RESEARCH ARTICLE - ETHNOPHARMACOLOGY

Treating Asthma with Medicinal Plants. An ethnomedicinal Case Study from Baré-Bakem, Nkongsamba Region, Cameroon

Emmanuel Noumi
Plant Laboratory, Higher Teachers Training College, University of Yaoundé I, P.O. Box 47 Yaoundé, Cameroon. E-mail: noumikap@yahoo.fr

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Abstract. This paper provides an account of 29 plants from 24 different families used by the Mbo community of Nkongsamba, Cameroon, as traditional herbal medicines in the treatment of asthma. Many of the plant species that are claimed to be remedies against asthma by the population are highly effective when compared with the published literature on ethnomedicine or on pharmacology in different regions of Africa. Two of these species (Cannabis sativa L. and Datura metel L.) are dangerous in case of overdose, and another one (Persea Americana Mill.) is contra-indicated for pregnant women.

Keywords: Ethnobotany; Anti-asthmatic plants; Nkongsamba; Cameroon.

Introduction
The people of Baré-Bakem, in the region of Nkongsamba (Cameroon), consider asthma as a reversible obstruction of the respiratory tract due to hyper-secretion of mucus by the windpipe and the bronchial tubes that react to various stimuli. They call it “Wetol”. These different symptoms correspond to criteria of clinical signs (Barnes et al., 1988; Le Garnier-Delamare, 1995). Ethnobotanical studies have reported anti-asthmatic plant species in Africa (Kerharo et al., 1974; Fortin et al., 1997). However, no such work has been done in Cameroon. Nowadays there are many conventional drugs to calm asthmatic attack, and to cure the disease. Many asthma patients are doomed to resort to traditional medicine because of poverty. Thus, the traditional healers have found in the vegetation the plants to treat asthma.

The objectives of this paper are therefore to provide information on plant species and recipes used in the treatment of asthma, as practiced in the Nkongsamba region, and to evaluate the degree of phytotherapeutic exploitation on asthma in the study area.

Study Area
Nkongsamba is located 125 km from Douala, the economic capital of Cameroon, and belongs to the Mungo Division (Littoral Province), between 4°40′-5° N latitude and 9°55′-10° E longitude. It experiences an equatorial climate with a long rainy season (February-November), a short dry season (December-January), and a moderate temperature (22.4 °C) due to its altitude (877 m) and its mountainous surroundings (Koupe, 2050 m; Lonako, 1825 m and Manengouba, 2396 m). As a result, the weather is usually cool, especially in the morning. Baré-Bakem is part of the region of Nkongsamba. The bulk of the Nkongsamba population is basically made up of the native Mbo and the immigrant Bamileke tribes. The population, estimated to some 6,000 inhabitants (2004 estimate), is quite
representative of the total population of Cameroon. Nkongsamba is a mountainous agricultural region. Asthma is linked to the environment, and very often the patients ignore it. Using cigarettes to brave the morning cool and fog, pesticides and fertilizers in farming as well as the pollen from plants and the dust, is a factor that contributes to the high prevalence of the asthma disease.

Methodology
The study was carried out from 2004 to 2006, and covered both the urban and rural zones of Nkongsamba. Several field trips were organized to administer questionnaires and interviews to traditional healers and patients. The questions were designed to obtain information on their knowledge of asthma, the plants used in treating the disease, the method of preparation and the type of administration. Only the recipes that were cited by at least 3 different informants were retained in the study. These plants were thus collected, dried and identified by the author and authenticated by the personnel of the National Herbarium of Cameroon (YA), Ministry of Scientific and Technical Researches, Yaoundé, Cameroon. The voucher specimens were kept in the Plant Biology Laboratory of the Higher Teachers’ Training College of the University of Yaoundé I.

