

Full Length Research Paper

Medicinal plant parts and practices used by communities around the Miombo woodlands of Urumwa, Tanzania

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A study to document medicinal plants parts and practices in relation to sustainable use was performed in communities around the Miombo woodland of Urumwa in Tanzania. Data collection was based on semi-structured interviews and discussion with key stakeholders. G-tests were used to ascertain differences in medicinal plants practices between women and men. Roots were the commonly used parts for medicine followed by barks. In practice, boiling and grinding were the preferred methods for preparing remedies. Remedies are administered orally in decoctions form with lack of standardized dosages. Medicinal plants are collected from the reserve using both root digging and bark stripping methods. Local communities need sensitization through trainings on various aspects of medicinal plants practices especially issues of sustainable harvesting methods, simple processing, domestication and the importance of standardized dosages so as to improve work performance, ensure resource sustainability and contribute to development of the primary health care system in Tanzania.

Key words: Medicinal plants, practices, sustainability, Miombo woodlands, Tanzania.

INTRODUCTION

Traditional medical practices are important parts of the primary healthcare system in the developing world (Sheldon et al., 1997). Plant-based traditional knowledge has been recognized to be a tool in search for new sources of pharmaceuticals. Medicinal plants are assumed to be of great importance in the primary healthcare of individuals and communities in many developing countries. Traditional medical knowledge of medicinal plants and their use by indigenous cultures are not only useful for

conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future (Pei, 2001). In Tanzania, traditional treatments using medicinal plants enjoy considerable popularity and are practiced by numerous healers all over the country, despite Western medicine being the mainstream of the health care system (Ruffo, 1990; Ishengoma and Gillah, 2002). By the late 1990's, Tanzania had more than 30,000 traditional healers who

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who mainly operated in rural communities (Urio et al., 1996). Considering the population of Tanzania, Ishengoma and Gillah (2002) noted that at least one healer serves 750 people, whereas 50,000 people are served by one qualified medical doctor.

Though most practices and treatments in herbal medicine require specialists or professionals which are referred generally to as herbalists, self-care using plants is common in Tanzania. The plant parts used, preparation and administration of herbal medicines vary from one place to another. However, the knowledge of herbal medicines is gradually perishing, although some of the traditional herbal men are still practicing the art of herbal healing effectively.

Medicinal plant species throughout the tropics according to Akerele et al. (1991), Balick and Cox (1996), Lange and Schippmann (1997) and Leanman et al. (1999) are threatened in the wild due to over-exploitation. Unsustainable harvesting and land-use practices for Miombo land and products generally are now recognized as serious problems (Bodeker, 2002). The main threat (Maundu et al. 2004) is unsustainable harvesting practices, particularly ring-barking and uprooting. A well known example is the commercial exploitation of *Warburgia salutaris* (Bertol.f.) Chiov. bark from the miombo woodland of Southern Africa (Botha et al., 2004), which is commercially traded in the markets. The species is among the International Union for Conservation of Nature (IUCN) (2001) Red List species categorized as vulnerable and endangered in different countries in southern Africa.

Within rural communities, the main underlying cause of over-exploitation of medicinal plants is the combination of poverty and high unemployment due to falling per capita income in most African countries. Harvesting and the provision of medicinal plants to meet the urban demand have become an environmentally destructive activity (Williams et al., 2000), due to the development of a substantial network of rural commercial gatherers, herb traders, traditional healers and consumers. In response, non-professionals have turned to herbal harvesting and trading (and even treatment activity).

Like many other rural communities, the people around the Miombo woodlands of Tabora use medicinal plants for their primary health care. Ethnobotanically, these people have recently been explored (Augustino et al., 2011); however, there is no comprehensive account of the plants in terms of parts used and practices mainly sustainable harvesting, processing and preparations as well as dosages. In this paper we provide understanding of the medicinal plants practices in relation to sustainable use by communities around the miombo woodlands of Urumwa and Tanzania. In the context of this paper, medicinal plants practices are referred to as all activities included in the use of medicinal plants from preparations,

processing up to the mode of administering the remedies in relation to sustainable use of medicinal plant resources. The findings are crucial in designing strategies to promote primary health care and ensure sustainable utilization of wild plant resources in the Miombo woodlands of Tanzania.

