites, the parts used and the mode of preparation and application of the remedies. In addition, the healers were asked about their general understanding of the clinical signs associated with gastrointestinal (GI) parasites infections.

In each area, traditional healers are organised in associations. A group meeting was arranged where the healers were informed about the background and the purpose of the study in their local language with the help of interpreters. After, the healers who agreed to respond to the questions were met individually in their home and then interviews were conducted with them.

A field work was organised and the plants cited during the interview were collected with the aid of informants and identified first on the field of collection. This determination was later confirmed at the herbarium of the “Centre National de la Recherche Scientifique et Technologique (CNRST)” where vouchers are deposited.

All data obtained from this study were subjected to simple descriptive statistics calculating frequency counts and percentages. A frequency (F) of citation of the plants was calculated by using the formula:

\[ F = \left( \frac{\text{Number of healers who cited the plant}}{\text{total number of the healers interviewed}} \right) \times 100 \]

RESULTS

- Farmer’s profile
In the survey, 58 persons have been met; with a repartition of 12, 16, 18 and 12 respondents at Bobo-Dioulasso, Boni, FadaN’Gourma and Pobé-Mengao respectively. There were a large number of men (79.3%, n = 46) compared to women (20.7%, n = 12). The respondents were 45 - 65 years old. The main activities of the healers were agriculture (48.27%, n = 28), livestock holding (29.3%, n = 17), home women (20.7%, n = 12). One person (1.7%) was a retired paramedic.

- Clinical signs
The major clinical signs the healers considered as related to GI parasites infections in humans where stomach ache, ocular observations of worms like guinea worm and/or presence of tapeworm segments in the faeces as well as the presence of blood in the faeces and/or diarrhoea. In livestock, the respondents considered as major clinical signs of GI parasites infections when the animal did not graze and/or have diarrhoea.

- Plants used
Cumulatively, twenty five (25) medicinal plants of eleven (11) families were used in the 4 sites for the treatment of GI parasitosis in human and/or in livestock. The most cited plant (43.10%) was Cassia sieberiana D.C. (CAESALPINIACEAE). The parts used, the indications, the preparation and application of the plants products and the frequency of citation of the plants during the survey are summarized in table 1.
### Table 1: Plants used for the treatment of gastrointestinal parasites in the 4 study sites in Burkina Faso.

