Ethnobotanical study of anthelmintic and other medicinal plants traditionally used in Loitoktok district of Kenya

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A R T I C L E   I N F O

Article history:
Received 30 July 2010
Received in revised form 20 January 2011
Accepted 10 February 2011
Available online 22 February 2011

Keywords:
Ethnobotanical study
Anthelmintic
Medicinal plants
Loitoktok
Kenya

A B S T R A C T

Aim of the study: The objective of the study was to investigate and document the utilization of medicinal (with emphasis on anthelmintic) plants by the people of Loitoktok district in Kenya for the management of both animal and human health.

Materials and methods: The study was conducted between May and October 2009. Information was gathered from 23 traditional health practitioners, from across the district, by use of semi-structured questionnaires; transect walks, oral interviews and focus group discussions. Voucher specimens of cited plants were collected and deposited at the botanical herbarium of the University of Nairobi.

Results: A total of 80 medicinal plants cited were collected and identified as belonging to 46 families and 70 genera. The plants identified were 48%, 38%, 7%, 6% and 1% trees, shrubs, herbs, lianas and lichens, respectively. Most of the plants belonged to the families Fabaceae (10%), Euphorbiaceae (6%), Rutaceae (5%) followed by Boraginaceae, Labiatae, Rubiaceae, and Solanaceae at 4% each. However, the six most important families by their medicinal use values in decreasing order were Rhamnaceae, Myrsinaceae, Oleaceae, Liliaceae, Usenaceae and Rutaceae. The ailments treated included respiratory conditions, helminthosis, stomach disorders, malaria, sexually transmitted diseases, infertilities and physical injuries. Helminthosis in both livestock and humans was recognized as a major disease managed by use of medicinal plants (with an informant consensus factor of 0.86) in the study area. The most frequently used plant anthelmintics were Althizia anthelmintica (Fabaceae), Myrsine africana (Myrsinaceae), Rapanea melanophleos (Myrsinaceae), Clausena anisata (Rutaceae) and Olea Africana (Oleaceae) used by 70%, 70%, 26%, 13% and 9% of the respondents, respectively. Other plant anthelmintics used, each by 4% of the respondents, were Rumex usambarensis (Polygonaceae) and Salvadora persico (Salvadoraceae).

Conclusion: It is concluded that traditional health practice in Loitoktok depend largely on naturally growing plants and that the study area has a potential for bio-prospecting of crude drugs from plants due to the large number of medicinal plants cited. There is also need for further studies to validate the plants used in medicinal remedies in this area.

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1. Introduction

Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs. Right from its beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important modern drugs (Cox, 2000; Flaster, 1996). The modern pharmacopoeia still contains in the order of 25% of the drugs derived from plants and many others are synthetic analogues built on prototype compounds isolated from plants. Traditional medicine still remains the main resource for a large majority (80%) of the people in developing countries for their primary health care needs (Danøe and Bøgh, 1999; WHO, 2002). There has been a resurgence of interest in traditional health practices throughout the world, which mainly encompasses ethnobotany and the use of herbal remedies. The forces responsible for this momentum include the perception that “natural is nice”, concerns of synthetic drug residues in the environment and the food chain, and particularly the spectre of rapid emergence of multiple resistant pest organisms through misuse and overuse of these modern drugs. A case in point is the effectiveness of artemesinin from the Chinese herb, Artemesia annua, against multi-drug resistant malaria (WHO, 2002).

More than 50,000 flowering plants are used for medicinal purposes across the world (Govaerts, 2001; Schippmann et al., 2002). In Kenya, more than 1200 plants are described as medicinal from

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a flora of approximately 10,000 members (Kokwaro, 1993). The widespread use of traditional medicine among both urban and rural population in Kenya could be attributed to cultural acceptability, efficacy against certain types of diseases, physical accessibility and affordability as compared to modern medicine. Kenyan traditional medical system is characterized by variation and is shaped by the ecological diversities of the country, socio-cultural background of the different ethnic groups as well as historical developments, which are related to migration, introduction of foreign culture and religion. In Kenya, the knowledge from herbalists is often passed secretly from one generation to the next through word of mouth.