METHODOLOGY

The study area

The study was conducted between April to November, 2004 in six villages (that is, Igombanilo, Isukamahela, Kasisi 'A', Masimba, Mtakuja mashariki and Ujerumani) around the Miombo woodland of the Urumwa Forest Reserve in Tabora-Uyui District, Tabora Region (4 to 7°S, 31 to 34°E). The six villages were selected based on their closeness to the reserve and involvement in the Joint Forest Management (JFM) programme. Tabora region forms part of the vast central plateau of the mid-western part of Tanzania (Figure 1a), an area of generally low relief most of which lies between 1,100 and 1,300 m elevation (Acres et al., 1984), where about 61% of the vegetation covers of Tabora region is dry Zambezi Miombo woodland (White, 1983). The choice of the study area was based on the richness of its Miombo woodlands. The reserve and its surrounding villages (5° 08' to 5° 14'S, 32° 44' to 32° 50'E) are about 15 km south of Tabora municipality (Figure 1b) and cover an area of about 13,000 ha. The reserve is bordered by 12 villages collectively with an estimated population of about 22,500 (Mbwambo, 2000). A large proportion (approximately 80%) of Tabora's urban population relies on the reserve for medicinal products.

Communities residing around Urumwa belong to two big ethnic groups that are Nyamwezi and Sukuma, though a small proportion of mixed tribes do exist. The main livelihoods of the locals in the study area are subsistence farming and livestock keeping. However, pitsawing, charcoal production and bee keeping are undertaken regularly (Mbwambo, 2000) and various non-timber forest products such as wild fruits and medicinal plants are collected and sold.

Semi-structured face-to-face interviews using a mixture of open- and closed-ended questionnaires were conducted with herbalists (that is, traditional healers, medicinal plant sellers and traditional birth attendants), medicinal plant collectors and knowledgeable households in six villages close to Urumwa Forest Reserve (Table 1), to collect information on local plant names, uses, parts used and modes of preparation and administration. Voucher specimens were also collected, pressed, dried, botanically identified and deposited at Tabora Miombo Woodland Centre and the Institute of Traditional Medicine Herbarium. Furthermore, several informal discussions with respondents and participant observation techniques were also employed to confirm the survey data and to gather additional information. Approach and entry to villages for data collection was through the village leadership, generally the Chairmen and Executive Secretaries, ensuring smooth running of day to day activities within the study area. Most respondents were generous in sharing their knowledge during the survey; however a few traditional healers refused to disclose their knowledge because they believe that once disclosed it will lose its effectiveness and also reflected the idea of a trade secret in traditional medicine system. Those who refused were not included in the interview and someone else was consulted.

A stratified sampling strategy based on gender in households of the six selected villages was used to select informants that is,

