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Ethnobotanical study of medicinal plants in Dedo District, Jimma Zone, Southwest Ethiopia

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Abstract

The study was conducted to assess medicinal plants and associated indigenous knowledge in Dedo District, Jimma Zone, Southwest Ethiopia. Fifty informants (30 males and 20 females) were selected from six villages. Out of these, 10 key informants (nine males and one females) were purposely selected based on the recommendations of elders and local authorities. Other 40 informants were selected randomly. Data were collected using semi-structured interview and field observation. Preference ranking, paired comparison and fidelity level were calculated. Sixty six plant species belonging to 33 families were collected, identified and recorded for the treatment of human and livestock ailments. Leaf was the most frequently used plant part for treatment of human and livestock ailments. Pounding/powdering was the most widely used method of preparation of remedies. The common route of administration was oral (63.01%) followed by dermal (26%). People of the study area have preference for *Ruta chalepensis* for treatment of general body illness. *Nigella sativa* was the most preferred species by traditional healers for the treatment of stomach ache. The study showed that people of Dedo District use medicinal plants to treat human and livestock ailments. Therefore, the documented plants should be further investigated for their efficacy and safety to be integrated into conventional medicine. Furthermore these plants need to be conserved for their sustainable utilization.

Keywords: Dedo district, indigenous knowledge, medicinal plants, traditional healers

1. Introduction

Plants are integral parts of the life and culture of man from the time immemorial. In addition to fulfilling the primary needs of man (food, shelter and clothing) plants have been used in remedy preparation for curing various human ailments^[1]. Medicinal plants are rich sources of ingredients which can be used in drug development and synthesis. Nowadays, traditional medicine plays important role in daily healthcare practices and is even preferred to modern medicine because it is less expensive and more effective in treatment of specific ailments^[2]. Furthermore, human life is directly integrated with plants and traditional medicine through healthcare practices^[3].

In use of traditional medicine as a base for the maintenance of good health has been widely observed^[4]. Natural products, mainly plants are the bases of traditional medicine^[5]. In Africa, up to 80% of the population uses traditional medicine for primary healthcare^[3]. Similarly, in Ethiopia, many species of plants have been used for treatment of different ailments for centuries^[6].

Like in any other rural communities of Ethiopia, the Oromo people of Dedo district have accumulated indigenous knowledge of traditional medicine to treat both human and livestock ailments. However, due to various anthropogenic activities such as habitat destruction, timber production, coal mining, agricultural activities and other geo-climatic factors, medicinal plant resources of the district are under threat. The knowledge of traditional medicine in the District is mostly in the mind of the old people and it has not been scientifically identified and documented so far. The objectives of this study were to: (1) assess medicinal plants and parts used to treat human and livestock ailments in Dedo District; (2) determine indigenous knowledge used for preparation and administration of traditional medicine

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2. Materials and Methods

2.1 Description of the study area

Dedo is one of the districts of Jimma Zone in Oromia Regional State, southwest Ethiopia. It is bordered by Konta, Tocha, Menjiwo and Gena Bosa districts in the south, Seka-chokorsa in

the west, Omo Nada in the east and Kersa in the north (Figure 1). According to [7], Dedo District has an estimated total population of 308,544 (male = 155,596, female = 152, 948). The annual rainfall of the district ranges from 400-1400 mm

depending on variation in elevation of the district. Oromo is the major ethnic group with the highest population while there are also some other ethnic groups with insignificant population size.

