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*Full Length Research Paper*

# Ethnobotanical survey of traditional medicinal plants in Tehuledere district, South Wollo, Ethiopia

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**An ethnobotanical survey of traditional medicinal plants was carried out in Tehuledere district, South Wollo, northeast Ethiopia from July 15, 2009 to August 30, 2009 using rapid ethnobotanical appraisal. A systematic random sampling was employed for selection of 9 study Kebeles and 67 informants. Ethnobotanical data were collected using semi-structured interview, field observation and group discussion. Data gathered were analyzed using descriptive statistics, Informant consensus factor, preference ranking, direct matrix ranking, fidelity level index and simple linear correlation coefficient. A total of 105 medicinal plants (99 ethnomedicinal and 19 ethnoveternary) were documented from the study area. The majority of plants (54%) were harvested from wild habitat. Herbs (48%) were the major plant species followed by shrubs (34%) and trees (13%). The most frequently used plant parts in the treatment of human diseases were leaves (50%) followed by roots (18%) and seeds (12%). Similar use pattern but with different proportion leaves (48%), roots (26%) and seeds (11%) were also used in the treatment of livestock ailments. Concoction forms were the largest proportion (23.4 %) and (58%) for human and livestock, respectively and the majority of preparations are orally administered. The Pearson correlation analysis (r = 0.94) indicated significant increase of medicinal plants knowledge with age at 5% level of significance. Direct matrix analysis revealed *Cordia africana* to be the most important species followed by *Ziziphus spina-christi* in the area. Over all, the community in the study area uses considerable diversity of plant species for maintaining their primary healthcare system. The conservation strategy practiced by the local people is not enough to tackle the erosion of plant species from their habitats. So, *In-situ* and *ex-situ* conservation should be implemented by training the practitioners; and the local government should organize medicinal practitioners into association in such way that their knowledge can be integrally used with modern medicine.**

**Key words:** Ethnomedicine, ethnoveternary, indigenous knowledge, traditional medicinal practitioners, plant use-categories and ailments.

## INTRODUCTION

Ethiopia is a country characterized by a wide range of climatic and ecological conditions possessing enormous diversity of flora and fauna, including wide range of potentially useful medicinal plants. Traditional medicinal practices are common in Ethiopia in which about 80% of the population in the country use plant-based traditional medicine as their major primary healthcare system (Dawit, 2001). The majority of Ethiopians rely on indigenous remedies for a numerous socio-cultural and economic reasons (Slikkerveer, 1990; Mesfin et al.,2005). However, environmental degradation, deforestation, agricultural encroachment, over harvesting and/or indiscriminate harvesting and alarming population growth with increasing demand and consumption are the principal problems which aggravate the rate of extinction of medicinal plants from their habitat and consequently the loss of important resources of globally significant plant species (Tesfaye et al., 2006). This is associated with the loss of indigenous knowledge on plant use for medicine. This strong link suggests that there is a need to document medicinal plants and take an appropriate conservation measure for threatened medicinal plants and associated knowledge. The main aim of this study

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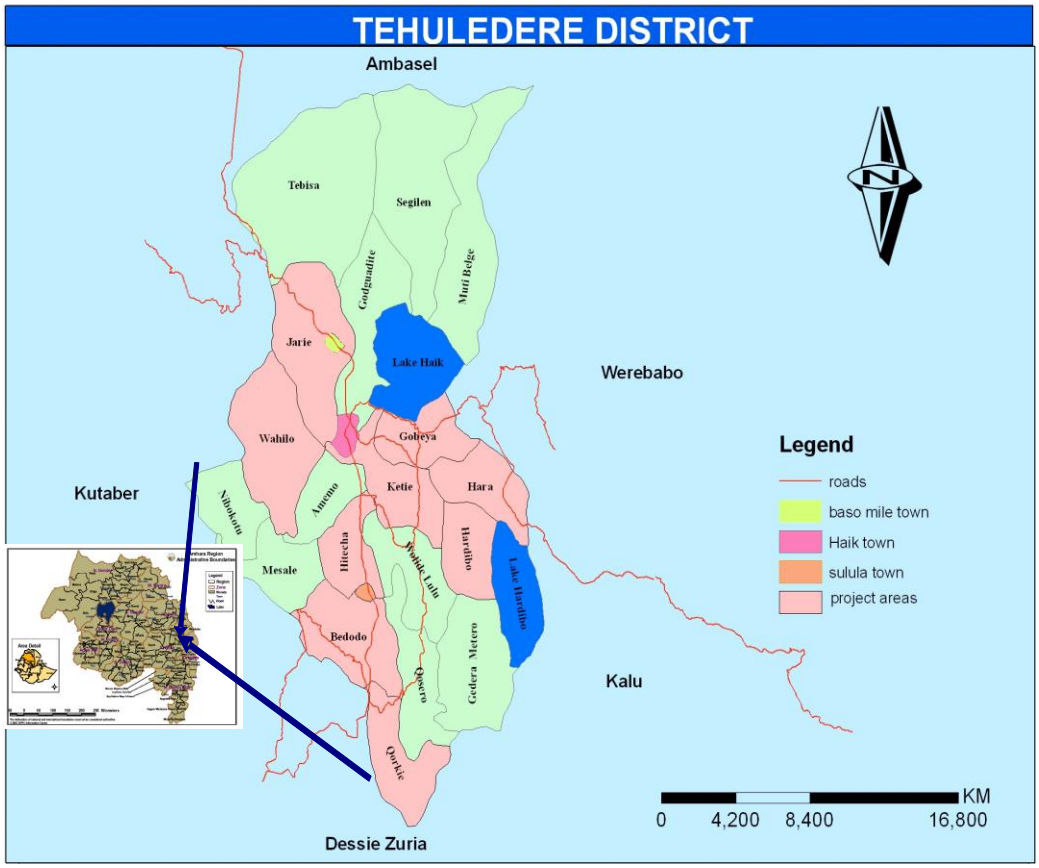