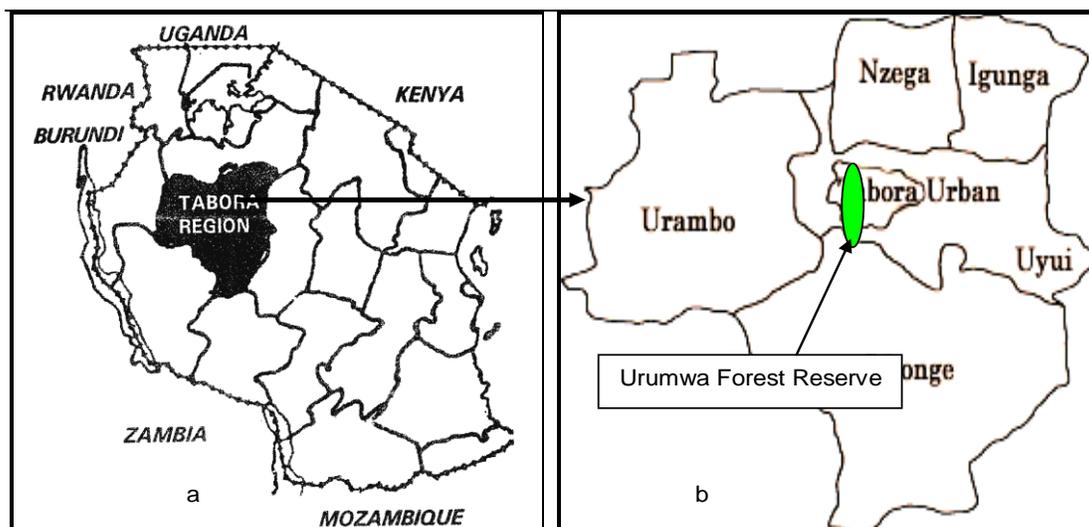


Figure 1. Location of the study area in Tanzania.
Source: URT (1998)

herbalists, medicinal plant collectors and household heads. In total, 115 informants (62 male and 53 female) were involved in the survey to explore local knowledge on use of medicinal plants; out of which 60 were herbalists, 6 medicinal plants collectors and 49 household heads. Based on the nature of the data in forms of responses in frequencies, G-tests of association were carried out to seek differences in medicinal plants practices knowledge between women and men around Urumwa. Assuming that men and women would have similar knowledge on practices of medicinal plants, the likelihood ratio statistic (G) was calculated as:

$$G = 2 \times \sum \{[(\text{observed frequency}) \times \ln (\text{observed frequency}/\text{expected frequency})]\}$$

Calculated values were corrected for continuity by applying the William's correction factor (Sokal and Rohlf, 1995). P values were calculated using the common method as recommended by Bailey (1995) as follows:

$$P = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!a!b!c!d!}$$

Where: (a+b), (c+d).....+(b+d) = Marginal values from 2 × 2 contingency table.

a+b+c+d = n = Total sample size

x! = 1. 2. 3. (x-1) = Factorial and 0! = 1

RESULTS

Plant parts used

The ethnobotanical information has been documented by Augustino et al. (2011), where 110 medicinal plant species

(72% trees, 20% shrubs and 8% herbs) belonging to 37 families in 20 phylogenetic orders were recorded in the Miombo woodlands of Urumwa forest reserve. Out of the reported species, 99 were from inside and 11 outside the forest reserve. Roots have been observed to be the most plant parts commonly used for medicine by communities around Urumwa Forest Reserve. Bark and leaves were also used, while whole plants, fruits, seeds, twigs and exudates were rarely mentioned to be used (Table 2).

Processing and mode of preparation

For most of plant medicines used by Urumwa communities (that is, 72% trees, 20% shrubs and 8% herbs), processing was noted to begin with sun drying, followed sometimes with pounding after which the material is ground using a local grinding stone. For both males and females around Urumwa, boiling combined with grinding (Table 3) was the preferred method for preparing remedies; followed by boiling only (32%) and grinding only (10%). Nevertheless, G-tests of independence showed no gender difference at $p = 0.05$ on the preferred methods of preparing medicinal plant remedies at Urumwa.

