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# Ethnobotanical Study of Traditional Medicinal Plants in Adami Tulu Jido Kombolcha District, Oromia, Ethiopia

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**Ethiopia has rich flora with different plant species having use in health care system based on local indigenous. In this study, plants of traditional medicinal use and their associated indigenous knowledge in Adami Tulu Jido Kombolcha were investigated. Total of 100 informants (age≥25) were selected to collect information on medicinal plant use from three sampled kebeles. Of these, 20 key informants were selected purposively based on recommendation by local elders and authorities. Ethnobotanical data were gathered using semi-structured interviews, field observations and group discussions with local traditional medicine practitioners. Data were analyzed using descriptive statistics. More over Jaccard similarity index, informant consensus factor, fidelity level, preference ranking and direct matrix ranking were computed. Ethnomedicinal use of 89 plant species distributed in 81 genera and 47 families was documented. Highest number of species (6) was under family Fabaceae, Asteraceae, Euphorbiaceae and Solanaceae. Habit wise, 38.2% were herbs followed by shrubs (32.5%) tree species (22.8%) and climbers (3.3%). Plants were used mostly in fresh for remedy preparation. The most widely used method of preparation were pounding (44.1%),crushing (26.4%) and cooking/boiling (19.5%), were the major remedy preparation methods reported. Route of administration mainly oral followed by dermal. Malaria and headache, intestinal parasite, diarrhea, amoebiasis, and stomach ache and common cold and cough had the highest ICF value ≥ 90. Therefore, biochemical profiles of plant species used for diseases categories of high ICF should be investigated for screening of the active principles.**

***Key words*:** Ethnobotany, Indigenous knowledge, Informant Consensus Factor, Traditional medicine

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## INTRODUCTION

Ethnobotany is the study of how people of a particular culture and religion make use of indigenous plants. It accounts for the study of the relationship between people and plants for their use as medicines, food, shelter, clothing, fuel, fodder and other household purposes (Samar *et al.,* 2015). In Africa, up to 80% of the population uses traditional medicine to help meet their health care needs (Yayesh *et al.,* 2015). Traditional medicines of plant origin are less costly than modern medication (Mekonen, 1990; Tesema *et al*., 2003). The current account of medicinal plants use of Ethiopia shows that about 887 plant species are reported to be utilized in

the traditional medicine (Tesema *et al*., 2002). Among these, about 26 species are endemic and they are becoming increasingly rare and rare at the verge of extinction.

Documentation of ethnobotanical knowledge on medicinal plants is basic for conservation and community developments. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of new drugs (Wright, 2005). Despite the agro-ecological and cultural diversity of the country, the documentation of medicinal plants and associated indigenous knowledge appears incomplete (Vechiato, 1993; cited in Mesfin *et al*., 2005). Most of the reviewed literatures show that studies on medicinal plants of Ethiopia have so far concentrated in parts of the south and south-west (Dula, 2013; Yibrah, 2014; Kidane *et al*., 2014; Birhanu *et al*., 2015) of the country. However, there is no much study in western part of Ethiopia, and particularly no documented study is found from Adami Tulu Jido Kombolcha District of Oromia Region, Ethiopia, suggesting that there is still a gap in our knowledge about ethnobotanical data on medicinal plants from various parts of Ethiopia, although we have rich and diverse ethnolingustic groups throughout the country (Engdasew *et al.,* 2015). According to Pankhurst (2001), detailed information on the medicinal plant could only be obtained when studies are taking place in the various areas of the country to include places where little or no botanical and ethnobotanical explorations have been made. Among rural Oromo communities of ATJK District as would be the case elsewhere, traditional medication is believed to be an important health care system, which mainly involves the use of locally available medicinal plants. However, such knowledge and practices, and plant resources may be threatened due to anthropogenic and other natural factors. Thus, concerted ethnobotanical research plays a vital role to draw information on plants and related indigenous knowledge for conservation and sustainable utilization. This study was, therefore, designed to conduct ethnobotanical investigation on medicinal plants used by peoples of Adami Tulu Jido Kombolcha district to treat human and livestock ailments.