The degree of physiotherapeutic exploitation was determined by evaluating the number of medicinal plants used in the treatment of asthma. Hence, the Exploitation Index (EI) was calculated using the formula EI = %Pm x AMP, where “% Pm” is the percentage of plants in relation to the total national plants that are being used for medicinal preparations; AMP is the average number of medicinal preparation per plant (Bruni et al., 1997).

Results
Anti-asthmatic plants and recipes
The plants identified were listed in alphabetical order (Table 1). Each entry provided the following information in sequence: botanical name/ family/ local name(s) [voucher specimen number]; and if need be, part of the plant used. The recipe number and the percentage of quotations of the plant with respect to the total quotations are in Table 1. The mode of use and possible duration of treatment are in column 3. The 29 plant species identified are used in 25 preparations, and the AMP = 0.86 (Table 1)

Quantitative data on anti-asthmatic plants
The degree of anti-asthmatic phytotherapeutic knowledge in Nkongsamba showed that the average number of quotations per informant (1.93), the average number of preparations per plant (0.86) and the value of therapeutic uses per plant (1.16)
Table 1: Classification of the anti-asthmatic recipes of the Nkongsamba region. (a) The values in parenthesis are percentages of quotations of the recipes by informants.

<table>
<thead>
<tr>
<th>Recipes Number</th>
<th>Plant species family/local Name (Voucher specimen number)</th>
<th>Instructions for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(4.41)</td>
<td><em>Abrus precatorius</em> L./<em>Fabaceae</em>/Esum ewolo [Noumi 823]</td>
<td>1 handful of leaves boiled in 1 L of water for 15 min. and cooled, then, half a glassful is drunk thrice a day during 2 weeks</td>
</tr>
<tr>
<td>2(2.76)</td>
<td><em>Annona muricata</em> L./<em>Annonaceae</em>/Sawa-sop [Noumi 815]</td>
<td>60 leaves infused in 1 glassful of hot water for 1 h, then, half a glassful is drunk twice a day, for 1 week, in the event of attacks/crises.</td>
</tr>
<tr>
<td>3(2.20)</td>
<td><em>Adansonia digitata</em> L./<em>Bombacaceae</em>/Emong [Noumi 814]</td>
<td>5 handfuls of dry leaves boiled in 20 L of water for 15 min, and the steam is deeply inhaled with the mouth wide-open.</td>
</tr>
<tr>
<td>4(3.31)</td>
<td><em>Boerhavia repens</em> L./<em>Nyctaginaceae</em>/Djanchele [Noumi 846]</td>
<td>60 leaves macerated in 2 L of water for 1 h, and half a glassful is drunk twice a day during 1 week.</td>
</tr>
<tr>
<td>5(3.31)</td>
<td><em>Datura metel</em> L./<em>Solanaceae</em>/Ndu saboe [Noumi 817]</td>
<td>2 handfuls of leaves are collected at the beginning of flowering are dried and infused in 1 L of hot water and filtered, then, one glassful shall be taken during 1 week.</td>
</tr>
<tr>
<td>6(8.28)</td>
<td><em>Euphorbia hirta</em> L./<em>Euphobiaceae</em>/Ntchutchu, Okulbifeg [Noumi 826]</td>
<td>2 handfuls of whole plant boiled in 2 L of water, for 15 min, cooled and drunk: 1 glassful twice a day during 2 weeks.</td>
</tr>
<tr>
