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Research Paper

Ethnopharmacological surveys and pharmacological studies of plants used in traditional medicine in the treatment of HIV/AIDS opportunistic diseases in Gabon

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ABSTRACT

Ethnopharmacological relevance: Ethnopharmacological surveys were conducted in two regions of Gabon. This led to highlighting some of the medicinal plants used by local populations in the management of HIV/AIDS opportunistic diseases. Two regions with the highest occurrence of HIV/AIDS cases were visited and ethnopharmarcological data was gathered. These regions were the Estuaire Province (Libreville and its neighborhood) and the Haut-Ogooué Province (Franceville and its neighborhood). The opportunistic diseases and symptomatic conditions considered during this study were: diarrhea, respiratory tract infections, cough, tuberculosis, abscesses, stomach ache, skin rashes, venereal diseases, typhoid fever, anemia, general tiredness, hepatitis and vomiting.

Materials and methods: The reported species were evaluated through three parameters: specificity, reliability and frequency. Plant parts of relevant species were harvested and extracted with an aqueous alcohol solution (ethanol/water: 1/1). The extracts obtained were submitted to phytochemical screening and *in vitro* microbiological assays on some clinical isolates and ATCC strains, involved in HIV/AIDS opportunistic diseases through the Agar well diffusion and Microbroth dilution methods.

Results: Among the 52 species identified during this survey, *Coelocaryon klainei* Pierre ex Heckel (Myristicaceae), *Dacryodes klaineana* (Pierre) H.J. Lam (Bursecaceae), *Phyllanthus diandrus* Pax (Euphorbiaceae), *Saccoglotys gabonensis* (Baill.) Urb. (Humiriaceae) and *Tetrorchidium didymostemon* (Baill.) Pax & K. Hoffm. (Euphorbiaceae) were submitted to *in vitro* microbiological assays. *Phyllanthus diandrus* bark and leaves show best antibacterial activities against *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* with MIC value of 0.25 respectively. Phytochemical screening revealed the presence in all the plant parts extracts of potentially bioactive molecules, including polyphenols, especially flavonoids and tannins.

Conclusion: It is concluded that some of these plants might be submitted to further scientific studies, including the identification and isolation of bioactive principles, that could be developed to drugs for the treatment of HIV/AIDS opportunistic diseases.

1. Introduction

The tropical forest in general, and the gabonese forest in particular, constitutes not only a key element in the fight against global warming, but, also an unvaluable source of species used in food and in the treatment of several diseases.

The rainforest covers 85% of the Gabon territory, and still today, about 70% of the gabonese population, most of which living below

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the poverty threshold, depend either partially or entirely on traditional medicines for the management of various diseases including HIV/AIDS. HIV/AIDS is one of the most prevalent infections in Gabon, with a national prevalence of 5.3% (approximately 82,466 people among 1,556,000 for the whole country), which constitutes the highest level in the Central African region (WHO, 2009). The high spread combined with the poor management of HIV/AIDS in Gabon can be considered as an obstacle in the fight against poverty and underdevelopment since the majority of infected people are among the economically active population (15–45 years old) (UNAIDS, 2006, 2008). However today, in spite of the decrease of HIV prevalence in Gabon, among an estimated 24,000 people who need antiretroviral therapy, only 67% of them are said to get access to the treatment (UNAIDS, 2013).

The factors involved are certainly limited accessibility for the majority of AIDS patients to antiretroviral therapy and the appearance of opportunistic diseases or infections caused by the acquired immune deficiency (Hodgson and Rachanis, 2002). These infections are the leading cause of the death of AIDS patients in Gabon and in the world (NIMR, 2004; UNAIDS, 2006). It should be important to know that these infections are particularly frequent in patients with HIV/AIDS, because a study conducted at a hospital in Libreville, by Okome-Nkoumou et al. (2006), showed that opportunistic infections due to HIV/AIDS in terms of prevalence were: prurigo (100%), cerebral toxoplasmosis (100%), oral candidiasis (88%), bacteremia (87.8%), shingles (84.6%), minor salmonellosis (72%), tuberculosis (53%), typhoid (29.4%), pneumonia (28%), bacterial meningitis (26.3%), hepatitis B (20%), and malaria (14%).