## MATERIALS AND METHODS

### Description of the Study Area

### Geographical Location

Adami Tulu Jido Kombolcha (ATJK) District lies between 7°35”-8°05” north and 38°20”-38°55” east in the northern part of the Rift Valley. It is bordered to the North by Dugda Bora District, in the west by Southern Nations Nationalities Peoples Region (SNNPR), Arsi Negelle to the south and Arsi zone to the East. Batu is the capital city of the District, which is 160 km away from Addis Ababa and 40 km from ASLNP.

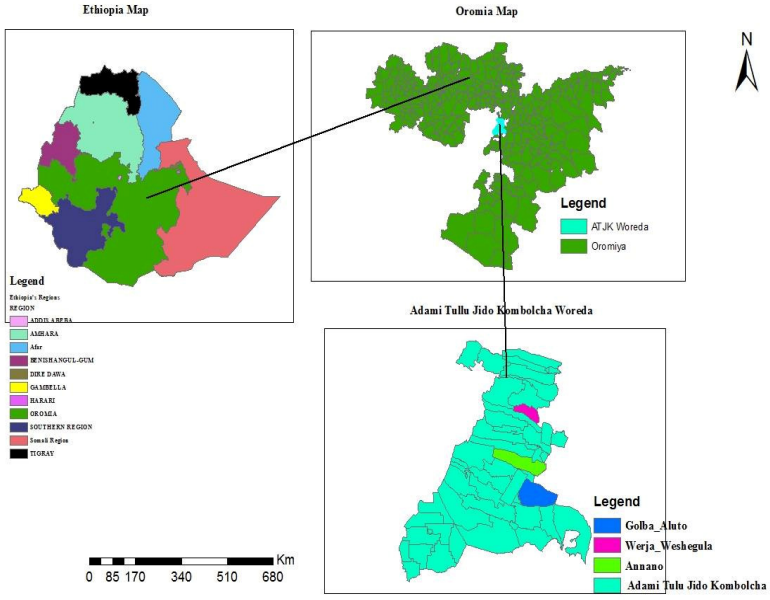


**Figure 1.** Map of the Study Area

**Topography and climate**

The area is characterized by plain and flat lands of volcanic origin with small mountains, hills and gorges extending from the most northern part of Central Rift Valley. The altitude ranges from 1500-2300 m.a.s.l. Adami Tulu Jido Kombolcha District has semi-arid and arid agro-climate zones. The District receives an average annual rainfall of 760 mm. The mean monthly temperature varies from 18.5$^{o}$C to 21.6$^{o}$C with mean annual temperature of 20$^{o}$C. Rainfall extends from February to September with a dry period in May to June, which separates the preceding short rains from the following long rains. The pH of soil is 7.88 fine sandy loams with sandy clay in proportion of 34, 48 and 18%, respectively (Adami Tulu Agricultural Research Center profile, 2004).

**Vegetation**

The vegetation of the area is categorized as tropical savannah dominated with Acacia species. Acacia trees are dominant and important means of livelihood for the local people.

**Population**

According to the District agriculture and rural development office, the total population of the District is estimated at 164,321 for the year 2006 (computed from 1994 CSA population and housing census which accounts a 3% population increase every year) of which 14.5% urban and 85.5% rural dwellers. The average household size was 4.6 with 4.9 and 4.2 for rural and urban areas, respectively. The population density was 99 persons per square kilometer (CSA, 2012). With regard to ethnic and religious composition 78.7% are Oromos, 21.3% are other ethnic groups. Muslims are 72.4%, 27.4% Christian and 0.2% others.