Modes of administration

The majority of male and female respondents at Urumwa indicated to administer plant medicines in the form of decoctions (Table 4) with a remedy in powder form were reported only once. Oral administration through drinking,

Table 1. Sampling scale used during ethnobotanical survey in villages around Urumwa, Tanzania.

| Village name | Traditional healers | | Traditional birth attendants | | Vendors | | Collectors | | Household | | Others | | Total |
|-------------------|---------------------|----|------------------------------|----|---------|----|------------|----|-----------|----|--------|----|-------|
| | Me | Fe | Me | Fe | Me | Fe | Me | Fe | Me | Fe | Me | Fe | |
| Masimba | 3 | 2 | - | 7 | 8 | - | 2 | - | 3 | 2 | 2 | - | 29 |
| Igombanilo | 2 | 1 | - | 5 | - | - | 1 | - | 4 | 1 | 2 | - | 16 |
| Mtakuja mashariki | 1 | - | - | 4 | - | - | 1 | - | 3 | 2 | 1 | 1 | 13 |
| Isukamahela | 2 | 1 | - | 5 | - | - | 2 | - | 5 | 4 | 1 | 1 | 21 |
| Ujerumani | 6 | 2 | - | 3 | - | - | - | - | 3 | 3 | 1 | 1 | 19 |
| Kasisi 'A' | 3 | 1 | - | 4 | - | - | - | - | 4 | 3 | 2 | - | 17 |
| Total | 17 | 7 | - | 28 | 8 | - | 6 | - | 22 | 15 | 9 | 3 | 115 |

Me, represents 'Male' and Fe, represents 'Female'

Table 2. Medicinal plant parts used for medicine by communities at Urumwa, Tanzania.

| Plant part | Number of taxa (out of 111) | % of total taxa |
|--------------------|-----------------------------|-----------------|
| Roots | 101 | 91 |
| Bark | 50 | 45 |
| Leaves | 49 | 44 |
| Fruits | 3 | < 1 |
| Seeds | 2 | <1 |
| Whole plant | 1 | <1 |
| Twigs and exudates | 1 | <1 |

Table 3. Plant remedies preparation methods in communities at Urumwa, Tanzania.

| Respondent category | Response category | | | | | | | Total |
|---------------------|-------------------|-------|---------|----------------|-----------------|----------------|--------------------|-----------|
| | Boil | Pound | Grind | Boil and Grind | Grind and Pound | Boil and pound | Boil, Grind, Pound | |
| Female | 22 (41) | 3 (6) | 2 (4) | 22 (41) | 1 (2) | 0 | 3 (6) | 53 (100) |
| Male | 15 (24) | 2 (3) | 10 (16) | 31 (50) | 0 | 0 | 4 (7) | 62 (100) |
| Totals | 37 (32) | 5 (4) | 12 (10) | 53 (46) | 1 (1) | 0 | 7 (6) | 115 (100) |

Numbers in parentheses are percentages of row total.

Table 4. Forms of remedies used by communities around Urumwa, Tanzania.

| Respondent category | Response category | | | | | Totals |
|---------------------|-------------------|----------------------------|---------|---------|----------|-----------|
| | Decoctions | Infusions/ concentrates | Powders | Others* | Mixtures | |
| Female | 35 (66) | 4 (7) | 1 (2) | 10 (19) | 3 (6) | 53 (100) |
| Male | 36 (58) | 6 (10) | 0 | 16 (26) | 4 (6) | 62 (100) |
| Totals | 71 (62) | 10 (9) | 1 (4) | 26 (23) | 7 (6) | 115 (100) |

Numbers in parentheses are percentages of rows total, * mostly poultices and protective charms.

Table 5. Modes of administering remedies used around Urumwa, Tanzania.

| Respondent category | Response category | | | | | | Totals |
|---------------------|-------------------|----------|----------------|---------------|-------------------|-----------|-----------|
| | Oral | External | Oral and nasal | Oral and anal | Oral and external | All modes | |
| Female | 23 (43) | 1 (2) | 2 (4) | 8 (15) | 13 (25) | 6 (11) | 53 (100) |
| Male | 32 (52) | 0 | 2 (3) | 3 (5) | 19 (31) | 6 (9) | 62 (100) |
| Totals | 55 (48) | 1 (2) | 4 (3) | 11 (9) | 32 (28) | 10 (12) | 115 (100) |

Numbers in parentheses are frequencies of row total.