The study of African medicinal plants has not been realized as fully as that of India, China or other traditional communities elsewhere (Iwu, 1993). In Kenya, though there has been some organized ethnomedicinal studies, there has been limited development of therapeutic products and the indigenous knowledge on usage of medicinal plants as folk remedies are getting lost owing to migration from rural to urban areas, industrialization, rapid loss of natural habitats and changes in life style (Njoroge and Bussman, 2006). In addition, there is a lack of ethnobotanical survey carried out in most parts of the country. In view of these, documentation of the traditional uses of medicinal plants is an urgent and important matter in order to preserve the knowledge (Fratkin, 1996). Thus, the purpose of this study was to investigate and document the traditional uses of medicinal plants by the people of Loitoktok district and to provide baseline data in an ongoing study whose aim is to formulate a plant
based anthelmintic using both indigenous technical knowledge and scientific pharmacognosy technique.

2. Materials and methods

2.1. Choice of study area

A reconnaissance survey was undertaken to Kajiado district headquarters, in May 2009, to identify key informants in the study. The district cultural officer, under whose jurisdiction the registration of herbalists fall and the local administrators were chosen as the key sources of information about the herbal practitioners. It is from discussions with these key informants that Loitoktok district, formerly part of Kajiado district, was chosen as the most suitable area of the study due to its widespread use of traditional medicine and relatively less modernity.

2.2. Study area description

Loitoktok district comprises an area of 6300 km² and is home to the Ikisono subgroup of the Maasai people. However, several non-Maasai groups, of which the Kikuyu and Kamba are the most numerous, now live in Loitoktok. Fig. 1 shows Loitoktok district in relation to the map of Kenya. It is located in the southwestern part of the Rift valley province of Kenya and borders Kajiado central district to the north, Namanga district to the northwest, Tanzania to the southwest, Taita-Taveta and Makuene districts to the southeast and northeast, respectively. Its highest point is the slopes of the snow-capped Mount Kilimanjaro (the highest mountain in Africa) and the Chyulu hills while its lowest point is the Amboseli basin.

Loitoktok has a bimodal rainfall pattern with the long rains falling between March and May and the short rains between October and December. High rainfall occurs around the slopes of Mt. Kilimanjaro and the Chyulu hills. Other areas, especially the range- lands are characterized by lower rainfall. The October–December rainfall accounts for 45% and the March–May for 30% of the total rainfall. The temperatures in Loitoktok, like rainfall, also vary with altitude and season. The hottest temperatures of 30 °C have been recorded around Lake Amboseli and the lowest mean min- imums of 10 °C are experienced on the eastern slopes of Mt. Kilimanjaro. The coolest period is June–August and the hottest is September–February. The vegetation of the Amboseli plains is dominated by bushland and open grasslands (Acacia – commiphora mosaic). Swamps are found at the base of Mt. Kilimanjaro. The vegetation composition has changed significantly over the last decade (Ntiai, 2002). Most of the woodland has been converted into marginal crop farming areas, swamps into irrigated land and grassland to bush land due to overgrazing and overstocking.

2.3. Data collection

Data on medicinal plants traditionally used to treat worm infestation and other ailments was collected through interviews, stakeholder meetings; transect walks, focus group discussion and administration of semi-structured questionnaires to herbalists. The approach was for the herbalists to mention the plants used in anthelmintic herbal remedies and then those used in remedies for other diseases and conditions. The information sought included the herbalists’ biodata, diseases treated with herbal remedies, harvesting of medicinal plants and parts used in herbal remedies, methods of their preparation and administration. Thirty herbalists from across the locations in Loitoktok district were recruited and 80% of them cooperated and fully participated in the study.

2.4. Collection of plant samples and identification

Plants reportedly used in herbal remedies were collected by a team comprising of herbalists, a botanist and researchers from the University of Nairobi. The plants were identified by a taxonomist and voucher specimens deposited at the University of Nairobi Herbarium. The information gathered included the vernacular name of the plant, species, habitat, parts used, ailments they cure and methods of preparation; dosage and routes of administration.