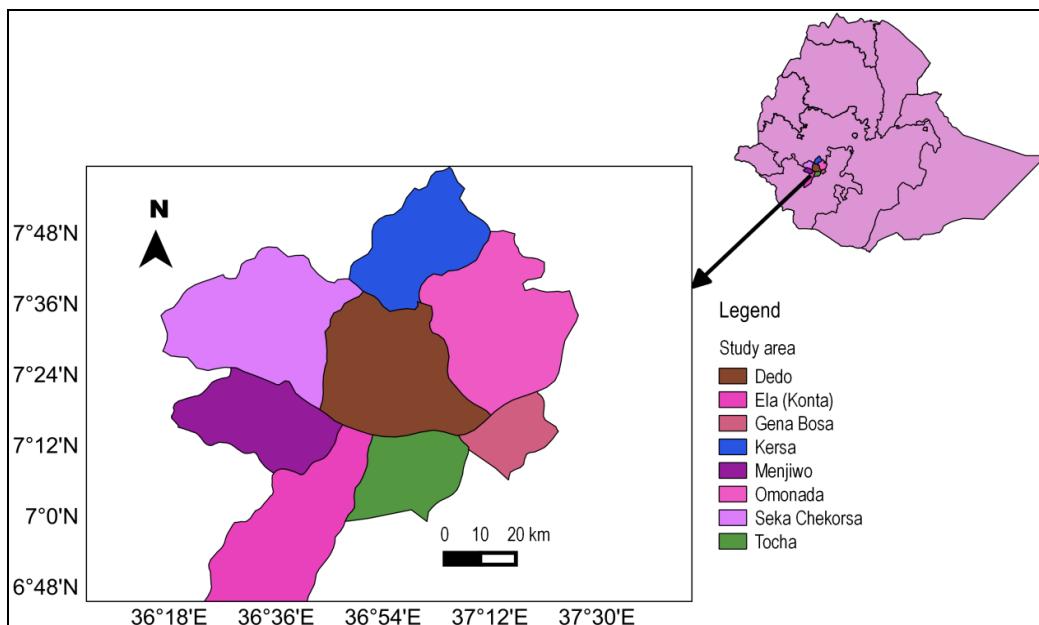


Fig 1: Study area showing Dedo and the neighboring Districts with Regional states of Ethiopia

2.2 Methods

2.2.1 Sample size determination and sampling techniques

From 33 villages of Dedo district, six villages (Debale, Garima-guda, Metesso, Offole-dawe, Omo-yalla and Warokolobo) were randomly selected for the study. In general, 50 informants (30 males and 20 females) were selected. Out of these, 10 key informants (9 males and 1 female) were selected using purposive sampling technique based on the recommendations of local authorities, knowledgeable elders and development agents. The other 40 informants (21 males and 19 females) were selected randomly from the local community. The traditional healers identified were asked for their consent to share their knowledge only for the purpose of this study.

2.2.2 Methods of data collection

The Ethnobotanical data of medicinal plants were collected by using semi-structured interview and field walk with key informants. The interview includes types of medicinal plants, methods of preparation, parts of medicinal plants used for treatment of human as well as livestock ailments and route of administration. The sample of medicinal plants was collected and transported to Jimma University for identification. The voucher specimens were deposited at Jimma University herbarium.

2.2.3 Data analysis

Descriptive statistics like percentage and frequency were used to analyze and summarize the data on medicinal plants and associated knowledge.

2.2.3.1 Preference ranking

Preference ranking was computed following [8] for eight most important medicinal plants used in treating general body illness and febrile illness. Eight key informants were selected to assess the degree of effectiveness of these eight medicinal plants against the ailment. The medicinal plant believed to be most effective to treat the illness has got the highest value (8)

and the least effective got the lowest value (1). The value of each species was summed up and the rank was determined based on the total score. This helps to indicate the most effective medicinal plants used by the community to treat the disease.

2.2.3.2 Paired comparison

This analytical tool was used for evaluating the degree of preferences or levels of importance of certain selected plants/parts of plants [9]. Paired comparisons to indicate the efficacy and popularity of seven medicinal plant species used to treat stomach ache were employed as described by [8]. Seven key informants were randomly selected by flipping coins and allowed to show their responses independently for pairs of seven traditional medicinal plants that were noted for treating the disease. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses recorded, total value summarized and rank was made based on the report of the informants.

2.2.3.3 Fidelity level

The fidelity level was calculated for those frequently reported diseases by informants in order to identify the most important medicinal plant species used to treat. The following formula was used to calculate fidelity level:

$$FL = (Ni/N) \times 100$$

Where, Ni is the number of informants that claim use of a plant species to treat a particular disease and N is the number of informants that use the plant as a medicine to treat any given ailments [10].