**Figure 1.** Map of the Tehuledere district with its sampling Kebeles.

was to identify and document key medicinal plants and associated knowledge used to treat human and livestock ailments in Tehuledere district, Ethiopia.

## MATERIALS AND METHODS

### Study site and informants selection

The study was conducted in nine Kebeles of Tehuledere (Figure 1) by following rapid ethno-botanical appraisal research procedure. The selection of Kebeles was made systematically based on the information gathered on the relative status of forest coverage, population settlement and availability of practitioners by the help of agricultural and rural development office of the district and local Community Development Agents. In this study, a total of 67 informants (44 males and 23 females), regardless of gender and social status, between the age of 16 and 90 were randomly selected. Finally, a total of eleven key informants were systematically selected by the help of local administrator, local elders and local community development agents.

Ethnobotanical data were collected using semi-structured interview, field observation, illustrated checklist and field walk interview, and group discussion between July 15, 2009 to August 30, 2009 where two field visits were made to each site based on procedures recommended by Martin (1995) and Cotton (1996). Medicinal plant collection was made using plant press, cardboard, newspaper (absorber), scissor, polyethylene bag, fungicide etc. Identification of specimens was done using illustrated checklists in the book of Dawit et al. (2003) and using taxonomic keys in books of 'Flora of Ethiopia and Eritrea' (Hedberg and Edwards, 1989; Edwards et al., 1995; Hedberg et al., 2003; Mesfin, 2004). Plant species collected and identified were deposited in Bahir Dar University temporal herbarium.

### Data analysis procedures

A descriptive statistic such as percentage and frequency were employed for analyzing plant habit, plant parts used and methods of preparation, dosages and routes of administration. Simple linear correlation test was calculated to determine the correlation of medicinal plant knowledge versus age range of informants or medicinal practitioners. The level of homogeneity between information provided by different informants was calculated using informant's consensus factor for nine use-categories. Preference ranking was performed using seven selected key informants for eight medicinal plants on the basis of healing power of several ailments. Direct matrix ranking was also done for eleven multipurpose medicinal plants in eight use-categories as recommended by Martin (1995) using eight selected key informants. Finally, the average use-value for each category was calculated and then the mean values of each use-category were summed up for each plant species and ranked. The fidelity level (FL), the percentage of informants claiming the uses of a certain plant species for the same major purposes, was calculated for six medicinal plants used to treat malaria and diarrhea as described by Alexiades (1996).

**Table 1.** Quantitative analysis of nine Use-categories of medicinal plants in the study area (NB: #= number).

| Use category | Species (#) (nt) | % of species | Use- reports (Ur) | % of use reports | ICF ($n_{ur}$-$n_t$/ $n_{ur}$-1) |
|---|---|---|---|---|---|
| Medicinal | 105 | 100 | 715 | 39 | 0.85 |
| Food (edible) | 24 | 23 | 207 | 11 | 0.89 |
| Forage | 28 | 26 | 123 | 7 | 0.78 |
| Fence | 31 | 29 | 139 | 7 | 0.78 |
| Fire wood | 51 | 48 | 260 | 14 | 0.81 |
| Charcoal | 16 | 15 | 60 | 3 | 0.75 |
| Construction | 33 | 31 | 140 | 7 | 0.77 |
| Furniture | 18 | 17 | 57 | 3 | 0.70 |
| Commercial | 28 | 26 | 166 | 9 | 0.84 |
| Mean ICF | - | - | - | - | 0.80 |