<td>7(6.62)</td>
<td><em>Eucalyptus saligna</em> Smith/Myrtaceae/Ecleptus, Kapté [Noumi 813]</td>
<td>4 handfuls of leaves boiled in 3 L of water for 10 min, and a hot compress of the decoction is applied using a towel, on the thoracic cage, twice a day during 1 week.</td>
</tr>
<tr>
<td>8(2.76)</td>
<td><em>Gardenia ternifolia</em> Schum. &amp; Thomn./<em>Rubiaceae</em>/Nackack [Noumi 830]</td>
<td>10 fruits boiled in 2 L of water for 15 min and cooled, then half a glassful is drunk 2 times a day during 10 days.</td>
</tr>
<tr>
<td>9(2.76)</td>
<td><em>Kigelia africana</em> (Lam.) Benth./<em>Bignoniaceae</em>/Nackack [Noumi].</td>
<td>500 gm of stembark are boiled in 2 L of water for 15 min, then half a glassful is drunk twice a day for 2 weeks.</td>
</tr>
<tr>
<td>10(3.86)</td>
<td><em>Lantana camara</em> L./<em>Verbenaceae</em>/Assona kutchu [Noumi 818].</td>
<td>500 gm of flowers macerated in 1 L of water, then half a glassful is drunk daily during 15 days.</td>
</tr>
<tr>
<td>11(4.97)</td>
<td><em>Mangifera indica</em> L./<em>Anacardiaceae</em>/Mangolo [Noumi 822].</td>
<td>500 gm of stembark boiled in 2 L of water during 15 min, then, the patient shall drink a glassful twice a day during 1 week to subside crises, and during 3 months to be treated.</td>
</tr>
<tr>
<td>12(3.31)</td>
<td><em>Nicotiana tabacum</em> L./<em>Solanaceae</em>/Taku [Noumi 840].</td>
<td>2 leaves are infused in 2 L of water. Dosis: a) Child: half a glassful twice a day for 1 week; b) Adult: 1 glassful twice a day for 1 week.</td>
</tr>
<tr>
<td>13(4.41)</td>
<td><em>Ocimum basilicum</em> L./<em>Lamiaceae</em>/Mesib, Ossim, Kotimanjo [Noumi 819].</td>
<td>10 dried leaves boiled in 2 glassfuls of water for 5 min, and the decoction is then concentrated up to a volume of a glass and cooled, the patient shall drink half a glassful twice a day for 1 week.</td>
</tr>
<tr>
<td>14(4.97)</td>
<td><em>Pentaclethra macrophylla</em> Benth./<em>Mimosaceae</em>/Kombo, Ebae [Noumi 841].</td>
<td>2 kg of stembark boiled in 3 L of water during 15 min and cooled, then 1 glassful taken twice a day for 2 weeks.</td>
</tr>
<tr>
<td>15(4.41)</td>
<td><em>Persea Americana</em> Mill/ <em>Laureaceae</em>/Apiè, Pia, Fia [Noumi 829].</td>
<td>500 mg boiled in 2.5 L of water, the decoction is concentrated to 2 L and added to a quarter glassful of honey and cooled down. Dosis: half a glassful twice a day for 6 days.</td>
</tr>
<tr>
<td>No.</td>
<td>Page</td>
<td>Medicinal Plant</td>
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</tbody>
</table>
| 16  | 2.75 | *Piliostigma reticulatum* (D.C.) Hochst./Caesalpinioideae/Esum wetol [Noumi 842]. |  | 30 gm of fruits are boiled in 1 L. of water. Dosis:  
- Child under 1 year old: 1 teaspoonful twice a day;  
- Child from 1 to 4 years old: 1 tablespoonful twice a day;  
- above 4 years old: 2 tablespoonfuls twice a day. | |
| 17  | 3.86 | *Xylopia aethiopica* (Dunal) A. Rich. /Annonaceae/Ekui, lyere [Noumi 858]. |  | 50 mg of fruits or stem bark in 2 L. of water for 15 min, and then 2 spoonfuls are drunk twice a day during 1 week. | |