3. Results and Discussions

3.1 Medicinal Plants of the Study Area

Overall, 66 plant species, belonging to 33 families were collected, identified and documented from the study area. Asteraceae and Lamiaceae were represented by seven species

each, Solanaceae by five species, Rutaceae by four species; Fabaceae, Poaceae and Euphorbiaceae by three species each, Acanthaceae, Zingiberaceae, Apiaceae, Malvaceae, Myrtaceae, Rubiaceae, Rosaceae and Ranunculaceae, constitute two species each, and the rest (16) families were represented by one species each. The local community assigned vernacular names to all of the documented medicinal plants. This indicates the existence of very close interaction between the people and plant resources. The importance of plants in local culture is usually shown by the proportion of plants that can be identified by local people using local names. Of these, 50 (75.75%) and 16 (24.24%) were used to treat human and livestock ailments, respectively. Among the cited medicinal plant species of the study area, the majority were from the wild (53.03%), while the remaining were from homegarden (18.18%) and cultivated (28.78%) by the community.

Similar results were obtained from other studies in different parts of Ethiopia [11, 12, 13, 14]. This result indicates that the local communities mostly depend on medicinal plants collected from the wild than those from the homegardens. The number of medicinal plants collected from the homegarden is also promising. This finding agrees with different ethnobotanical studies conducted in different parts of Ethiopia [15, 16].

Most of the medicinal plants in Dedo district were herbaceous species while the contribution of climbers was the least (Table 1). Similar results were reported by different investigators in Ethiopia [17, 18, 19]. Some of the medicinal plants collected and identified in this study were also reported by other investigator from other parts of Ethiopia [20]. Such wide spread use of these medicinal plants by different groups of people in different parts of Ethiopia could be due to cultural overlap among different ethnic groups.

Table 1: Growth form distribution of medicinal plants in Dedo district, Jimma Zone

Plant habit/Growth form	Number of Species	Percentage (%)
Herbs	27	40.9
Shrubs	21	31.8
Trees	14	21.21
Climbers	4	6.06

3.2 Parts of medicinal plants used to treat human ailments

The study revealed that almost all plant parts (roots, seed, leaves, bark, and fruits) are used for preparing different remedies. However, the most frequently utilized plant part was leaf followed by root and seed (Figure 2), while the whole plant part was the least used.

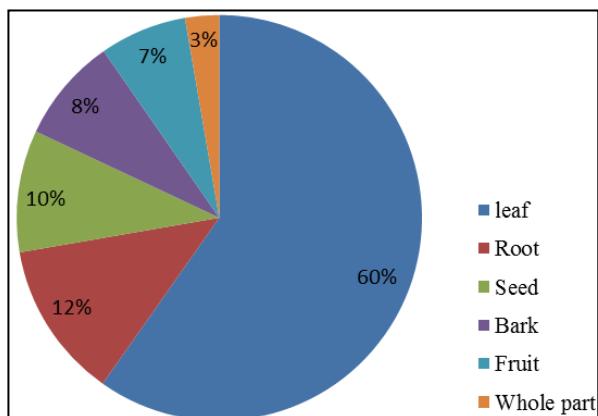


Fig 2: Parts of medicinal plants used to treat human ailments in the study area.

Leaves were the most cited plant parts used by the healers for

the preparation of traditional medicines. This finding is in line with the results of other ethnomedicinal studies in Ethiopia [21, 16, 18] who reported that the leaves were the most cited plant parts used in remedy preparations, but disagrees with the finding of [22, 23, 17, 24, 25] who found roots to be the most commonly used plant parts. This deviation is probably due to differences in plant resource sites and cultural differences among the users. The preference for leaves could be due to ease of preparation for the treatment of ailments. Remedy preparation that involves roots, rhizomes, bulbs, barks, stems or whole plant have effects that pose a lasting danger to the continuity of an individual plant compared to leaves. In this study area, the fear of high threat of medicinal plants due to plant parts used for the purpose of medicine is minimal as leaves were the most harvested plant parts used in the area which has little effect on the survival of mother plant. This finding is similar to the results of other ethnomedicinal studies across Ethiopia [13, 21].

3.3 Method of preparation

The local people employed variety of methods in order to prepare remedies. Remedy preparations vary based on the type of ailments treated and the actual site of the ailment. Powdering (38%), crushing (34%), squeezing (15%) and boiling and chewing (13%) were methods of remedy preparations used by the indigenous people in Dedo district. Powdering was the most frequently reported method of preparation of traditional medicine in the study area. This may be due to the possibility of effective extraction of plant ingredients when crushed/powdered so that its curative potential would increase. The preparations are either used fresh or can be stored in different clean and dry containers (clothes, plastic bags or sealed bottles) for later use. Preparations may involve using a single plant part or mixtures of different organs of the same plant or mixture of organs from different plants. This agrees with the work of [11].