Table 6. Dosage knowledge around Urumwa communities, Tanzania.

| Respondent category | Response category | | Total |
|---------------------|-------------------|----------|-----------|
| | Standardized | Informal | |
| Female | 20 (38) | 33 (62) | 53 (100) |
| Male | 30 (48) | 32 (52) | 62 (100) |
| Total | 50 (43) | 65 (57) | 115 (100) |

Numbers in parentheses are percentages.

chewing and or mouthwash (Table 5) was typical (48%) for both female and male at Urumwa, followed by mixture of oral and external modes as mainly massage, baths, steaming and smoking.

Plant remedies dosages

Neither female nor male respondents consistently used standardized dosages when administering plant remedies to patients (Table 6). Dosage for most local communities is generally determined subjectively and depends on the severity of the symptoms. Where described as 'standardized', administration of remedies was done as a specific quantity for a specified period of time and the patient had to continue with the dose even if he/she felt better soon after taking the medicine. For example, ½ cup of tea × 3 × 5 days was commonly mentioned for treating diseases like intestinal worms and venereal diseases.

In the case of 'informal' dosages, however, no quantity

specification was provided, the patient had to estimate a small quantity to take and was expected to stop using the remedy soon after he/she feels recovered from the ailment concerned.

Medicinal plants harvesting

Most medicinal plants used by communities around Urumwa grow wild and were collected mainly from the forest reserve with few cultivated around homesteads. Root digging and bark stripping in combination was the most reported method used for harvesting medicinal plant parts in communities around Urumwa. As a single procedure, root digging was reported most frequently (Table 7).

DISCUSSION

For the case of Urumwa surrounding communities, the

Table 7. Harvesting methods used in communities around Urumwa Forest Reserve, Tanzania.

| Respondent category | Response category | | | | | Total |
|---------------------|-------------------|----------------|------------------------------------|---------------------------------|-------------|-----------|
| | Root digging | Bark stripping | Root digging and leaves collection | Root digging and Bark stripping | All methods | |
| Female | 18 (34) | 1 (2) | 5 (9) | 32 (42) | 9 (13) | 53 (100) |
| Male | 19 (31) | 1 (2) | 2 (3) | 28 (45) | 12 (19) | 62 (100) |
| Totals | 37 (32) | 1 (2) | 7 (6) | 50 (43) | 19 (16) | 115 (100) |

Numbers in parentheses are percentages.

medicinal plants practices seem to be dominated by the use of roots to prepare decoctions for oral administration. However, lack of any standardized dosage noted among users in both men and women is striking. On one hand, it implies not only confidence in the informal limits within which traditional medicines are administered but also suggests inadequate attention to potential risks in terms of safety and quality of plant medicines. A measure of complacency may probably be resulting from the rather high level of illiteracy.

Earlier studies in Tanzania have also noted the lack of standardized dosages for treatment (Maximillian et al., 2001; Kitula, 2001, 2007) administered by most herbalists and by other household members who all tend to rely on long term experience that probably does impose some regulation. Yineger et al. (2008) noted lack of precision in measurements for most traditional healers when administering plant remedies. Certainly, Giday et al. (2003) noted in Zay communities of Ethiopia that dosages took account of age and the physical and health condition of the patient. Similar observations on dosages are noted by Abebe and Ayehu (1993) also in Ethiopia, in addition to of socio-cultural explanation of the illness, diagnosis and experience of individual herbalist in prior to giving remedies to the patient. Nevertheless, potential side effects are sometimes not considered probably due to lack of knowledge. According to Hillebrand (2006) and Kitula (2007), the lack of consistent dosage may be potentially dangerous as some of the species could have a high degree of toxicity, over dose might cause serious health problems for patients.