| 18  | 3.31 | *Zea mays* L./Poaceae/Nguessang [Noumi 831]. |  | 1 handful of stigmas and styles is added to a piece of rock salt and infused in 1 L. of water, then 1 glassful shall be taken twice a day for 1 week. | |
| 19  | 4.97 | *Citrus adansonia digitata* L./Bombacaceae/Emong [Noumi 814]: 200 g of leaves.  
- *Citrus aurantiifolia* Rutaceae/(Ofunbi beti [Noumi 998]: Juice of two fruits. |  | Six dried leaves are boiled in 2 L. of water for 15 min and the decoction concentrated up to 1 L is mixed with the juice of 2 fruits of *Citrus aurantiifolia* (Rutaceae) and 10 tablets of sugar or a suitable quantity of honey. Dosis: Child (4-10 years old), 1 teaspoonful four times a day; adolescent and adult (1 spoonful 4 times a day for 2 weeks) | |
| 20  | 2.76 | *Allium sativum* L./Liliaceae/Al [Noumi 834]: 1 clove.  
- *Petroselimum crispum* (Miller)A. H. Hill./Lamiaceae/Persil [Noumi 34]: 1 handful. |  | The ingredients are ground and the paste mixed with an equal volume of condensed milk. The patient shall consume the mixture in case of attack to reduce its intensity. | |
| 21  | 6.62 | *Satium crisum*  
- *Cannabis sativa* L./Cannabinacea/Banga, Essum me muse [Noumi: 821]: 200 g of leaves.  
- *Carica papaya* L./Caricaceae/Fofolo [Noumi 1069]: 100 g of leaves. |  | 200 gm of leaves and 100 gm of *Carica papaya* leaves infused in 1L of water for 1h, then 1 glassful shall be taken twice a day for 1 week. | |
| 22  | 2.76 | *Pentandra citus* (L.) Gaertn./Bombacaceae/Bouma [Noumi 828]: 20 dried leaves  
- *Citrus aurantiifolia*: 15 fruits. |  | The leaves boiled in 2 L. of water during 15 min, and the decoction concentrated to 1 L is added to the juice of 15 fruits of *citrus*... and 10 tablets of sugar. Dosis: half a glassful once a day for 2 weeks | |
| 23  | 2.76 | *Asteraceae*  
- *Sida acuta* Burn.f./Malvaceae/Sem sem [Noumi 824]: 30 g of leaves.  
- *Dicrocephala integrifolia* (L.) O. ktze./Asteraceae/Dulgne [Noumi 670]: 10 g of whole plant. |  | All the plant parts are ground and added to 20 g of palm kernel oil, then one full tablespoon shall be taken three times a day for 1 week. | |
| 24  | 2.20 | *Ipomoea batatas* (L.) Mam./Convolvulaceae/Mekip [Noumi 847]: 30 leaves.  
- *Citrus aurantiifolia*: 40 leaves.  
- *Eucalyptus saligna*: 40 leaves. |  | The leaves are boiled in 5 L. of water for 20 min, then the preparation is used as a stream bath twice a day for 3 days. | |
- *Mangifera indica*: 25 leaves.  
- *Zingiber officinale* Roscoe/Zingiberaceae/Ndjindja [Noumi 203]: 50 g of the roots.  
- *Citrus aurantiifolia*: 2 glassfuls of juice. |  | The ingredients boiled in 4 L. of water, the juice added and the mixture boiled once more. The medicine obtained is generally used for children. Dosis:  
- 1-4 years old: 1 teaspoonful twice a day;  
- 4-10 years old: 2 teaspoonfuls before eating, twice a day, for 2 weeks. |
were high (Table 1). Given that there are approximately 8000 plants species in Cameroon (Letouzey, 1979), the percentage of medicinal plants used (% Pm) is 0.36 (=29/80,000 x 100). The EI for asthma in Nkongsamba region is therefore %Pm x AMP = 0.36 X 0.86 = 0.30.