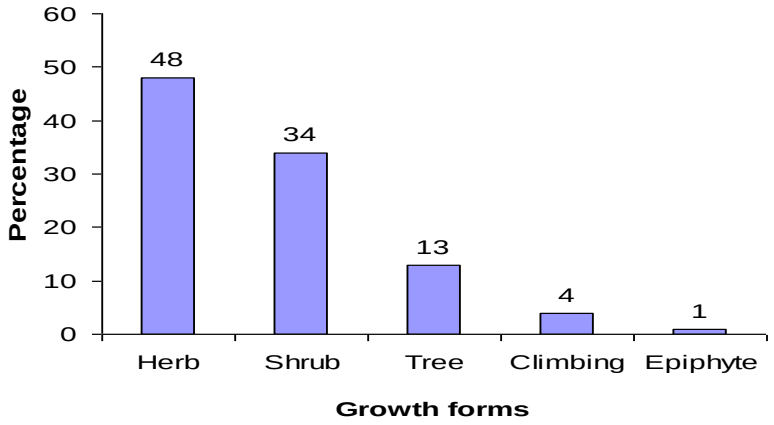


**Figure 2.** Percentage distribution of growth forms of medicinal plants used to treat human and livestock ailments.

## RESULT AND DISCUSSION

### Major plants use-categories by the people of Tehuledere

A total of 105 plants were identified as ethnomedical and ethnovetrinary plants from the study area. In addition to their medicinal values, they are utilized for other purposes by the community. Therefore, based on the information gathered, nine use-categories were set in which a total of 1867 use-reports (Ur) were recorded from 334 frequencies of occurrences among 105 species of medicinal plants. Informant's consensus factor (ICF) analysis showed that there exists a high consistency (uniformity) of plant consumption among local people in the study sites. ICF values were very close to 1 that reveals the homogeneity in use of plants for multiple purposes. Accordingly, edible (food) plants took the highest ICF value of 0.89 followed by medicinal use-category with ICF value of 0.85. The lower ICF score for medicinal use category compared to ICF value for edible ones is because, though high Ur value (715) for medicinal plants (nt = 105) is recorded, the ratio nUr-nt/nUr-1 (ICF) for medicinal use category is lower than that of ICF value of edible plants use category (Ur = 207 and nt = 24) (Table 1).

### Ethnomedicinal and veterinary plant species in the study area

Plants are the major resources for the people in the study area which are predominantly used as source of medicinal remedies, food, construction, forage and financial incomes. From the total 105 species of medicinal plants recorded from the study sites, 99 species (94%) are used by the local community as remedies for treatment of human ailments while 19 species (18%) are used for curing livestock disease and 13 species (12%) are used for treatment of both human and livestock diseases. The existence and utilization of such a large number of medicinal plants by the people of Tehuledre depicts the dependency of local people on traditional plant remedies for treatment of both human and livestock health problems.

The growth forms include, herbs (48%) shared the largest proportion of growth form (Figure 2). In this regard, similar findings were reported by Debela (2001)

**Table 2.** Percentage distribution of sources of medicinal plants used to treat human and livestock diseases in Tehuledere district (NB: # = number).

| Source | Med. Plants (#) | %age |
|---|---|---|
| Wild | 57 | 54 |
| Cultivated | 31 | 30 |
| Both | 17 | 16 |
| Total | 105 | 100 |

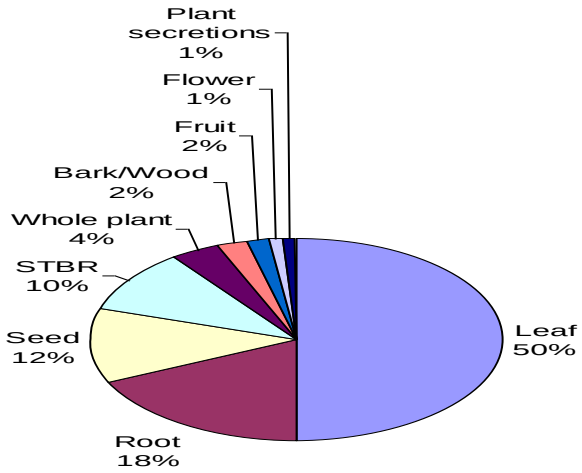


**Figure 3.** Percentage distribution plants parts used in preparation of remedies for human ailments (note: STBR= Stem, Tuber, Bulb and Rhizome).

and Endalew (2007) in their ethnomedicinal research at Boosat Wereda and Chelya Wereda (West Shoa, Ethiopia), respectively. In the contrary, Haile and Delenasaw (2007) and Ermias et al. (2008) have found shrubs to make up the highest proportion of medicinal use followed by herbs in Sekoru and Mana Angetu districts, respectively.

Out of 105 medicinal plants recorded, 57 species (54%) were collected from wild vegetation that grew in a bushy area while only 31 species (30%) were harvested from cultivation. Mirutse (1999) and Endalew (2007) have found similar findings in their works on medicinal plants of Zay people that live in the island and along shore of Lake Ziway and Ejaji area (West Shoa), respectively. Hence, the results indicated that, natural vegetation is the major source of most medicinal plants (Table 2).

## Taxonomic category of the identified human medicinal plants

Medicinal plants are the primary remedies for treatment of several ailments in Tehuledere. Ninety nine species used to treat human ailments belong to 84 genera and 49 families are documented. Families Asteraceae (Compositae) and Euphorbiaceae made up the highest species proportion (8 species) followed by Labiatae with 7 species, Solanaceae, Leguminosae (Fabaceae) and Rubiaceae 5 species, Rutaceae 4 species and Verbenaceae and Liliaceae 3 species (2.8%) each. Similarly, families Acanthaceae, Crassulaceae, Cruciferae, Cucurbitaceae, Fabaceae, Oleaceae, Poaceae, Polygonaceae, Ranunculaceae, Rhamnaceae, Rosaceae, and Lamiaceae shared 2 species (1.9%) each while Agavaceae, Amaranthaceae, Amaryllidaceae, Anacardiaceae, Apocynaceae, Asparagaceae, Athyriaceae, Boraginaceae, Capparidaceae, Caricaceae, Caryophyllaceae, Chenopodiaceae, Cupressaceae, Cyperaceae, Loranthaceae, Lythraceae, Malvaceae, Meliaceae, Melianthaceae, Menispermaceae, Moraceae, Myrtaceae, Phytolacaceae, Piperaceae, Santalaceae, Sapindaceae, Scropholariaceae, Umbelliferae, Vitaceae and Zingiberaceae constituted 1 species each. This reveals the presence and utilization of high diversity of medicinal plants by the people of the Tehuledere. In most instances, plant species in family Asteraceae (Compositae) are reported to have great medicinal values. For example, Endalew (2007) has reported that Asteraceae made the largest proportion of medicinal plants used by the people of Ejaji area (Chelya Wereda), West Shoa. This indicates the wider utilization of Asteraceae for medicinal purpose by different ethnic groups in various parts of Ethiopia that can confirm their efficacy, indeed.