**Reconnaissance Survey and Selection of Study Sites**

Adami Tulu Jido Kombolcha district has 38 kebeles. Reconnaissance survey was conducted from July 27 to 30 to select three potential kebeles, which included; Worja woshgullaa, Annanno and Golba alluto for ethnobotanical data collections.
These kebeles were selected based on the availability of traditional medicine practitioners, traditional medicine use history, and altitudinal variation between kebeles.

**Ethno botanical Data Collection**

Prior to Ethnobotanical data collection, respondents were selected from the selected kebeles. Totally, 100 respondents (aged ≥25) 80 ordinary (non-traditional healers) residents and 20 key informants (traditional healers) were participated in this study. Key informants (traditional healers) were selected by purposive sampling from the study kebeles based on the information gathered from the local people while other 80 respondents were randomly selected. Ethnobotanical data were collected between August, 2017 and October, 2017 on two field trips made to the sites. Data collection methods were through semi-structured questionnaires and interviews, group discussions and guided field walks with key informants (traditional healers) for field observations. Key informants were first interviewed individually to mention about the local names of the plants they use to treat diseases, diseases treated, part(s) of plants used, methods of gathering, methods of preparation of remedies, route of administration of remedies, application of the remedies, dosage, side effects of the treatment, use of the plants other than medicine, types of threat and conservation problems. Thereafter, group discussions were made with them based on the checklist of questions and asked for field walk for *on site* observation of the plants. Similar procedure was also applied with randomly selected non-practitioners of traditional medicine. Voucher specimens were collected, pressed, and dried for identification. For some species, preliminary identification was done in the field using keys and illustrations. In addition, further identification of all specimens was done by comparison with authentic specimens, illustrations and taxonomic keys from Flora of Ethiopia and Eritrea, and with assistance of experts of Haramaya University. The identified specimens were deposited in Haramaya University Herbarium.

**Data Analysis**

A descriptive statistical method (e.g., percentage and/or frequency) was employed to summarize ethnobotanical data.

**Jaccard's similarity index (JI)**

Jaccard's similarity index was calculated to compare similarity of medicinal plant knowledge between kebeles of different altitude. For this, presence of a given plant species and its utility as medicine or its absence/not considered as medicine are used as data sets.

$$JI = \frac{c}{a + b + c}$$

*Where* JI is the Jaccard similarity index, 'c' is the number of species shared by the study sites, 'a' is the number of species in study site A only and 'b' is the number of species in study site B only. The JI values range between 0 and 1, whereby a value of 1 indicates complete similarity.

**Informant consensus factor (ICF)**

Informant consensus factor was calculated for categories of ailments to identify the agreements of the informants on the reported cures using the formula used by (Rodrigo *et al*., 2005). ICF was calculated as follows: number of use citations for each ailment (nur) minus the number of species used (nt) for that ailment, divided by the number of use citations for each ailment minus one.

$$\mathbf{ICF} = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

**Fidelity level**

The fidelity level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was also calculated for the most frequently reported diseases or ailments using the following equation (Teklehaymanot,2007).

$$\mathbf{FL(\%)} = \frac{NP}{N} x100$$

*Where* Np is the number of informants that claim the use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

**Preference ranking**

Preference ranking is used to compare the most effective medicinal plants used by the community to treat the particular disease. Preference ranking was conducted following Martin (1995) and Cotton (1996) for six most important medicinal plants used in treating bloating, as traditional healers treat it usually. For this, ten informants were selected to identify the best preferred medicinal plant species for treatment of the illness. Each informant was provided with six medicinal plants reported to cure Bloating with leaves of medicinal plant used being paper tagged then asked to assign the highest value (6) for the most preferred species against the illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining one. The value of each species was summed up and the rank for each species was determined based on the total score. This helps to indicate the rank order of the most effective medicinal plants used by the community to treat the disease.

