ETHNOBOTANY OF PLANTS USED AS INSECTICIDES, REPELLENTS AND ANTI-MALARIAL AGENTS IN JABITEHNAN DISTRICT, WEST GOJJAM

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ABSTRACT: An ethnobotanical study on plants used for the prevention and treatment of malaria was conducted to document the indigenous knowledge particularly associated with the use and conservation of anti-malarial, insecticide and insect repellent medicinal plants. In this study, five sampling sites were selected based on the prevalence of malaria and availability of practitioners. Twenty five key informants were selected based on the comments from indigenous peoples, religious leaders and authorities. Moreover, 45 other informants were selected randomly by tossing a coin in their house or in working fields. Eight medicinal plants were found to be used as insecticides and insect repellents and 11 species as anti-malarial. Informants’ consensus showed that 65.7 percent of the informants used Lepidium sativum for medicinal purposes followed by Croton macrostachyus (61.4 percent). The paired comparison showed that Allium sativum ranked first followed by Calpurnia aurea, C. macrostachyus, L. sativum and Phytolaca dodecandra for the treatment of malaria. On the other hand, the direct matrix ranking revealed that C. aurea ranked first followed by Dodonea angustifolia, C. macrostachyus, P. dodecandra and Gnida involucrata. The study indicated that medicinal plants are at conservation risk because of suspected overuse and deforestation for settlement, agriculture and construction purposes. The introduction of proper management system in the society and encouraging practitioners to use medicinal plants sustainably can serve as a tool for the conservation of medicinal plants.

Key words/phrases: Indigenous knowledge, key informants, medicinal plants

INTRODUCTION

Traditional medicine is the sum total of the knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental and/or social imbalance (WHO, 1987). It depends exclusively on practical experience and observations handed down from generation to generation verbally or in writing.

It is reported that 60 to 85 percent of the population in every country of the developing world has to rely on traditional medicine (Sofowora, 1982). It is estimated that more than 85 percent of the Ethiopian population doesn’t enjoy the services and benefits of modern medicine (Amare Getahun, 1976; Dawit Abebe, 1986). Moreover, modern drugs are too expensive for the Ethiopian economy particularly the rural mass. Thus, the development of medicinal plants in primary health care not only will save the foreign exchange but also will aid in conserving our national heritage.

In Ethiopia, as well as around the world, traditional medicine mostly uses plants. Moreover, national product research is often based on ethnobotanical information and many of the drugs used today were developed from medicinal plants used by indigenous societies (Leonti et al., 2001). Despite this fact, many medicinal plants are threatened with extinction and indigenous cultures are being disrupted and destroyed (Martin, 1995; Zemede Asfaw, 2001). If this extinction and destruction continues in the present trend it will not be long that we lose very important part of our biodiversity, the totality of the diversity of genes, species, ecology and the different cultures (Abebe Demissie, 2001). Economic, agricultural and health conditions of people are dependent on these resources and native peoples have been stewards of 99 percent the world’s genetic resources (Martin,
endemism (White, 1983). It mainly consists of
afromontane archipelago-like regional centre of
diversity and the very lower part of the
zone between Sudanian regional centre of
December and January.

Mean annual temperature ranges from 19°C to
24°C. The highest temperature is registered to be
32.8°C in March and the lowest is 9.8°C in
December and January.

The vegetation of the study area is a transition
zone between Sudanian regional centre of
diversity and the very lower part of the
afromontane archipelago-like regional centre of
diversity (White, 1983). It mainly consists of

**MATERIALS AND METHODS**

**The study area**

The study was conducted in Jabitehnan District,
West Gojjam. It lies approximately between
latitudes 10°24' and 10°56' N and longitudes 37°04'
and 37°31' E. It covers an area of 1230 km² and it is
situated 385 km northwest of Addis Ababa.
According to the climatological data gathered for
the last ten years (1991–2000), the average annual
rainfall is 1047 mm and the major rain falls during
June to August (MOA, 1982; NADC, 1983/4). The
mean annual temperature ranges from 19°C to
24°C. The highest temperature is registered to be
32.8°C in March and the lowest is 9.8°C in
December and January.

The vegetation of the study area is a transition
zone between Sudanian regional centre of
diversity and the very lower part of the
afromontane archipelago-like regional centre of
diversity (White, 1983). It mainly consists of
secondary scrub at higher altitudes and broad-
division at lower altitudes. However, at present only patches of secondary
scrub and woodland vegetation are restricted to
hills and river valleys. Trees of the genus *Ficus*
(Moraceae) are the common forms around *Geray*
and *Menz* districts and Fenote Selam Town. They
appear in agricultural fields. The remnant
vegetation is found following rivers and streams,
rocky spots, hills and around churches. The
vegetation is cleared for firewood, charcoal and
agriculture.