## Plant parts used and methods in preparation of plant remedies for treatment of human ailments

The local community mostly uses leaves (50%) for preparation of remedies and roots take the second proportion (18%) (Figure 3). Certain ethnobotanical researches in other parts of the country reported leaves followed by roots to be mostly used in the treatment of various health problems (Mirutse, 1999; Haile and Delenasaw, 2007). On the other hand, Ermias et al. (2008) have found roots to take the highest proportion in the preparation of remedies in Mana Angetu district. The use of leaves for preparation of most plant remedies in Tehuledere and other areas could reduce the possibility

**Table 3.** Method of preparations of medicinal plants by the local people for treatment of human ailments (note: DCP= dried, crushed & pounded; #= number).

| Form or methods of preparation | | Preparation (#) | % total |
|---|---|---|---|
| Used alone | Crushing | 11 | 5.9 |
| | Pounding/grinding | 43 | 22.9 |
| | Squeezing | 37 | 19.7 |
| | Single decoction | 9 | 4.79 |
| | Milky | 4 | 2.10 |
| | Roasting | 7 | 3.7 |
| | Heating | 3 | 1.6 |
| | DCP and homogenized with water | 10 | 5.31 |
| Mixed | Concoction | 44 | 23.4 |
| | Mixed decoction | 20 | 10.6 |

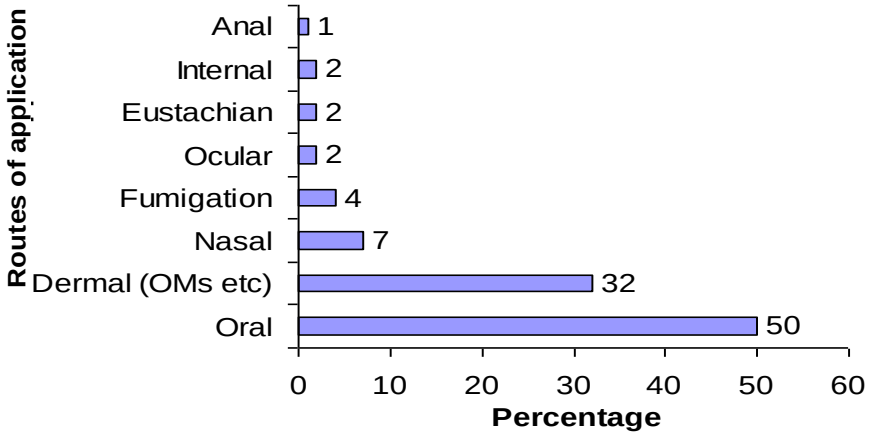


**Figure 4.** Major routes of administration of medicinal plant remedies in the treatment of human ailments (note: OMs= Ointment and Minor surgery).

of the loss of medicinal plants form their natural habitat. In this regards, Dawit and Ahadu (1993) have indicated that plant harvest involving roots, rhizomes, bulb, bark and stem have a serious effects on the survival of the mother plant in its habitat.

With regard to the method of preparation, concoction (23.4%) and pounding or grinding (22.9%) are the major form followed by squeezing (19.7%) as indicated in Table 3. This shows that medicinal plant remedies are also prepared from mixture of several plant parts rather than only being used alone that could improve the efficacy of the remedies in treating ailments. Similarly, Ermias et al. (2008) has reported concoction to be largely used in Mana Angetu district, while Endalew (2007) has found pounding and powdering to be the most frequently used methods of preparation in Ejaji area, Ethiopia.

Additive substances like coffee, salt, honey, butter and oils are necessary while preparing some plant remedies. Manipulations of such additives were also being practiced elsewhere in Ethiopia (Mirutse, 1999 and Endalew, 2007). The substances improve the flavor and reduce the adverse effects of remedies and reduce the possibility of vomiting and abdominal discomfort due to some heavier remedies and improve the healing power of remedies.

## Route of application and dosage of remedies in treatment of human disease

Oral and Dermal (topical) are the major routes of administration of plant remedies. Accordingly, 50% of preparations are taken orally followed by dermal or topical way sharing 32% of preparations (Figure 4). Similarly, Debela Hunde et al. (2004), Kebu et al. (2004), Endalew (2007), Haile and Delenasaw (2007) and Ermias et al. (2008) have reported oral r oute to be the major route followed by dermal application.