**Direct Matrix Ranking**

Direct matrix ranking exercise was done following Martin (1995) and Cotton (1996) to compare multipurpose use of a given species and to relate this to the extent of its utilization versus its dominance. Based on information gathered from informants, multipurpose tree species was selected out of the total medicinal plants and use diversities of these plants were listed for selected key informant to assign use value to each species. Each key informants was asked to assign use values (5=best, 4=very good, 3=good, 2=less used, 1= least used, and 0=not used). Accordingly, each key informants use values for the selected multipurpose medicinal plant species, average value of each use diversity for a species was taken and the values of each species was summed up and ranked.

## RESULTS AND DISCUSSION

**Some Socio-Demographic Data of the Respondents**

Based on degree of responsibilities to care for family health and assumed accumulation of traditional knowledge of the Oromo community, which is the largest inhabitants of the study area, respondents were categorized into three age classes. Age distribution of informants shows that the majority (48%) are between 41 and 60 years of age followed by 25-40 (40%) and >60 (12%). Marriage wise, 93% of the respondents were married, whereas 7% of them were unmarried. The majority (49%) of respondents had no formal education, whereas 24, 18 and 9% of them elementary school, high school and college level educations, respectively. Majority of the respondents 87% were males and 13% females. All the study participants were Oromos, 89% were Muslims and 11% Christians.

**Ethnomedicinal Plant Species Used By People of The Study Area**

A total of 89 species of medicinal plants used to treat 68 different health problems were gathered and documented from the study area. These plants belong to 81 genera and 47 families. Out of these plants, 51 species (57.3%) and 13 species (14.6%) were noted to treat only human and livestock ailments only, respectively while 25 species(24.5%) were used to treat both human and livestock ailments (Appendix 1). This suggests that local people of Adami Tulu Jido Kombolcha District practice traditional medicine of plant origin besides modern medicine. In terms of species composition, family Asteraceae, Fabaceae, Euphorbiaceae and Solanaceae each consisted of 6 species. The remaining families contained one to three species each (Appendix 1). Jaccard`s Similarity index (JI) was computed in order to see the degree of similarities between the surveyed kebeles in terms of the number of medicinal plant species reported. Result showed that respondents from Annanno

(1558 m) and Worja woshgulla (1492 m) kebeles reported the same 69 species with JI value of 1. The complete similarity between these two kebeles could be due to similarity in their environment. e.g., Altitude of Annanno (1558 m) and Worja woshgulla (1492 m) closer to one another and flow of information between the two kebeles residents about medicinal plants was the same.

The next higher similarity was observed between Golba alluto (1920 m) and Annanno (1558 m) kebeles with 50 common species (JI=0.88) in common. The least similarity was between Golba alluto and Worja woshgulla with 42 species in common (JI=0.56%). The least similarity between these two kebeles could be due to differences in their environment and flow of information between the two kebeles about medicinal plants was rare. The majority (39.3%) of medicinal plant species were obtained from wild followed by Home garden (32.5%), agricultural field (15.7%), live fence (8.9%), and road side (3.3%). The fact that high number of medicinal plant species was obtained from wild suggests that wilds are a good option to conserve medicinal plants in the study area.

Some plants were reported more frequently as medicinal plants than others to treat various ailments. For example, *Aloe macrocarpa* L. was cited by 75% of the respondents as a source of remedy for treating different internal parasites for both livestock and humans followed by *Carissa spinarum* L. cited by 63% respondents for evil spirit, stabbing pain, gonorrhea and malaria; *Allium sativum* L. by 58% respondents to treat colds, evil eye, malaria and wounds; *Croton macrostachyus* L. by 51% respondents to treat Ascaris, gonorrhea, bloating, jaundice and stomachache; *Vernonia amygdalina* Del. by 48% respondents to treat internal parasites, jaundice and diarrhea; *Dodonean angustifolia* L. by 41% respondents to treat different internal parasites, ear wounds, lice and wounds and *Hypoestes forskaolii* L. by 37% respondents to treat diabetes, tonsillitis and bleeding (stopping of bleeding completely) (Table 1)