Discussion and Conclusion
Twenty-nine anti-asthmatic plant species are employed in 25 recipes with an average of 1.16 plants per recipe. The mixture of plants in the recipes lowers the number of preparations per plant (0.86). The high average of quotation per informant (1.93) indicates the degree of asthmatic phytotherapeutic knowledge by the Nkongsamba people. Most of the recipes reported were claimed to have been highly effective against asthma decades ago and had a wide local acceptance as prescriptions with *Abrus precatorius* L., *Adansonia digitata* L., *Cannabis sativa* L., *Eucalyptus saligna* Smith (introduced in 1950), *Euphorbia hirta* L., *Mangifera indica* L., *Ocimum basilicum* L. and *Pentaclethra macrophylla* Benth.

Treatment from 1 to 3 weeks is aimed at calming crises. It takes 3 to 5 months to cure asthma. Some of the 29 plants recorded were also mentioned to having a curative effect on bronchitis and pneumonia: *Euphorbia hirta* L., *Dicrocephala integrifolia* (L.) (ktze), *Ocimum canum* L. and *Piliostigma reticulatum* (DC.) Hochst (Fortin et al., 1997). Though we did not record *Anthocleista schweinfurthii* Gilg. as an anti-asthmatic plant in this study, it is being actually used as such in Nkongsamba area (Mapi, 1988). The use of *Euphorbia hirta* L. as anti-asthmatic was pointed out (Kasone et al., 1993; Pousset, 1989). In Kivu (RD Congo) 30 plants were identified with anti-asthmatic properties, and some of them belong to the genuses that were identified in Nkongsamba: *Sida* (*Sida rhombifolia* L.), *Eucalyptus* (*Eucalyptus globulus*) and *Lantana* (*Lantana trifolia* L.) (Kasonia et al., 1999).

During fieldwork, it appeared that some of these plants also had other therapeutic effects: *Adansonia digitata* L. in diarrhoea treatment, *Carica papaya* L. against intestinal worms, *Kigelia africana* (Lam.) Benth. in developing teenage girl breast, *Ocimum basilicum* L. as anti-inflammatory, *Euphorbia hirta* L. in dysentery treatment and fever (Noumi et al., 2001; Noumi et al., 1981), and *Abrus precatorius* L. and *Nicottiana tabacum* L. as are aphrodisiacs (Noumi et al., 1981). Some plants yield substances acting against asthma. Glyzine of *Abrus precatorius* L. is anti-inflammatory and anti-allergic (Boiteau et al., 1964). Tropane and its derived alkaloids (hyoscyamine, atropine and scopolamine) are spasmylytic and mitigate salivary gland and bronchial tube secretions (Fattoruso and Ritter, 1967). An agent of *Cannabis sativa* L. has hypnotic properties in respiratory affection. In *Euphorbia hirta* L., there is an agent which has an effect on the respiratory apparatus and the heart, and gives interesting results in case of spasmodic asthma by dilating bronchial tubes (Fortin et al., 1997; Pousset, 1989). The essence of *Ocimum basilicum* L. has antispasmodic property to nervous dyspepsia (Kerharo and Adam, 1974). The bark extract of *Pentaclethra macrophylla* Benth. enables some action in response to acetylcholine and histamine (Correia Da Silva et al., 1970; annonaceine, an alkaloid with morphine-like action, is yielded in *Xylopia aethiopica* (Dunal) A. Rich (Kerharo et al., 1974). This shows that many of the aforementioned plants have a real impact due to many active principles.

Some of the recipes have dangerous side effects in case of overdose: *Datura metel* L. is very toxic and provokes delirium
with dizzy spells, drunkenness, hallucinations and visions (Noumi, 2004); *Cannabis sativa* L. is hypnotic; thus, they must be avoided. *Persea americana* Mill. is used for abortion in the Sangmelima region (South Cameroon); so a pregnant woman should not use a recipe based on this plant (Noumi, 2000).

As a recommendation, the phytochemical, toxicological and pharmacological studies of these plants should be undertaken to show the efficiency level of the anti-asthmatic recipes stemming from them.

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The author thanks Mr. Noutsa, who participated in this survey by providing information on the medicinal plants used in the treatment of asthma, and Dieudonné Toukam (Senior Translator-Editor) for editing.

References