3.4 Route of administration

The routes of administration of traditional medicine in the study area were oral (63%), dermal (26%), nasal (8%), through eye (2%), through ear (1%). Oral administration was the main route of application of traditional medicine while the least was through ear application. According to [26], the application of traditional medicine through oral and nasal routes permits rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power. The remedies that are administered orally are taken diluted by water, skimmed milk and honey or are taken with red 'teff' or bread made from finger millet or taken with boiled coffee. Those taken through nasal are either smoked or boiled in water and the patient inhales the smoke or the steam being covered with cloth. Similar results were obtained by other authors [15, 14, 13, 27].

3.5 Dosage

People of the study area use various units of measurements and the duration of administration to determine the dosage. Local units such as finger length (e.g., for bark, root, stem), pinch (e.g., for pounded plant medicine) and numbers (e.g., for leaves, seeds, fruits, bulbs and flowers) were used to estimate and fix the amount of medicine. Recovery from the disease, disappearance of the symptoms of the diseases, fading out of the disease sign and judgment of the healer to stop the treatment were some of the criteria used in determining duration in the administration of the dosage. Dosage was determined in several ways including

measurement of root length and leaf number. Various authors [22, 28, 29, 24, 27] have also reported the absence of standardized dosing in the application of traditional medicines in Ethiopia and elsewhere. However, from the interview made during the study, it was found that there was disagreement among the healers concerning the dosage. For example, some informants suggested that three or five leaves of the plants are used to treat some ailments, while others suggest two or three leaves for the same problem. Still some others suggested that they applied the leaves number up to seven randomly without such measuring system. Although the full dose determination is varying from healer to healer, the dose given depends on age, physical strength and health conditions. The healers never administer treatments that are taken internally to pregnant women. This finding indicates that there was lack of precision in the determination of doses in the area. This is the real drawback of medicinal plants. Similar finding was reported from other parts of Ethiopia [21, 30, 31].

3.6 Medicinal plants used to treat livestock ailments

From the collected medicinal plants, 16 species belonging to 11 families were used for treatment of livestock ailments. Regarding their habitats; 62.5% species were collected from the wild, 25% from cultivated and 12.5% were from homegardens. More species for livestock treatment were collected from the wild. As most informants agree, even though the area has high number of livestock population, the local people do not have enough knowledge about ethnoveterinary medicinal plants compared to those used for treatment of human ailments. Most of the ethnoveterinary medicinal plants were shrubs followed by trees, while herbs were the least in medicinal plant composition. In this study area shrubs like *Dodonaea angustifolia*, *Acalypha fruticosa*, *Vernonia amygdalina* and *Solanum marginatum*; climbers like *Mikania capensis* and *Ampelocissus bombycinia* and herbs like *Nicotiana tabacum* were used only for the treatment of livestock ailments in the study area. This finding agrees with the result of ethnoveterinary study in other part of Ethiopia [27].

3.7 Plant parts used for livestock remedy preparation

The mostly harvested plant part for treatment of livestock ailments in the study area were leaves, while the least used

plant part was the seed. Like that of human medicine, leaves were the most harvested plant part for remedy preparation against livestock ailments [18].

3.8 Method of preparations and route of administration

The local people used different forms of remedy preparations and applications to treat livestock ailments. The methods of preparations used were crushing, pounding and boiling. For instance, the leaf of *Nicotiana tabacum* was crushed, mixed with little water and then added through the mouth by using bottle to treat the stomachache in the study area. Fresh leaves of *Vernonia amygdalina* was used to treat retained placenta. Based on the nature of the ailments the remedies were applied through different routes. Oral application of remedies was found to be the highest (56.25%), followed by dermal (18.75%) and through eye and nose (25%). This finding agrees with [19] in other parts of Ethiopia.

3.9 Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. *Ruta chalepensis* is the most effective in treating evil eye and general body illness followed by *Ocimum lamiifolium* and the least effective was *Calpurnia aurea* (Table 2A).

3.10 Paired comparison

Paired comparison made to determine the most preferred medicinal plants among the seven species that were used to treat stomachache in the study area. The responses of seven informants showed that *Nigella sativa* ranked first followed by *Ruta chalepensis* (Table 2B). The result indicated that *Nigella sativa* was the most preferred while *Erythrina brucei* was the least favored over the other plant species cited in treating the disease.