**Table 1.** Some of the medicinal plants cited most by informants

| Botanical Name of Medicinal Plants | No. of Informants | Percentage |
|---|---|---|
| *Aloe macrocarpa* Tod | 75 | 75.0 |
| *Carissa spinarum* L. | 63 | 63.0 |
| *Allium sativum* L. | 58 | 58.0 |
| *Croton macrostachyus* L. | 51 | 51.0 |
| *Vernonia amygdalina* Dell. | 48 | 48.0 |
| *Dodonean gustifolia* L. | 41 | 41.0 |
| *Hypoestes forskaolii* L. | 37 | 37.0 |
| *Calpurnia aurea* (Ait.)Benth | 35 | 35.0 |
| *Ocimum lamiifolium* Hochst. ex Benth. | 29 | 29.0 |
| *Melia azedarach* L. | 21 | 21.0 |

Of the 89 medicinal plants collected, majority are herbaceous followed by shrub, tree and climbers (Figure 2).This shows herbs and shrubs are most widely used medicinal plants of the study area. This may be due to the abundance of these habits in the study area compared to trees and climbers. Relatively high number of herbs and shrubs for medicinal purpose has also been reported previously by Alemayehu (2015) who studied medicinal plants of Ada'a District east Shoa zone.

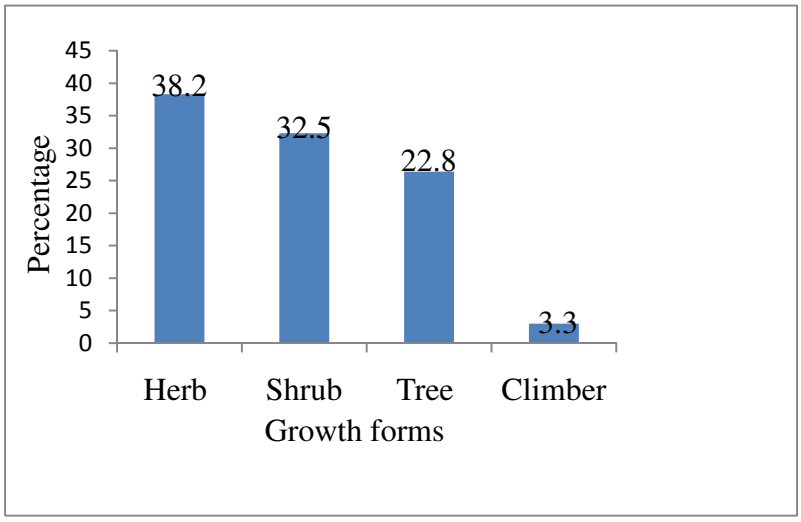


**Figure 2.** Growth forms of medicinal plants used for human and livestock ailments in the study

**Plant Part(s) Used For Medicine, Preparations Methods and Conditions**

Although different plants part were reported, the most cited plant part for remedy preparations was leaf followed by root, the whole part, seed and bark (Table 2). Other plant parts including fruit, bulb, stem, sap, latex were also reported (Table 2). This result agrees with some previous studies conducted in different parts of the country (e.g., Mirutse, 1999; Endalew, 2007; Jarrso, 2016, Mekonen 2013; Mulugeta, 2014). According to Dawit & Ahadu (1993), herbal preparation that involves roots, rhizomes, bulbs, barks, stems or whole parts have negative effects on the survival of the mother plants. In this study area use of root and entire plant part that require uprooting of plants will negatively affect their regeneration.

The same is true with collection of bark and seeds. Therefore, emphasis should be given not to excessively collect these plant parts in order to ensure their survival for future use.