**Population, disease prevalence and health services**

According to the census result of PHCC (2001), the
population of Jabitehnan district is 237318 of which
50.06 percent are males and 49.9 percent are
females. Among the total figure, 85.6 percent live
in the rural areas while 14.4 percent live in the
urban areas. The mother tongue is Amharic. There
are three small to medium urban areas. One
hospital and 11 health centres serve the people.
Three of the health centres are private and the rest
are governmental.

The ten most important health problems
identified by the Jabitehnan district health service
office (1998–2001) are, in their order of importance,
malaria, respiratory health problems, intestinal
parasites, gastritis, diarrhea, rheumatism, anaemia,
skin ulcer, unknown fever and eye illness. Malaria
occurs throughout the year and is the most
prevalent disease on account of the suitable
temperature, various small and medium bodies of
water and the frequently used irrigation canal for
breeding of mosquitoes. Malaria is more prevalent
during the months of September through
November and May and June provided that there
is rainfall followed by warm temperature. In
summer, humidity and flood do not support the
growth of mosquito larvae to pupa and adult
stages. Thus, malaria seldom occurs during July
and August.

**Methods**

The study was conducted from July 15, 2001 to
January 16, 2002. Accordingly, the study sites and
informants were selected and ethnobotanical
information was collected based on the methods
given by Martin (1995) and Hoft *et al.* (1999). A
field survey was made during the first filed visit
and five study sites were selected based on the
prevalence of malaria and availability of
practitioners. The study sites are *Fenote Selam* town,
*Mankussa*, *Mebesh*, *Jimat*, and *Arba-etu Ensesa.*
Mankussa and Mebesh are located northeast and northwest of Fenote Selam at 9 and 8 kms, respectively. Whereas, the other two (Jimat and Geray) are situated southeast and south of Fenote Selam town 13 and 4 kms, respectively.

Seventy informants (25 key informants and 45 other informants) were selected. Key informants were selected based on comments and recommendations from religious leaders, elders and authorities. On the other hand, other informants were selected randomly from the community by tossing a coin and questioning every person in the house or in working fields whenever the head of the coin was up. Ethnobotanical data were collected using open-ended or semi-structured interviewing, direct matrix ranking and paired comparison (Martin, 1995; Hoft et al., 1999).

RESULTS

The use report about traditional medicinal plants for anti-malarial treatments, insecticides and insect repellents showed that *Lepidium sativum* (65.7 percent), *Croton macrostachyus* (61.4 percent), *Allium sativum* (58.6 percent) and *Phytolaca dodecandra* (58.4 percent) are widely used in the study area (Table 1).

Moreover, ranking of all species based on three attributes (anti-malarial, insecticides and insect repellents) revealed that different usages exist among the society (Table 2). For example, based on the use report for insecticides only *Cyphostema adenanthum* is widely used followed by *Calpurnia aurea* and *Capparis tomentosa*. The use report for insect repellents only showed that *A. sativum* is commonly used followed by *L. sativum* and *C. tomentosa*.

On the other hand, the paired comparison of five selected medicinal plants used to treat malaria based on informants’ consensus revealed that *A. sativum*, *C. macrostachyus*, and *L. sativum* ranked first, second and third, respectively (Table not shown here). However, the direct matrix ranking on five use criteria (building, medicine, firewood, washing and charcoal) showed that *C. aurea*, *D. angustifolia* and *C. macrostachyus* stood first, second and third, respectively (Table not shown here).

Table 1. Botanical names, local names and habit of medicinal plants used to treat malaria, as insecticides and insect-repellents, use reports, parts used and other uses (L, leaves; R, roots; S, seeds; B, bulbs; F, fruits; Br, barks; St, Stem; Sh, shrub; T, tree; H, herb, Ln, liana).