3.11 Fidelity level (FL)

Fidelity level (FL) is useful for identifying the inhabitants' most preferred species in use for treating certain ailments. *Ruta chalepensis*, *Nigella sativa* and *Dicliptera laxata* were reported by many informants to treat evil eye and general body illness, stomachache and eye disease hence had the highest FL value (Table 2C). High FLs could also be indicator of efficacy of the reported plants to cure specific ailments.

Table 2: Preference ranking (A), Paired comparison (B) and Fidelity level (C) of medicinal plants used in Dedo District

Scientific name	Respondents (R ₁ - R ₈)								Total	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈		
<i>Ruta chalepensis</i>	7	5	5	6	8	6	8	7	52	1 st
<i>Ocimum lamiifolium</i>	7	8	6	6	5	6	7	5	50	2 nd
<i>Dicliptera laxata</i>	8	5	6	5	6	6	7	49	3 rd	
<i>Justicia schimperiana</i>	7	6	4	5	6	4	3	4	39	4 th
<i>Croton macrostachyus</i>	2	5	4	5	6	4	5	4	35	5 th
<i>Withania somnifera</i>	2	1	4	6	5	4	6	5	33	6 th
<i>Ocimum forskolei</i>	6	1	5	4	1	6	5	4	32	7 th
<i>Calpurnia aurea</i>	4	6	7	4	1	2	6	1	31	8 th

A. Preference ranking of medicinal plants used for treating general body illness in Dedo district

Scientific name	Respondents (R ₁ - R ₇)							Total	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇		
<i>Allium sativum</i>	6	5	3	2	6	4	4	30	3
<i>Nigella sativa</i>	7	5	7	4	5	5	4	37	1
<i>Pavonia urens</i>	4	1	5	1	6	3	3	23	5
<i>Brucea antidyserterica</i>	5	6	5	4	5	1	3	29	4
<i>Prunus perisca</i>	4	2	1	1	5	3	4	20	6
<i>Ruta chalepensis</i>	7	6	6	4	5	3	3	34	2
<i>Erythrina brucei</i>	4	1	1	3	5	2	3	19	7

B. Paired comparisons of seven medicinal plants used to treat stomach ache in Dedo district

Scientific name	Ailments treated	N _I	N	FL	FL%
<i>Ruta chalepensis</i>	Evil eye and general body illness	22	23	0.956	95.6
<i>Nigella sativa</i>	Stomach ache	17	18	0.944	94.44
<i>Dicliptera laxata</i>	Eye disease	17	19	0.894	89.47
<i>Allium sativum</i>	Malaria	14	16	0.875	87.5
<i>Ocimum lamiifolium</i>	Head ache	18	21	0.857	85.7
<i>Zingiber officinale</i>	Tooth ache	11	14	0.786	78.57

C. Fidelity levels of some medicinal plants in Dedo district

4. Conclusion

Indigenous people in Dedo District use traditional medicines derived from plants for treatment of both human and livestock ailments. Overall, 66 medicinal plant species were collected and documented from Dedo district. Of these, 50 species were used for treatment of human ailments while 16 species were used for treatment of livestock ailments. These medicinal plants are distributed in different habitats with the highest richness in the wild. Most of the medicinal plants of this district are herbaceous species followed by shrubs while few of them are lianas. Leaf is the most frequently used plant part followed by roots for preparation of human and livestock remedies. Oral administration was the main route of remedy application followed by dermal (application on the skin). All medicinal plants are not equally preferred by the traditional healers for treatment of certain ailments.

5. Recommendations

Based on the results of the study, the following recommendations were forwarded for the sustainable use of medicinal plants:

- Encouraging the local community to grow medicinal plants in their homegardens and as live fence around cultivated lands.
- To increase the awareness of young people, the role of medicinal plants should be integrated into formal and non-formal education systems.
- Recognition and intellectual property rights should be given to traditional healers.
- Attention should be given to standardization of measurement and hygiene of the traditional medicines prepared from plants.
- The overall analysis shows that major uses of medicinal plants for treatment of different ailments ranges from simple to fatal diseases. These traditional remedies in fact, need to be confirmed through scientific investigations to identify those that may give alternatives for modern drugs.

6. Acknowledgement

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