The effectiveness of a given medication also depends

**Table 4.** Lists of major human diseases and the corresponding medicinal plant species used by the indigenous people of Tehuledere district (NB: # = number).

| Diseases (injuries) | Med. plants (#) | Diseases (injuries) | Med. plants (#) |
|---|---|---|---|
| Stomach complaints | 25 | Swelling | 3 |
| 'Devil' disease | 10 | Tonsillitis | 3 |
| Diarrhea | 9 | Ascaries | 2 |
| Eczema | 8 | Miscarry (abortion) | 2 |
| Hepatitis | 7 | Infection on swelling | 2 |
| Herpes zoster | 7 | Toothache | 2 |
| Febrile (fever) | 6 | Fire damage (scar) | 2 |
| Malaria | 6 | Bloody diarrhea | 2 |
| Hemorrhoid | 6 | Broken leg/hand | 2 |
| 'Evil eye' | 5 | Eye disease | 2 |
| Erectile dysfunction (Impotence) | 5 | Pustular psoriasis | 2 |
| Bleeding | 5 | Wart | 1 |
| Snake biting | 5 | Urine retention problem | 1 |
| Ringworm (*Tinea corporis*) | 4 | Boil | 1 |
| Cough | 4 | Athlete's foot (Tinea pedis) | 1 |
| Wound sore | 4 | Allergic | 1 |
| Tinea versicolor | 4 | Alopecia areata | 1 |
| Common cold | 3 | Arthritis (psoriatic) | 1 |
| Headache | 3 | Stroke (syncope) | 1 |
| Face fungus (*Tinea faciei*) | 3 | Gonorrhea | 1 |
| Favus (honeycomb) | 3 | Itching | 1 |
| Placental retention (delay) | 3 | Pregnancy | 1 |
| Rheumatic | 3 | Thorn inside body | 1 |

up on the dosage to be administered. For instance about 31% preparations are taken with known dosages mostly quantified by spoon, cup of tea, palm and other equipment. The majority plant remedies (69%), however, are taken with no fixed dosage. Ermias et al. (2008) have reported the existence of such dosage quantifica-tions in Mana Angetu district. The quantification, in fact, depends up on the type of preparations and diseases to treat. In most instances, dosages with ½ to 3 cups of tea are the common quantity of medication taken through oral route of application, while ½ -1 spoonful powdered remedies are prescribed for dermal (topical) application. Similarly, Dawit and Ahadu (1993), Etana (2007) and other researchers have reported the absence of fixed dosage in a treatment of ailments traditionally. When seen altogether, the limitation of a fixed dosage for a given preparation is the existent problem of traditional medicinal plant remedies in various parts of the world in general and in Ethiopia in particular.

## Major human diseases and the corresponding number of plant species used

A total of 46 human disease and health defects (like Injuries), which are treated using ninety nine plant species, are documented in the study area. Of these, 34 ailments (74%) are treated using two or more medicinal plant species while 12 ailments (26%) are treated using only one plant species (Table 4). Accordingly, stomach complaint or distention is treated using large number of medicinal plants (25 species) followed by 'devil' disease which is believed to be treated by ten species, diarrhea using nine plant specie and Eczema by eight species (Table 4). This reveals that a given medicinal plant (s) could be used for treatment of several human ailments. The treatment of ailment (s) using different plant species is owing to the frequent occurrence of the disease (s) and the ease accessibility of medicinal plants to treat the ailment (s).

## Medicinal plant species used to treat livestock disease problems

A total of 19 plant species (18%) are found to be used in the treatment of livestock diseases. Of these 15 species serve as major sources of ethnoveternary medicine while the other four species are supporting plants that are mixed with some major medicinal plants. The species are distributed in 18 genera and 16 families in which families Solanaceae and Euphorbiaceae consisted of 3 and 2

**Table 5.** Method of preparations of medicinal plants by the local people for treatment of livestock ailments (note: DCP= dried, crushed and pounded).

| Form or methods of preparation | | Frequency | %age |
|---|---|---|---|
| Used alone | Crushed | 1 | 7 |
| | Pounded/grinded | 1 | 7 |
| | Single decoction | 1 | 7 |
| | DCP and Homogenized with water | 2 | 14 |
| Mixed | Concoction | 9 | 58 |
| | Mixed decoction | 1 | 7 |

species respectively, while families Rubiaceae, Cucurbitaceae, Compositae, Crassulaceae, Rhamnaceae, Lamiaceae, Vitaceae, Phytolacaceae, Verbenaceae, Scropholariaceae, Sapindaceae, Liliaceae, Cupressaceae and Cruciferae were represented by 1 species (5% each).

The majority of these plant species (8 species, 47%) are harvested from wild vegetation while six species (32%) are cultivated in either home garden or farming lands. The rest four are found to be both cultivated and wild forms. On the other aspects, growth form analysis depicts that eight plants (42%) take herbaceous habit while seven plants (37%) have shrubby growth form and tree possessing three plants. These findings disagree with the study by made by Etana (2007) where shrubs take the larger proportion followed by herbs and trees in Gimbi Wereda, Westerm Wellega. Moreover, trees followed by herbs then shrubs and climbers were reported in Ejaji area by Endalew (2007).