<table>
<thead>
<tr>
<th>Name / family</th>
<th>Voucher N°</th>
<th>Parts used</th>
<th>Indications</th>
<th>Mode of preparation / Application</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accassianilotica var. adansonii (Guill. et Perrott.) O. Ktze / MIMOSACEAE</td>
<td>HNBU000210 F, Sb</td>
<td>Intestinal worms, Diarrhoea, dysentery (in human and livestock)</td>
<td>Decoction of stem bark (human), Dried fruit powder (livestock) / oral</td>
<td>20.69</td>
<td></td>
</tr>
<tr>
<td>Adansonia digitata Lam. / BOMBACACEAE</td>
<td>HNBU00169 Sh</td>
<td>Guineaworm</td>
<td>Burn the plant part / apply locally on the painful site</td>
<td>05.17</td>
<td></td>
</tr>
<tr>
<td>Annona senegalensis Pers. / ANNONACEAE</td>
<td>HNBU00168 Rb</td>
<td>Dysentery, Intestinal worms</td>
<td>Maceration / oral</td>
<td>06.89</td>
<td></td>
</tr>
<tr>
<td>Anogeissus leocarpus D.C. Guill. et Perrott. / COMBRETACEAE</td>
<td>HNBU00185 L, F, Sb</td>
<td>Tapeworms, Guineaworm</td>
<td>Decoction; burn and apply the charcoal powder (Guinea worm) / oral, local application</td>
<td>39.65</td>
<td></td>
</tr>
<tr>
<td>Balanites aegyptiaca (L.) Del./ BALANITACEAE</td>
<td>HNBU00165 Rb, S</td>
<td>Intestinal worms in human and livestock, -fever in livestock</td>
<td>-Mix the seed powder with millet powder / oral -Maceration or decoction of Rb or S/oral</td>
<td>24.13</td>
<td></td>
</tr>
<tr>
<td>Capparis eriocarpa Lam. / CAPPARIDACEAE</td>
<td>HNBU00663 Sb</td>
<td>Guinea worm</td>
<td>Burn and reduce in powder / apply the charcoal on the painful site</td>
<td>03.44</td>
<td></td>
</tr>
<tr>
<td>Cavaia sieberiana D.C. / CAESALPINIACEAE</td>
<td>HNBU00179 Rb</td>
<td>Dysentery, intestinal worms in human and livestock</td>
<td>Maceration / oral</td>
<td>45.10</td>
<td></td>
</tr>
<tr>
<td>Combretum africarum Lept. / COMBRETACEAE</td>
<td>HNBU00188 L, Rb</td>
<td>Diarrhoea</td>
<td>Maceration / oral</td>
<td>39.65</td>
<td></td>
</tr>
<tr>
<td>Danellia pseudocarpus (Rolfe) Hutch et Dalz / CAESALPINIACEAE</td>
<td>HNBU00610 Sb, L</td>
<td>Dysentery, gastroenteritis, intestinal worms in human and livestock</td>
<td>Decoction / oral</td>
<td>29.31</td>
<td></td>
</tr>
<tr>
<td>Detarium microcarpum G. et Perr. / CAESALPINIACEAE</td>
<td>HNBU00340 Sb</td>
<td>Dysentery</td>
<td>Decoction / oral</td>
<td>06.89</td>
<td></td>
</tr>
<tr>
<td>Diospyros mespiliformis Hochst. / Ebenaceae</td>
<td>HNBU00969 L</td>
<td>Dysentery</td>
<td>Maceration / oral</td>
<td>03.44</td>
<td></td>
</tr>
<tr>
<td>Feretia apondanthera Del. / RUBIACEAE</td>
<td>HNBU02176 Rb, L</td>
<td>Stomach ache, dysentery</td>
<td>Maceration / oral</td>
<td>03.44</td>
<td></td>
</tr>
<tr>
<td>Guiera senegalensis J.F Gmel. / COMBRETACEAE</td>
<td>HNBU00252 L</td>
<td>Stomach ache, dysentery</td>
<td>Decoction / oral; chew the leaves and swallow the juice</td>
<td>17.24</td>
<td></td>
</tr>
<tr>
<td>Korva senegalensis J.F Gmel. / MELIACEAE</td>
<td>HNBU00295 L</td>
<td>Intestinal worms</td>
<td>Maceration / oral</td>
<td>06.89</td>
<td></td>
</tr>
<tr>
<td>Lannea acida A. Rich. / ANACARDIACEAE</td>
<td>HNBU00139 Rb</td>
<td>Dysentery</td>
<td>Decoction / oral</td>
<td>01.72</td>
<td></td>
</tr>
<tr>
<td>Lannea mucronata Engl. et K. Krause. / ANACARDIACEAE</td>
<td>HNBU00141 Rb</td>
<td>Dysentery, venem detoxifying</td>
<td>Maceration / oral</td>
<td>06.89</td>
<td></td>
</tr>
<tr>
<td>Leptadenia hastata (Pers.) Decne. / ASCLEPIADACEAE</td>
<td>HNBU00403 Rb</td>
<td>Stomach ache</td>
<td>Decoction / oral</td>
<td>01.72</td>
<td></td>
</tr>
<tr>
<td>Pipturus africanus (G. et Perr.) Taub. / MIMOSACEAE</td>
<td>HNBU00199 Sh</td>
<td>Dysentery</td>
<td>Decoction / oral</td>
<td>01.72</td>
<td></td>
</tr>
<tr>
<td>Pterocarpus sericeus Poir. / PAPILIONACEAE</td>
<td>HNBU00284 Sb</td>
<td>Diarrhoea, intestinal worms</td>
<td>Decoction / oral</td>
<td>01.72</td>
<td></td>
</tr>
<tr>
<td>Sapindus grahamii Hochst. / Apocynaceae</td>
<td>HNBU00223 L</td>
<td>Stomach ache, dysentery</td>
<td>Decoction / oral</td>
<td>24.13</td>
<td></td>
</tr>
<tr>
<td>Securidaca longepedonculata Fress. / POLYGALACEAE</td>
<td>HNBU00299 Rb</td>
<td>Guineaworm, intestinal worms</td>
<td>Decoction / oral</td>
<td>10.34</td>
<td></td>
</tr>
<tr>
<td>Senna alata (L.) Roxb. / CAESALPINIOIDEAE</td>
<td>HNBU00176 Sh</td>
<td>Intestinal worms, malaria</td>
<td>Decoction / oral</td>
<td>20.69</td>
<td></td>
</tr>
<tr>
<td>Ximenia americana Linn. / OLACACEAE</td>
<td>HNBU00178 Rb</td>
<td>Dysentery</td>
<td>Decoction / oral</td>
<td>05.17</td>
<td></td>
</tr>
<tr>
<td>Zizyphus mucronata Willd. / RHAMNACEAE</td>
<td>HNBU02139 Rb</td>
<td>Stomach ache in livestock</td>
<td>Maceration / oral</td>
<td>03.44</td>
<td></td>
</tr>
</tbody>
</table>