**Table 2.** Plant parts used for traditional medicine preparations in Adami Tulu Jido Kombolcha District.

| Plant parts | Total responses | % of total |
|---|---|---|
| Leaf | 60 | 41.09 |
| Root | 33 | 22.60 |
| Seed | 15 | 10.27 |
| Bark | 15 | 10.27 |
| Stem | 6 | 4.10 |
| Fruit | 5 | 3.42 |
| Bulb | 4 | 2.73 |
| Sap | 3 | 2.05 |
| Latex | 2 | 1.36 |
| Flower | 2 | 1.36 |
| Whole part | 1 | 0.68 |
| Total | 146 | 100 |

Concerning the preparation of traditional medicine, the local people employ various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of disease treated and the actual site of the ailment. Pounding (44.1%), crushing (26.4%), cooking/boiling (19.5%), squeezing (6.8%) and smoking (2.9%) were the major remedy preparation methods reported. Preparations may involve using a single plant part or

mixtures of different organs of the same plant. For example, fresh fruit of *Citrus limon* and bulb of *Allium sativum* are pounded together and mixed with honey and eaten with bread to treat a stomachache. In this study, the local people also use some other products as additives in their preparations. For example, water, oil, sugar, salt, milk, honeys are some of the additives that the local people reported to be used to improve the flavor and reduce adverse effects such as vomiting and diarrhea so that the efficacy of the traditional medicine would be maintained or increased. Such additives were also reported by some previous researchers (Mulugeta, 2014; Semayat, 2017; Fitsum and Mebrahtom, 2017).

Most (63.43%) remedy preparations were reported to be from fresh plant materials while 23.13% and 13.43% of preparations were from dried and fresh/dried plant materials, respectively. Similarly, a study conducted by Teshale *et al*. (2004) in Borana, Oromia Regional State, south Western Ethiopia, showed that using fresh materials for different health problems is more than dry materials.

**Dosage, Route and Ways of Remedy Administration**

The dosage of medicine to be administered is given by rough estimation of the age and physical condition of the patient. Hence there is no precision on the dosage of the remedy. Dawit and Ahadu (1993) reported that lack of precision in the dosage is one of the major drawbacks of practicing traditional remedy. As regards to route of administration, include through oral, dermal, nasal, and others. Overall, oral administration was reported as a dominant route of administration (60.13%) followed by dermal route (34.64 %) (Figure 3) both oral and dermal routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power. This finding agrees with some previous reports (Kebu *et al*., 2004; Mulugeta, 2014).