## Plant parts used and method of preparation of plant remedies for treatment of livestock diseases

Leaves were the largest proportion of plant part used proportion. Accordingly, about six preparations are made from leaves of nine plants (48%) either alone or mixed with others while other five preparations are made from roots of five plant species (26%). In addition to these, plant parts such as seed (11%) and bark (wood), fruit and SBT (stem or bulb or tuber) make 5% each. Preparation of plant remedies using leaves is found to be easier and faster than preparation using roots. However, this finding contrasts the reports of Debela (2001), Kebu et al. (2004) and Endalew (2007) where roots takeover the highest frequency followed by preparations from leaves.

The most frequently applied forms of preparations in ethnovternary medicine include concoction (9 preparations, 58%), DCP and homogenizing in water and decoction (single + mixed) (2 preparations, 14% each) (Table 5). According to Endalew (2007) pounding is the most frequent mode of preparation followed by powdering in Ejaji area (Chelya Wereda). In a different study by Ermias et al. (2008) crushing and homogenizing in water were the highest proportions followed by concoction and powdering in Mana Angetu district. This actually is the reflection of the variation of medicinal plant knowledge and practices of different ethnic groups of different ecological areas.

## Rout of application and dosage of remedies in treatment of livestock diseases

There are four major routes of application (oral, nasal, ocular and dermal) of plant remedies commonly adopted for a total of fifteen preparations by indigenous people of the study area in the treatment of livestock diseases. Accordingly, 12 preparations (80%) are administered orally while 5 preparations (33%) follow nasal routs, 2 preparations (13%) via ocular and a preparation (7%) by dermal routes. This showed that some preparations were found to be taken by more than one route that analysis was based up on. In this regard, Endalew (2007) and Ermias et al. (2008) in their studies have found out that most preparations are manipulated via oral route in treating livestock. But, in this study, anal and other types of routes mentioned previous sections are not common while treating livestock.

## Medicinal plant knowledge versus level of age

In most studies, it is found that traditional medicinal knowledge increase with age. Similarly, in this study the Pearson correlation coefficient ($r = 0.94$) test, calculated from Table 6, showed the existence of high degree and positive association between age and the number of medicinal plant citations.

Analysis of t-test for population correlation coefficient at 5% level of significance and 3 degree of freedom ($Df = n-2$, $n = 5$) indicates the presence of significant correlation, that is, the increase in age the greater the medicinal plant knowledge. Since the t-calculated value is greater than the t-critical one, it falls in the critical region that there is enough evidence to argue the presence of

**Table 6.** Age classes of informants and average medicinal plants reported in Tehuledere district.

| Age range | Mid- points (X) | Average med. plants cited (Y) | XY | $X^2$ | $Y^2$ |
|---|---|---|---|---|---|
| 16-30 | 23 | 8.0 | 184.0 | 529 | 64.00 |
| 31-45 | 38 | 8.7 | 330.6 | 1444 | 75.69 |
| 46-60 | 53 | 8.7 | 461.0 | 2809 | 75.69 |
| 61-75 | 68 | 10.8 | 737.4 | 4624 | 116.64 |
| 76-90 | 83 | 13.3 | 1103.0 | 6889 | 176.89 |
| Total | 265 | 49.5 | 2817 | 16295 | 508.9 |

Note: From the above table, t calculated for population correlation coefficient (p) is 22.7, and t critical, at 5% level of significance and 3 degree of freedom (Df= n-2, n=5), is 3.18. This indicates the presence of significant correlation; the increase in age the greater the medicinal plant knowledge possession. Since the t-calculated is greater than the t-critical there is enough evidence to reject the null hypothesis (Ho) of no correlation.

**Table 7.** Preference ranking of eight selected medicinal plants on the degree of healing several ailments by key respondents (NB: R= respondent).

| Species | Respondents | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | R6 | R11 | R28 | R44 | R50 | R54 | R55 | Total | Position (mean) | Rank |
| *Allium sativum* (Liliaceae) | 7 | 8 | 8 | 7 | 8 | 8 | 8 | 54 | 1.3 | 1st |
| *Ruta chalepensis* (Rutaceae) | 1 | 3 | 2 | 1 | 4 | 5 | 2 | 18 | 6.43 | 7th |
| *Nigella sativa* (Ranunculaceae) | 8 | 7 | 6 | 8 | 7 | 7 | 7 | 50 | 1.86 | 2nd |
| *Zingiber officinale (*Zingiberaceae) | 2 | 1 | 3 | 2 | 3 | 4 | 1 | 16 | 6.71 | 8th |
| *Clutia abyssinica* (Euphorbiaceae) | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 37 | 3.71 | 3rd |
| *Adhatoda schimperiana* (Acanthaceae) | 3 | 4 | 7 | 6 | 5 | 3 | 4 | 32 | 4.43 | 4th |
| *Verbena officinalis* (Verbenaceae) | 5 | 6 | 4 | 3 | 1 | 2 | 5 | 26 | 5.3 | 5th |
| *Carica papaya* (Caricaceae) | 6 | 2 | 1 | 4 | 2 | 1 | 3 | 19 | 6.3 | 6th |

high correlation between age and medicinal plants knowledge. However, Haile and Delenasaw (2007) have reported the absence of such a correlation between age of traditional healers and number of medicinal plants reported in Sekoru district, Jimma zone.