2.5. Data analysis and reporting

The data collected was analyzed and reported using proportions and percentages. The relative importance of individual plant species, for medicinal use by the community, was assessed by calculating their use values (UVr) by a slight modification of the method described by Phillips and Gentry (1993); where use value of a species (UVr) = Σj(Uj/nj), where Uj is the use value of one plant species to one informant and nj is the number of informants interviewed for the species (in our case the number of informants citing use of the species). Our assumption was that every informant had equal chances of mentioning any of the species used in medicinal purposes in the area because of the way we framed our questions. UVR = ΣUVr/nr, where nr is the number of uses mentioned by an informant for a particular plant species and nr is the number of interviews by the informant (in our case only one interview for each informant). The value of a botanical family (FUV) = UAV/nr, where nr is the number of species reported in the family.

Calculation of the consensus factor (IC) for the use of herbal remedies in the treatment of helminthiasis was done by the method provided by Trotter and Logan (1986), where IC = Nr - Nr - (Nr - 1) and Nr is the number of use-reports of informants for a particular illness usage, where a use-report is a single record for use of a plant mentioned by an individual, and Nr refers to the number of species used for a particular illness category for all informants.

3. Results and discussion

The traditional healers have registered an association with the Ministry of State on National Heritage and Culture for regulatory and advocacy purposes. Out of the 24 participating herbalists, 21 were men (87.5%) and three (12.5%) were women including one traditional midwife. Majority of the herbalists (62.5%) treated only human ailments while 37.5% attended both to human and livestock. Fifty eight percent (58%) of the herbalists inherited their knowledge from relatives while 42% acquired the knowledge by observation and apprenticeship with older herbalists. This pattern of knowledge transfer and the tendency of secrecy are also reported in similar studies elsewhere (Mesfin et al., 2009; Nanying et al., 2008).
<table>
<thead>
<tr>
<th>Plant family</th>
<th>Species</th>
<th>Vn&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Local name</th>
<th>Habit</th>
<th>Medicinal uses</th>
<th>pu&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Nh&lt;sup&gt;c&lt;/sup&gt;</th>
<th>UVs&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amaranthaceae</strong></td>
<td><em>Sericocomposis hildebrandtii</em></td>
<td>JK25</td>
<td>Olaisai</td>
<td>Shrub</td>
<td>Malarial complications</td>
<td>R</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Anacardiaceae</strong></td>
<td><em>Rhus matutinalis</em></td>
<td>JK57</td>
<td>Olmusigiyoi</td>
<td>Shrub</td>
<td>Endometritis, foot and mouth disease</td>
<td>Sb,R,L</td>
<td>3</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Apocynaceae</strong></td>
<td><em>Ozoroa insignis</em></td>
<td>JK63</td>
<td>Olokonunoi</td>
<td>Tree</td>
<td>Tooth ache, snake bite</td>
<td>R</td>
<td>1</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Compositae</strong></td>
<td><em>Azadirachta indica</em></td>
<td>JK26</td>
<td>Olamurindi</td>
<td>Tree</td>
<td>Gonorrhea, syphilis</td>
<td>R</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Flacourtiaceae</strong></td>
<td><em>Dovyalis abyssinica</em></td>
<td>JK53</td>
<td>Olmoriiya</td>
<td>Tree</td>
<td>Blood pressure, ectoparasites, AIDS</td>
<td>R,Sb</td>
<td>1</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Moraceae</strong></td>
<td><em>Ficus sycomorus</em></td>
<td>JK36</td>
<td>Olgaboli</td>
<td>Tree</td>
<td>uterine bleeding</td>
<td>B</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Myrsinaceae</strong></td>
<td><em>Myrtus onyokie</em></td>
<td>JK32</td>
<td>Olchani onyokie</td>
<td>Tree</td>
<td>Cowpox, stomach upsets</td>
<td>R,B,T</td>
<td>3</td>
<td>0.17</td>
</tr>
</tbody>
</table>

*Note: J.K. Muthee et al. / Journal of Ethnopharmacology 135 (2011) 15–21

<sup>a</sup> Vn: Voucher number
<sup>b</sup> pu: Published
<sup>c</sup> Nh: Number of habitat
<sup>d</sup> UVs: Unusual values