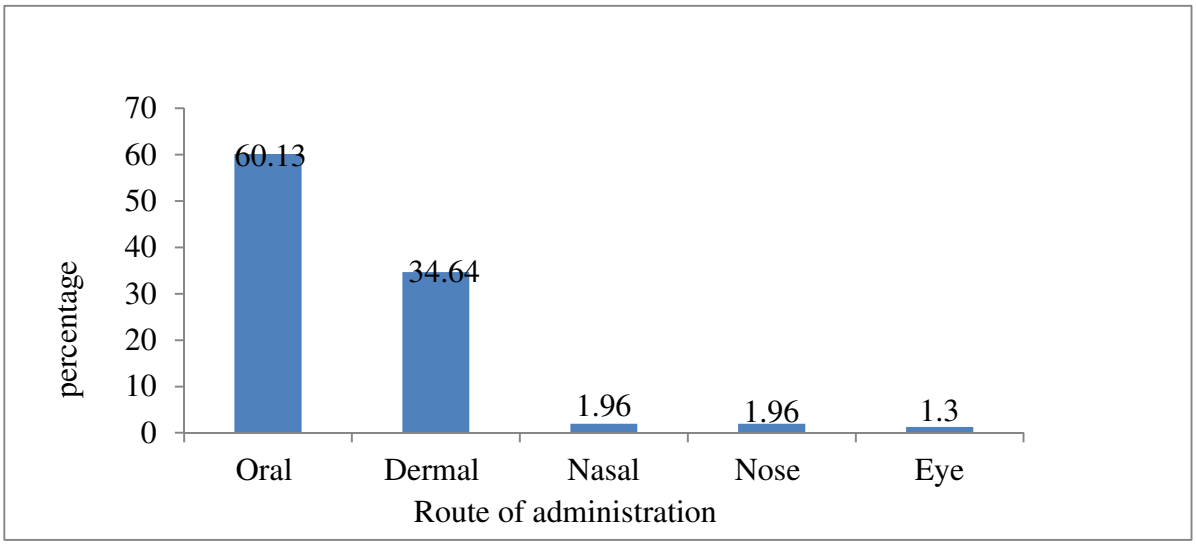


**Figure 3.** Percentage distribution of route of administration of plant remedies used for human and livestock.

**Ways of Applications of Plant Remedies**

The prepared traditional medicines are applied in a number of methods, among which drinking (41.66%), eating (20.37%), painting (7.40%), put on and tide (6.48%), smoking (5.55%), rubbing (4.62%),washing (4.62), holding on (3.70%), put on (2.77%), inserting (1.85%), and sniffing (1.85%), were mentioned. In this study, drinking and eating account for the largest percentage

**Informant Consensus Factor (ICF) and Fidelity Level**

| No. | Ways of Applications | Total Responses | Percentage (% ) |
|---|---|---|---|
| 1 | Drinking | 45 | 41.66 |
| 2 | Eating | 22 | 20.37 |
| 3 | Painting | 8 | 7.40 |
| 4 | Put on & Tide | 7 | 6.48 |
| 5 | Smoking | 6 | 5.55 |
| 6 | Rubbing | 5 | 4.62 |
| 7 | Washing | 5 | 4.62 |
| 8 | Holding on | 4 | 3.70 |
| 9 | Put on | 3 | 2.77 |
| 10 | Inserting | 2 | 1.85 |
| 11 | Sniffing | 2 | 1.85 |
| | Total | 108 | 100 |

The diseases of the study area have been grouped into different categories based on the site of incidence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. Analysis of ICF showed that values ranged from 0.77 to 0.93 for the diseases categories Of the disease categories, Malaria and head ache had the highest ICF value suggesting the common occurrence of these problems and agreement of the people on their remedy. It has been showed that medicinal plants that are effective in treating certain diseases and well known by community members have higher ICF values. Gonorrhea, kidney problem and Jaundice, had the lowest (0.77) ICF value, which may be due to the rare occurrence of these diseases.

Fidelity level (FL) is an index, which shows the specificity of a given plant to effectively treat a particular disease. Fidelity level was then calculated for some commonly used medicinal plants to treat ailments. Result showed that *Allium sativum* had the highest FL followed by *Buddleia polystachya*, *Vernonia amygdalina*, *Aloe macrocarpa*, *Calpurnia aurea, Citrus Limon*, *Brassica carinata* and *Croton macrostachyus*. The medicinal plants that are widely used by the local people to treat one or very few ailments have higher FL values than those that are less popular (Tilahun and Mirutse 2007; Mulugeta, 2014). High FL could also be an indication of efficiency of the reported plant to cure a specific ailment.

**Preference Ranking and Direct Matrix Ranking**

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of six medicinal plants that were reported for treating Bloating was conducted after selecting ten key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (6) for the medicinal plant which they thought most effective in treating Bloating and the lowest number (1) for the least effective plant in treating Bloating. *Aloe macrocarpa* scored 49 and ranked first indicating that it is the most effective in treating Bloating followed by *Capsicum annuum* and the least effective was *Cucurbita pepo* (Table 6)

In the study area, many medicinal plants were found to have different uses other than medicinal purpose. The major uses of plants reported were for firewood, charcoal making, construction, fencing, food, forage, furniture and medicine. The direct matrix ranking result showed that *Laggera tomentosa* ranked first followed by *Acacia etabaica, Acacia abyssinica, Cordia africana, Croton macrostachyus, Vernonia amygdalina, Dovyalis abyssinica, Carissa spinarum, Ficus sycomorus, Maytenus senegalensis* and *Olea europea*.This result indicates that *Laggera tomentosa* and *Acacia etabaica* appear to have more demand than the others as they are used for more diverse purposes. The direct matrix ranking result also shows that the local people harvest the 11 multipurpose plant species mainly for firewood followed by charcoal, fencing, medicinal purpose, furniture, construction, forage and food.