Sun drying as a processing method seems to be done un-hygienically on bare ground or using plastic mesh materials at Urumwa. This makes the product potentially harmful as dust may contaminate it, while fungi and bacteria might grow on the plant tissue. The process also seems to be wasteful as much plant materials are lost during all stages of processing. The need to introduce simple processing technology to reduce post-processing loss and conserve the plant material is highly recommended to communities.

Boiling combined with grinding is the preferred method for preparing remedies at Urumwa. Results seem to agree

with Kitula (2007), Medius (1998) and Marshall (1998) in traditional medicine that boiling is believed to be efficient in extracting active ingredient and for hygienic reasons. Similarly in Ghana, a study by Asase et al. (2005) observed that the majority of the herbal preparations involved boiling the plant material and then drinking the extract; with none of the people interviewed providing any information about how the treatment might be standardized. According to Anfom (1986) and Sofowora (1982), lack of standardization and quality control is seen as one of the main disadvantages of traditional medicine.

The roots, leaves and barks of many Miombo species have been reported to be used in health care, both as medicine and for magic (Gelfand et al., 1985). However, the dominant use of roots at Urumwa apparently reflects belief that roots have higher concentrations of remedial elements, a belief also reported by Kitula (2007) around Udzungwa Mountains and Makonda et al. (2000) in Kilosa, Bagamoyo and Geita Districts of Tanzania. The clear dominance of roots is not always the case in traditional medicine. For instance, a study by Hamisy et al. (2000) around Uluguru Mountains observed wide use of leaves as well as roots. Leaves were actually the dominant plant parts used in areas studied in Ethiopia (Giday et al., 2003) and Uganda (Tabuti et al., 2003).

It has been postulated (Dhillion and Amundsen, 2000; Dhillion and Gustad, 2003; Shrestha and Dhillion, 2003) that the selection of perennial plant parts such as roots, tubers, bark and stem or reproductive plant parts, especially of woody or slow growing species, for use as herbal medicines can threaten plant populations or species viability. This assumption is supported by respondents' observations, as some species, such as *Ekebergia benguelensis* DC. and *Cassia abbreviata* Oliv. were reported to become rare (that is, difficult to find in the forest reserve as their population is perceived to decline based on the frequency of report from interview) inside Urumwa Forest Reserve due to unsustainable harvesting intensities and practices of mainly whole plant removal. However, the effect of harvesting upon the medicinal plant populations has not been assessed in Urumwa, necessitating the need to do so prior to the development of cultivation/domestication plans.

The future availability of medicinal plants in the Miombo woodlands of Urumwa might seriously be threatened in future if root digging and debarking will be entertained for commercial interest by users. According to Giday et al. (2003), collection of leaves does not pose a great danger to the existence of an individual plant when compared with the collection of underground part, stem, bark or whole part.

Nevertheless, Abebe and Ayehu (1993) argued that the popularity of roots including bulbs and rhizomes, barks and stems has serious consequences from both ecological point of view (that is, affecting plant viability) as well as the survival of the medicinal species in the wild. It is suggested that the government should pay attention to plant species which utilize roots and barks for medicinal purposes including studies on specific management in order to ensure the resources' sustainability in terms of productivity and yield in the Miombo of Urumwa.

CONCLUSION AND RECOMMENDATIONS

The traditional medicinal practice by men and women at Urumwa is dominated by the use of roots and lack of standardized dosage for most of plant remedies administered. These are sensitive matters which could hinder the development of traditional medicine system unless serious actions are taken. Sustainable harvesting practices in addition to domestication need to be emphasized and recognized by communities as the most important conservation strategy, given their current and potential contributions to the primary health care services, local economies and their greater value to harvesters over the long term. Local communities also need to be sensitized through provision of trainings on issues of simple processing technology and the importance of having standardized dosages to improve their work performance and contribute to the development of primary health care services. A quantitative study to assess the status of potential medicinal plants at Urumwa is vital before designing conservation strategies.

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Conflict of Interests

The author(s) have not declared any conflict of interests.

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