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Family</th>
<th>Local name</th>
<th>Habit</th>
<th>Use report (%)</th>
<th>Part used</th>
<th>Other uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allium sativum</em> L.</td>
<td>Alliaceae</td>
<td>Nech shinkurt</td>
<td>H</td>
<td>58.6</td>
<td>B</td>
<td>Pneumonia</td>
</tr>
<tr>
<td><em>Calpurnia aurea</em> (Lam.) Benth.</td>
<td>Fabaceae</td>
<td>Liyita</td>
<td>Sh</td>
<td>10</td>
<td>S, L</td>
<td>Rabies</td>
</tr>
<tr>
<td><em>Carrica papaya</em> L.</td>
<td>Caricaceae</td>
<td>Papaya</td>
<td>T</td>
<td>20</td>
<td>S</td>
<td>Abortion</td>
</tr>
<tr>
<td><em>Dodonea angustifolia</em> L.</td>
<td>Sapindaceae</td>
<td>Kitikta</td>
<td>Sh</td>
<td>4.3</td>
<td>F</td>
<td>-</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em> Hochst. ex Del.</td>
<td>Euphorbiaceae</td>
<td>Bissana</td>
<td>T</td>
<td>61.4</td>
<td>L</td>
<td>Ring worm</td>
</tr>
<tr>
<td><em>Gnidia involucrata</em> Steud. ex A. Rich.</td>
<td>Thymelaceae</td>
<td>Beto</td>
<td>H</td>
<td>11.4</td>
<td>R</td>
<td>STDS, TB, Mental problem, intestinal pain</td>
</tr>
<tr>
<td><em>Gossypium barbadense</em> L.</td>
<td>Malvaceae</td>
<td>Tit</td>
<td>H</td>
<td>1.4</td>
<td>Br</td>
<td>-</td>
</tr>
<tr>
<td><em>Jasminum abyssinicum</em> Hochst.</td>
<td>Oleaceae</td>
<td>Tembele</td>
<td>Ln</td>
<td>5.7</td>
<td>S, L</td>
<td>Rabies, insect repellent</td>
</tr>
<tr>
<td><em>Justicia scimperiana</em> (Hochst. ex Nees)</td>
<td>Acanthaceae</td>
<td>Simiza</td>
<td>Sh</td>
<td>21.4</td>
<td>L</td>
<td>Hepatitis</td>
</tr>
<tr>
<td><em>Lepidium sativum</em> L.</td>
<td>Brassicaceae</td>
<td>Feto</td>
<td>H</td>
<td>65.7</td>
<td>S</td>
<td>Abdominal pain</td>
</tr>
<tr>
<td><em>Phytolaca dodenandra</em> L’Herit</td>
<td>phytolaccaceae</td>
<td>Endod</td>
<td>Ln</td>
<td>58.4</td>
<td>L, R</td>
<td>Intestinal parasites</td>
</tr>
<tr>
<td><em>1Allium sativum</em> L.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><em>Calpurnia aurea</em> (Lam.) Benth.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>L</td>
<td>*</td>
</tr>
<tr>
<td><em>Capparis tomentosa</em> Lam.</td>
<td>Capparidaceae</td>
<td>Gumero</td>
<td>Sh</td>
<td>18.6</td>
<td>R, L</td>
<td>-</td>
</tr>
<tr>
<td><em>Cyphostema adenanthum</em> (Fresen.) Descoings</td>
<td>Vitaceae</td>
<td>Etse-zewe</td>
<td>H</td>
<td>11.4</td>
<td>R, L</td>
<td>-</td>
</tr>
<tr>
<td><em>Jasminum abyssinicum</em> Hochst.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>L</td>
<td>*</td>
</tr>
<tr>
<td><em>1Lepidium sativum</em> L.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><em>Melia azedarach</em> L.</td>
<td>Meliaceae</td>
<td>Mimi-zaf</td>
<td>T</td>
<td>15.7</td>
<td>L</td>
<td>Blood pressure</td>
</tr>
<tr>
<td><em>Momordica foetida</em> Schum.</td>
<td>Cucurbitaceae</td>
<td>Enkuriy</td>
<td>H</td>
<td>14.3</td>
<td>R, L</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: * see on the same table, 1not used as insecticides.
Table 2. Ranks of all species used to treat malaria, as insecticides and repellents based on percentage of use reports for each attribute.

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Mosquito repellent</th>
<th>Insecticide</th>
<th>Anti-malarial</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allium sativum</em> L.</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>-</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Calpurnia aurea</em> (Lam.) Benth.</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Capparis tomentosa</em> Lam.</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td><em>Carica papaya</em> L.</td>
<td>-</td>
<td>-</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em> Hochst. ex Del.</td>
<td>-</td>
<td>-</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Cyphostema adenanthum</em> (Fresen.) Descoings</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td><em>Dodonaea angustifolia</em> L.</td>
<td>-</td>
<td>-</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Gnidia involucrata</em> Steud. ex A. Rich.</td>
<td>-</td>
<td>-</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Gossypium barbadense</em> L.</td>
<td>-</td>
<td>-</td>
<td>11&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Jasminum abyssinicum</em> Hochst</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Justicia scimperiana</em> (Hochst. ex Nees) T. Anders</td>
<td>-</td>
<td>-</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Lepidium sativum</em> L.</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>-</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td><em>Melia azedarth</em> L.</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td><em>Momordica foetida</em> Schum.</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td><em>Phytolaca dodecandra</em> L’Herit</td>
<td>-</td>
<td>-</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