**Threats to Medicinal Plants and Indigenous Knowledge, and Conservation Efforts of Traditional Medicinal Plants**

Rural people need plants for their livelihood in different aspects. In this study several factors both human and natural were found to contribute to the threats that affect survival of medicinal plants species in the study area. From the interview with informants various factors were recorded as the main threats to medicinal plants in Adami Tulu Jido Kombolcha District. Agricultural encroachment, firewood collection, charcoal production, plant use for house and fence construction, overgrazing and urbanization were reported to be factors for the dwindling

of natural vegetation in general and medicinal plants in particular.

As a result, according to the respondents, the accessibility of medicinal plants has become less when compared to the previous times.

Traditional healers also keep their knowledge on medicinal plants for the sake securing means of income and a cultural belief that telling information may make plants ineffective to cure the ailments. Similar findings were reported elsewhere (Abebe, 2017; Fassil, 2001; Mirutse and Gobena, 2003). However, it was recognized that ethnobotanical knowledge on uses of some medicinal plants is transmitted orally to one or few family members to use in secrecy. They disclose their knowledge on medicinal plants at old age by the time when they most probably die before teaching the details of medicinal plants or when they are too old to walk to the field to show the plants in their habitats. According to the respondents, access to modern medication has also contributing to the loss of indigenous knowledge as new generations give less attention to traditional medicinal plants. As a result the indigenous knowledge seems to be endangered in the study area.

Indigenous people of the study area practice some conservation measures. For instance, some medicinal plants are found in majority of household gardens and farm borders in the study area, as they need these plants in their daily life as medicine or for other values. Medicinal plants are also maintained or protected near vicinity due to their fragrance, as live fences to avoid enemies, as spices and for food. Plants are also left as remnants of forest in agricultural field due to their uses for construction, fuel wood and other values. Here, the intermixing of multi-purpose plant species by farmers on their farmland is evidence to management practices in the area. The healers conserved some medicinal plants by cultivated mixing with crops in agricultural field, planted in special places, such as, live fences of home gardens and fields.

## SUMMARY AND CONCLUSIONS

This study was conducted in Adami Tulu Jido Kombolcha District, Oromia, Ethiopia with the objective of documenting ethnomedicinal plants and indigenous knowledge on their use for medicine. Hundred respondents have participated in this study as respondents. Data on medicinal plants use were collected through semi-structured interviews, field observation, and group discussion and guided field walk. Totally 89 medicinal plant species treating human and livestock diseases were documented. Herbs were found to be the dominant growth forms used for the preparations of traditional remedies followed by shrubs. Leaves were the most frequently used plant parts followed by roots for preparation of remedies. The most commonly used route of administration was oral followed by dermal. The major threats to medicinal plants and the associated knowledge in the study area are firewood collection, charcoal production, agricultural expansion, uses of plants for construction and using plants for fencing and furniture. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, and influence of modern education are the major ones.

## RECOMMENDATIONS

Based on the finding of the study, the following recommendations are forwarded.

- In order to conserve medicinal plants and preserve indigenous knowledge, local people should be aware of cultivating medicinal plants in their home gardens mixing with crops and as live fences;
- Encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives;
- Attention should be given to standardization of measurement and hygiene of the medicines made from plants by training both the healers and other members of the local community;
- Biochemical profiles of plant species used for diseases categories of high ICF should be investigated for screening of the active principles.

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