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Table 1: Plants used in various herbal remedies in Loitoktok district.
The conditions treated included stomach disorders and helminthosis, malaria, sexually transmitted diseases, infertilities, injuries, aches, coughs and colds. Some of the remedies were used for recreational purposes under various categories with regard to the effect they exert. Some of these are excitants, digestives, aphrodisiacs, emetics, bio-stimulators and fat emulsifiers. The most common methods of preparation included boiling or soaking in water, drying and grinding while the preferred route of administration was oral. These methods of remedy preparation and dosing are quite similar to those reported by others (Nanyingi et al., 2008; Abebe, 1986; Getahun, 1976; Sofowara, 1982). The majority of the herbalists (67%) interviewed were aware that overdosing could result in undesirable effects and some of the antidotes they discussed (Abebe, 1986; Getahun, 1976; Sofowara, 1982). The majority of the herbalists (67%) interviewed were aware that overdosing could result in undesirable effects and some of the antidotes they discussed (Abebe, 1986; Getahun, 1976; Sofowara, 1982).
cited as being useful in various ethno-medical/veterinary remedies. These plants belonged to 46 different families and 70 genera as shown in Table 1. The Plant families Fabaceae, Euphorbiaceae and Rutaceae were cited at 10%, 6% and 5%, respectively, while others varied between 1 and 4%. However, the six most important families by their medicinal use values in decreasing order were Rhamnaceae, Myrsinaceae, Oleaceae, Liliaceae, Usenaceae and Rutaceae. The habits of the medicinal plants in the area were 48%, 38%, 7%, 6% and 1% trees, shrubs, herbs, lianas and lichens, respectively. Some of the medicinal plants recorded in Lotoktok are also used in remedies in other parts of Kenya and elsewhere in Africa (Anonymous, 1996; Beentje, 1994; Gathuma et al., 2004; Kokwaro, 1993; Mesfin et al., 2009).

Twenty-one herbalists (91%) used one or more plants for the treatment of helminthosis, which is probably an indication of the importance of the disease in the area. Seven plants belonging to 7 genera and 6 families were cited for their anthelmintic use (Table 2) in addition to other uses (Table 1). The most frequently used anthelmintic plants (with an informant consensus factor of 0.86) were Albizia anthelmintica (Fabaceae), Myrsine africana (Myrsinaceae), Rapanea melanolophleos (Myrsinaceae), Clausena anisata (Rutaceae) Olea africana (Oleaceae), Rumex usambarenisis (Polygonaceae) and Salvadora persica (Salvadoraceae) by 70%, 70%, 26%, 13%, 9%, 4% and 4% of the respondents, respectively. These plants have been reviewed in Table 2, and all of them have been cited in one or more studies for their anthelmintic and other uses.

The most widely sought plant parts in the preparation of remedies were the root, bark, leaves, stems and seeds in that order. The popularity of these parts has serious consequences from both ecological point of view and the survival of the medicinal plant species in their locality because of their belief that these species in the natural vegetation are more effective in the prevention and treatment of diseases and health problems. Furthermore, the documented medicinal plants can be used as a basis for further studies on the regions medicinal plants knowledge and for future phytochemical and pharmacological studies.

4. Conclusion

It was established that herbal remedy is crucial for primary health care in Lotoktok district. Traditional medicinal plants were harvested mostly from natural vegetation area but also home gardens; roadsides, farmlands and live fences. The medicinal plants in the area are becoming scarce and traditional healers had resulted to planting some in their home gardens and sourcing the plants from distant places including across the border in Tanzania. However, traditional healers still depend largely on naturally growing species in their locality because of their belief that those species in the natural vegetation are more effective in the prevention and treatment of diseases and health problems. Furthermore, the documented medicinal plants can be used as a basis for further studies on the regions medicinal plants knowledge and for future phytochemical and pharmacological studies.

Acknowledgements

The authors are highly indebted to the Jomo Kenyatta University of Agriculture and Technology for funding this research and the University of Nairobi for coordination, logistics and plant identification. The Lotoktok herbalists association and the local community are highly acknowledged for their time and willingness to share their knowledge. Our sincere gratitude also goes to Ms. Cecilia Wanjia, the District Cultural Officer for her immense support in organizing contacts and meetings with the local community. The authors declare that they have no competing interests.

References