DISCUSSION

Prevention and treatment

In the study area traditional medicinal diagnosis is essentially based on systematic interviewing and Physical examination (Dawit Abebe, 1986; Abiyot Berhanu, 2002). Besides, if the disease is very serious and the healer thinks that it is the result of evil spirits, magical performances are often carried out to know it clearly. Churches and some peoples frequently state that this method of diagnosis is against the will of God. After all, if the healer is unable to ascertain the type of disease, the patient is sometimes referred to the nearby health institution either to bring the result of the diagnosis or to be treated there. The other way often practiced is referring the patient to more knowledgeable traditional healer with strict warning not to tell the name of the healer who referred him. The diagnosis of malaria (*Woba*) is often simple: intermittent fever and shivering recognized as symptoms of malaria (Dawit Abebe, 1986).

The overall conditions of the patient are taken into consideration while measuring out dosages. The major factors that determine whether the treatment is to be given are age, physical fitness, stage of illness, pregnancy and presence or absence of any disease other than the disease to be treated (Dawit Abebe, 1986; 1996; Debela Hundie, 2001). For example, a drug against malaria, which is prepared from *Gnidia involucrata* or *Phytolaca dodecandra*, is not administered for a patient with hepatitis. On the other hand, a drug prepared from *P. dodecandra* is not administered to babies or old people, as it is lethal. Drugs that are given through the mouth and the nose are not usually administered to pregnant women unless the patient is in critical situation.

Prevention of malaria (as well as other diseases) is commonly practiced by indigenous people using traditional insecticides and insect repellent plants. Particularly, insect repellents are widely employed in the study area. For example, *A. sativum* is the most widely used mosquito repellent followed by *L. sativum*. The infusion prepared from those plants is applied on exposed body parts so as to directly attack mosquitoes and other pathogenic insects. Moreover, repellents or liquid preparations are sprayed all over the walls of the house and this method is employed in killing insects. Some of the commonly used insecticides include *Cyphostema adenanthum*, *Calpurnia aurea* and *Capparis tomentosa*. Smoking and growing medicinal plants near the entrances of the fence is also practiced as insect repellents though detailed information is lacking to how it works.

The paired comparison of the five species based on their anti-malarial importance only showed that *A. sativum* is most preferred followed by *C. macrostachyus* even though the latter is more widely used for the treatment of other health problems. *Lepidium sativum* ranked third for prevention and treatment of malaria though it is the first in treating different health problems. This is because most of the respondents used in the paired comparison were healers and they are less interested in commonly known medicinal plants by indigenous people. *Phytolaca dodecandra* and *C. aurea* are also known for their poisonous properties.
and the indigenous people and healers are well aware of their lethal actions.

**Conservation of medicinal plants**

The direct matrix ranking for randomly selected five medicinal plants used to treat malaria on five uses criteria showed that medicinal plants are widely harvested for different purposes. This is particularly true for *C. aurea* and *D. angustifolia*. Thus, indigenous people use those species for charcoal and fire wood. However, *G. involucarta* is extensively used for medicinal purposes by healers only with very little use as fire wood by other people. Generally, the direct matrix ranking shows that those medicinal plants are at conservation risk because of overexploitation and additional uses for different activities.

**CONCLUSIONS AND RECOMMENDATIONS**

The number of medicinal plants reported for the prevention and treatment of malaria is a good indicator of the potential that exists locally so long as scientific procedure is added to the indigenous knowledge. In this connection, it is important to develop the indigenous knowledge by focusing on the most popular plants used against malaria including through extraction and developing phytomedicines. In view of the good number of plants used as insecticides and insect repellents, this work can concentrate more on those as prevention is most desired than cure and this is very relevant in the case of malaria, which is a devastating disease in the study area. Thus, in view of seriousness of malaria in the study area and existence of medicinal plants for the prevention and control of it, research must be enhanced to test activities of those species widely used by the society namely *A. sativum*, *C. macrostachyus*, *L. sativum*, *P. dodecandra*, *C. adenanthum* and *C. aurea*. Moreover, a further study on the conservation and sustainable use of medicinal plants is recommended.

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