F = fruits, L= leaves, Rb = roots bark, S = seeds, Sh = stem bark.
Most of the plants are used separately. The plants parts widely used by the healers are the roots and leaves (45.45%). Decoctions with water are the predominant modes of preparation of the plants products (72.7%) and the oral route is used as the main administration way (90.9%). The dosage of a remedy depends on the age of the patient and was 60 -1000 g /l for adults. In general, children have small quantities (30 -250 g/ l). No interdicts was said to be required during the treatment.

DISCUSSION

Most of the interviewed healers were men. Generally, they use their knowledge on medicinal plants to help the community by selling their products to the patients. The few women interviewed in this survey were also organized in associations. The major signs considered as being due to GI parasites infections were stomach-ache, diarrhoea, the presence of the worms and blood in the faeces. 36% (n = 9) of the plants reported are widely known and commonly used in all the 4 sites for the treatment of GI parasitism.

In the study, there were various methods of preparation and application for the different types of remedies identified. Also, various preparations forms were observed like infusion, maceration, decoction, fresh application, powdering, chewing. However, there were few consistencies in the parts used, the indications and the mode of preparation of the plants products from a site to each other. For example, the seeds of *Balanites aegyptiaca* are used at Bobo-Dioulasso and Boni against intestinal worms while, for the same purpose the decoction and the macerate of the root bark is used at Fada-N’Gourma and Pobé-Mengao, respectively.

Only *Cassia sieberiana* roots bark were prepared the same way and used for the same indications in the 4 sites. Additionally, only *Sapium grahama* was used in both Bobo-Dioulasso and Boni for the same specific indication. The plants parts were used separately but sometime, traditional healers also used some ingredients such as milk to prepare the remedies. Thus, *Acassianilotica* product could be added to milk when *Senna alata* should be mixed in *Tamarindus indica* juice.

Among the plants we reported, *Anogeissus leiocarpus*, *Annona senegalensis*, *Balanites aegyptiaca* are known in the literature to be effective against helminthiasis[3][10][12][16]. *Securidacula longepedonculata*is used against diarrhoea, dysentery, intestinal worms, and malaria. The leaves decoction of this plant is used as a detoxifying of snake bites[17] while the leaves extracts of *Senna alata* is used in Côte d’Ivoire to treat bacterial infections related to *E. coli* and *C. albicans*[18]. The trunk bark decoction of *Daniellia oliveri* is used against skin diseases. This plant is also indicated for the treatment of human and ruminant’s gastrointestinal worms and as anthelmintic [11][12]. *Guiera senegalensis* has been known to have antitrypanosomiasis properties and used as venom detoxifying. When burnt in animal house, the dried leaves of this plant elicited insecticide properties [19]. *Cassia sieberiana* is used for abdominal pains, guinea fowl pest and dewormer and laxative [17]. *Sabal senegalensis* seeds are used against stomach aches, dysentery, diarrhoea and food intoxications. *Sapium grahama* is known to be very toxic. A decoction of the whole plant is used as a bath to treat skin affections andedema, and is taken internally to treat skin affections, including leprosy and ascites. An extract of the pounded leaves is applied to guinea worm sores or a few drops of the latex are applied to the sore to help to extract the parasite.

This survey underlines that 25 plants species were used to treat GI parasites infections and the symptoms that might be related to GI parasites. Therefore, there is a realistic potential that these plants would contain compounds with antiparasitic potency. In our present study, the results reported are preliminary findings. For the improvement and promotion of the local traditional knowledge using medicinal plants against GI parasites, there is the need to investigate the phytochemical, pharmacological and toxicological profile of the plants used in order to ensure their efficacy as well as their safety. Specially, anthelmintic trials should be carried out to assess the efficacy of the inventoried plants on GI parasites.

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