## Preference and direct matrix ranking

Plant species of various types are used for the treatment of different aliments. In such cases, indigenous people show preference towards plant species on the basis of their healing power against a given disease. Preference ranking performed by key informants for eight selected plant species on the basis of treating several diseases showed that *Allium sativum* is the most preferred one followed by *Nigella sativa* (Table 7).

Medicinal plant species that are utilized for multiple purposes can be analyzed through direct matrix. In this study, eleven multipurpose species were selected out of the total medicinal plants and eight use-categories were listed for 8 selected key informants to assign use values to each species. Accordingly, *Cordia africana* is found to be highly used by the local community for multiple purposes, followed by *Ziziphus spina-christi*, *Eucalyptus globulus* and *Juniperus procera* at 2nd, 3rd and 4th positions, respectively (Table 8). However, the intensive utilization of these plant species for multiple uses renders the scarcity of the species from the locality.

## Fidelity level index

Analysis of percentage of informants (Table 9) claiming the uses of a certain plant species for the same major purposes showed *Carica papaya* and *Clutia sp.* (Alashume) to have high medicinal value against malaria and diarrhea, respectively (Table 9). Hence, informant consensus could not be taken as the sole measure of the potential efficacy of any medicinal plant in fidelity level index analysis. For example, *A. sativum*, being reported by 54% of informants, with FL value of 0.50 is found to be the second species used in the treatment of malaria next to *C. papaya*. In the contrary, Endalew (2007) has reported *A. sativum* to be the prior plant species used for treating malaria in Ejaji area.

## Conclusion

The communities of Tehuledere district commonly use medicinal plants and some animals derived remedies

**Table 8.** Mean scores for direct matrix analysis of selected medicinal plants based on a general use-value (Key: 5 = Best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used).

| Species | Use-categories | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Medicine | Food | Fencing | Forage | Fire wood | Charcoal | Construction | Furniture | Total | Rank |
| *Eucalyptus globulus Lobill.* (Myrtaceae) | 4 | 0 | 3 | 1 | 4 | 2 | 5 | 4 | 23 | 3rd |
| *Croton macrostachyus Hochst.* (Euphorbiaceae) | 4 | 0 | 3 | 2 | 3 | 0 | 3 | 3 | 18 | 7th |
| *Ocimum lamiifolium Hochst. ex. Benth* (Labiatae) | 4 | 0 | 2 | 1 | 3 | 1 | 1 | 0 | 12 | 10th |
| *Piper nigrum L*.(Piperaceae) | 3 | 0 | 3 | 1 | 3 | 0 | 3 | 3 | 16 | 8th |
| *Ziziphus spina-christi* (L.) Desf. (Rhamnaceae) | 3 | 2 | 3 | 2 | 4 | 3 | 4 | 4 | 25 | 2nd |
| *Pterolobium stellatum Forssk* (Fabaceae) | 3 | 0 | 5 | 2 | 3 | 1 | 1 | 0 | 15 | 9th |
| *Ocimum sauve Willd. (*Labiatae*)* | 4 | 0 | 2 | 1 | 3 | 1 | 1 | 0 | 12 | 10th |
| *Cordia africana* (Boraginaceae) | 3 | 2 | 3 | 3 | 4 | 2 | 4 | 5 | 26 | 1st |
| *Ficus carica L*. (Moraceae) | 4 | 0 | 3 | 3 | 3 | 2 | 3 | 2 | 20 | 5th |
| *Carissa edulis vahl*. (Apocynaceae) | 3 | 3 | 4 | 3 | 3 | 2 | 1 | 0 | 19 | 6th |
| *Juniperus procera Hochst.* (Cupressaceae) | 4 | 0 | 4 | 1 | 4 | 1 | 4 | 4 | 22 | 4th |

**Table 9.** Fidelity level index for plant species used to treat malaria and diarrhea in the study area.

| Ailments | Percentage of informants | Species | Np | N | Fidelity index (Np/N) |
|---|---|---|---|---|---|
| Malaria | 54 | *Allium sativum* | 18 | 36 | 0.50 |
| | 9 | *Carica papaya* | 5 | 6 | 0.80 |
| | 6 | *Clutia abyssinica* | 1 | 4 | 0.25 |
| | 7 | *Adhatoda schimperiana* | 1 | 5 | 0.20 |
| Diarrhea | 42 | *Ocimum lamiifolium* | 12 | 28 | 0.43 |
| | 9 | *Clutia sp.* (Alashume) | 3 | 6 | 0.50 |
| | 9 | *C. papaya* | 1 | 6 | 0.20 |

for maintaining their primary healthcare. The indigenous knowledge exhibited significant increment with age but not with educational level. A total of 105 medicinal plants used for treating human and livestock disease were documented despite all the Kebeles of the district were not explored. The existence and utilization of diversity of plant species for medicinal purpose attributes to the still reliance of local people on traditional medicine as their central healthcare system. The majority plant species recorded in the district are found to be used in other parts of the country too that shows their potential efficacy. The majority of species are herbs followed by shrubs and trees. Leaves followed by roots are the dominant plant parts used for preparation of most remedies, while the great numbers of remedies are prepared in concoction form. The larger proportions of remedies are administered for internal ailments through oral route, while external infections are treated commonly using dermal route.