In fact, the spread of poverty, the expensive cost of medicines, the bacterial resistance to conventional drugs and the side effects of antiretroviral therapy lead most HIV/AIDS patients in Gabon to consult traditional healers whose merits in the treatment of HIV/AIDS opportunistic diseases by herbal medicines is particularly defended by a greater part of them. In Gabon, to date, no study based on the plants used in traditional medicine to treat HIV/AIDS opportunistic diseases has yet been carried out. On the other hand, in Tanzania, a study on the management of HIV/AIDS patients by traditional medicine, demonstrated the relevance of herbal therapies in the treatment of HIV/AIDS opportunistic diseases (Kisangau et al., 2007).

This work was carried out with the aim of providing scientific data with regards to these therapies, and to offer to science and pharmaceutical industries, active molecules against microbial strains responsible of HIV/AIDS opportunistic infections. This preliminary work included an ethnopharmacological survey, the harvest of plant organs, the phytochemical screening of plant extracts and *in vitro* microbiological testing.

2. Materials and methods

2.1. The study area

Estuaire province is one of the nine provinces of the Republic of Gabon (Fig. 1). It is a flat terrain zone that borders Equatorial Guinea Republic to the North, Woleu-Ntem province to the North East, Moyen-Ogooué province to the South East, Ogooué-Maritime province to the South and the Atlantic Ocean to the west. This province is the most popular of Gabon and it includes the capital of the country Libreville, the most popular town of Gabon, with about 493,351 inhabitants in 2012, among 1,556,000 inhabitants of the whole country (MHUESD, 2011; UNDESA, 2012). It is an important industrial and port zone, and a very cosmopolitan area with the highest concentration of AIDS patients in Gabon, who generally consult surrounding traditional healers.

Haut-Ogooué province is located at the South East of Gabon. It borders Ogooué-Ivindo province to the North, Congo-Brazza Republic to the East and the South, and Ogooué-Lolo province to the West. It is a mountainous zone at altitude that varies between 400 and 600 m over the sea level. The capital of the Haut-Ogooué province is Franceville, one of the most populous towns of Gabon, with about 39.096 inhabitants (MHUESD, 2011; UNDESA, 2012). In addition to manganese exploitation, agriculture is one of the economic mainstays of the province and the main crops are coffee, cocoa, bananas, cassava, yams and other food-producing products. The region is occupied by many tribes, among whom the Pygmies, who have the reputation of being very efficient in traditional medicine, and so, they are frequently consulted by citizens, among whom, people living with HIV/AIDS.

2.2. Ethnopharmacological surveys

Ethnopharmacological surveys were carried out in four localities in the Estuaire Province (Northwest Gabon) and four localities in the Haut-Ogooué Province (Southeastern Gabon) from November 2009 to June 2010.

In each province, a pre-established questionnaire was used to collect field information from traditional healers and people with declared knowledge on medicinal plants. The interviewees were identified with the assistance of traditional rulers, and local administrative officers. The questions focused essentially on the local names of the plants, parts used, preparation, harvest modalities, administration, disease condition treated age and the education level of the informant.

During investigations, symptoms of various HIV/AIDS opportunistic diseases/infections were described to practitioners, in order to enable them provide species they used to treat the considered disease (Kisangau et al., 2007; CDC, 2013). In fact, at the beginning of our study, we knew that it would be difficult for traditional healers to distinguish diseases, since many diseases share similar symptoms. In order to avoid the difficulty, we just asked the practitioners to identify symptoms of ailments they were treating, giving us the opportunity to identify and name the possible disease.

The opportunistic diseases considered during this study were hepatitis, respiratory tract infections, tuberculosis and venereal diseases. Other symptomatic but undefined conditions included anemia-general tiredness, abscess, diarrhea, skin rashes, stomach ache, typhoid fever and vomiting.

A sample of each plant species cited in the survey was collected, and identified either on site or sent for identification at the National Herbarium of Gabon at Libreville. A specimen of each species was kept in the Scientific and Technical University of Masuku, Franceville, Gabon. Samples were collected with pruning shears, labeled and transported in plastic bags.

To analyze the ethnobotanical importance of the reported plant species, coherence and convergence method was used including three parameters as described by Ben Haj Jilani et al. (2007) and adjusted to our study. This helped in the classification of species according to their potential importance, and the selection of the most interesting that would undergo more relevant scientific studies.

In the first screening, criteria based on the absolute number of citations was considered. Thus, those mentioned several times, at least by five informants were identified and selected.

In a second screening, the degree of specificity of plants for a disease was considered. Thus, during this second screening, only the species mentioned by at least three different informants for the same disease were selected for the next stage (Ben Haj Jilani et al., 2007).

At the end, the selection of the most relevant species was done in terms of specificity for the disease, reliability and frequency, because the value of a drug is due to its specific efficiency on a