Additive substances like honey, salt, coffee, sugar and butter are common which could minimize vomiting and inflammation as part of the side effect of remedies. Despite of all these, the future existence of medicinal plants resource and the associate knowledge is under question because of the ongoing practice of deforestation, agricultural encroachments, over exploitation or unwise use of plant resources and over grazing, and the frequent occurrence of drought. So, *in-situ* and *ex-situ* conservation strategies of medicinal plants should be adopted and implemented in the district by training (educating and awareness creating) the practitioners; and the local government should organize medicinal practitioners in association in such way that their valuable knowledge can be used along with modern medicines.

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### REFERENCES

Alexiades MN (1996). Collecting ethnobotanical data: An introduction to basic concepts and techniques. In: *Selected Guidelines for Ethnobotanical Research*: *A Field Manual*. The New York Botanical Garden, Bronx, New York.

Cotton CM (1996). *Ethnobotany: principle and application*. John Wiley and sons Ltd., West Sussex, England.

Dawit A (2001). The role of medicinal plants in healthcare coverage of Ethiopia, the possible benefits of integration. In: Proceedings of the national workshop on Biodiversity conservation and sustainable use of medicinal plants in Ethiopia, 23 April-1 May 1998 (Medihin Zewdu and Abebe Demisse, eds.), IBRC, A.A, Ethiopia.

Dawit A, Ahadu A (1993). Medicinal plants and enigmatic health practices of Northern Ethiopia, BSPE, A.A, Ethiopia.

Dawit A, Asfaw D, Kelbessa U (2003). Medicinal plants and other useful plants of Ethiopia: Illustrated checklist. EHNRI, A.A, Ethiopia.

Debela H (2001). Use and Management of traditional medicinal plants by indigenous people of “Boosat” Wereda Welenchiti area: An ethnobotanical approach. A.A, Ethiopia.

Debela H, Zemede A, Ensermu K (2004). Use and Management of ethnoveternary medicinal plants used by indigenous people in “Boosat”, Welenchiti area. Ethiop. J. Biol. Sci., 3(2): 113-132.

Edwards S, Mesfin T, Hedberg I (1995). Flora of Ethiopia and Eritrea, Vol. 2(2), *Canellaceae to Euphorbiaceae*. The National Herbarium, AAU, Addis Ababa and Uppsala.

Endalew A (2007). Use and management of medicinal plants by indigenous people of Ejaji area (Chelya Woreda), West Shoa, Ethiopia: An ethnobotanical approach. MSc thesis, AAU, Ethiopia.

Ermias L, Kelbessa E, Bekele T, Haile Y (2008). An Ethnobotanical study of medicinal plants in Mana Angetu District, southeast Ethiopia. J. Ethnobiol. Ethnomed., 4(10): licensee Biomed central Ltd: http://www.ethnobiomed.com/content/4/1/10, accessed in March, 2009.

Etana T (2007). Use and conservation of traditional medicinal plants by indigenous people in Gimbi Woreda, Western Wellega, Ethiopia, MSc thesis, AAU, Ethiopia.

Haile Y, Delenasaw Y (2007). Traditional medicinal plant knowledge and use by local healers in Sekoru District, Jimma Zone, southwest. Ethiop. J. Ethnobiol. Ethnomed., 3(24): licensee Biomed Central ltd.

Hedberg I, Edwards S (1989). *Flora of Ethiopia, Vol.* 3*, Pittosporaceae to Araliacae*. The National Herbarium, AAU, Addis Ababa and Uppsala.

Hedberg I, Edwards S, Sileshi N (2003). Flora of Ethiopia and Eritrea, 4(2): *Apiaceae to Dipsaceae*. The National Herbarium, AAU, Addis Ababa and Uppsala.

Kebu B, Ensermu K, Zemede A (2004). Indigenous medicinal plants utilization, Management and threats in Fentalle Area, Eastern Shewa, Ethiop. J. Biol. Sci., 3(1): 37-58.

Martin GJ (1995). *Ethnobotany: A method manual.* Royal botanical garden, Chapman and Hall, Kew, London.

Mesfin T (2004). Asteraceae (Compositae). In: (Hedberg I., Friis I., Edwards S., eds.) *Flora of Ethiopia and Eritrea*, 4(1). The National Herbarium, AAU, Addis Ababa and Uppsala.

Mesfin T, Debela H, Yehenew G (2005). Survey of medicinal plants used to treat human diseases in Seka Chekorsa, Jimma Zone, Ethiopia. Ethiop. J. Health Sci., 15(2): 89-106.

Mirutse G (1999). An Ethnobotanical study of Medicinal Plants Used by Zay People in Ethiopia. MSc thesis, Uppsala, Sweden.

Slikkerveer LJ (1990). Plural medical system in the Horn of Africa: The legacy of “Sheik” Hippocrates. London and New York: Kegan- Paul International.

Tesfaye S, Kaleab A, Tsige G (2006). Ethnobotanical and Ethnopharmaceutical studies on medicinal plants of Chifra district, Afar Region, Northeast Ethiopia. Ethiop. Pharm. J., 24: 41-58.