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Ethnobotanical Study of Medicinal Plants in Kondoa Eroded Area of Central Tanzania

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Abstract

An ethnobotanical study was undertaken to document medicinal plants and explore ailments treated by the plants in Kondoa eroded area of central Tanzania between 2001 and 2002. Semi-structured interviews, Focus Group Discussion and market surveys were administered to 66 Traditional Medical Practitioners to collect the information. Physical observations were made to the sites where plants were harvested. The study documented and deposited voucher specimens of 58 medicinal plant species from 33 plant families and 51 genera used for treating different human and livestock ailments. Roots were the most common plant part used in the preparation of herbal medicine contributing to (54.7%), followed by leaves (15.6%) and sap (10.9%). Most of the medicines were processed to a powdery form in order to extend the life span of the herbal drugs. The study demonstrated that processing of the plants to drugs reduces the frequency of harvest therefore enhancing sustainable use of plant resources in the area. It was established that the knowledge on medicinal plant use remains mostly with the older generation with few youths showing interest. The study recommended for youths involvement in traditional medicine in order to preserve the knowledge from being lost with the older generation. A survey on the trade of medicinal plants to ascertain volume traded and their impacts on *Senna abbreviata*, *Solanum incanum* and *Aloe secundiflora* species is recommended.

Keywords: ailment; ethnobotanical; ethnomedicinal; herbarium; pharmacopoeia; phytogeographical; taxonomic.

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1. Introduction

Traditional medicine is the sum total of the knowledge and practices, whether explicable or not, used in the diagnosis, prevention, and elimination of physical, mental and/or social imbalance [1]. It depends exclusively on practical experience and observations handed down from generation to generation formal or informal. Some confusion has developed over years on the use and misuse of terms describing the various specialists of traditional medicine [2, 3 & 4]. They have been given different names such as traditional healers, traditional doctors, practitioners, witch doctors, diviners, seers, spiritualists, etc. As [2] pointed out, it is reported that about 75% of the population in the developing countries relied on traditional medicine because of shortage and access to western or modern medical facilities and the nomadic life style of the people.

Rangi community is among major socio-cultural groups of Kondoa District in central Tanzania. They had settled in the Kondoa Irangi Hills apparent about 150 years ago [5]. Traditionally, their dominant economic activity had been agro-pastoralism, though there are some who regularly hunt and gather and others who do so sporadically. Various crops are grown both for subsistence and cash. The crops grown are maize, bulrush millet, finger millet, groundnuts and sorghum.

While different studies [6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, &17] have been conducted in the study area, there is no study which has assessed medicinal plant resources and their uses in the area. Given this need, an ethnobotanical study was undertaken to document medicinal plants of the area and ailments treated before this knowledge is lost from older generation. Therefore the objectives of the study were to (1) document medicinal plants of the area, and (2) explore the ailments or diseases treated by the plants. The selection of the area is based on the study objectives, appropriateness of the sites and the report [18] that soil erosion has reduced the land to completely unproductive status with incipient gully developments.

2. Materials and methods

2.1 Study area

Kondoa Eroded Area (KEA) covers about 10% or 1,256 Km² of Irangi Hills in Kondoa district of Dodoma region in central Tanzania. The District is located between latitudes 40° 40' to 50° 0' South and longitudes 35°40' to 36°10' East (Figure 1) [5]. The area has semi-arid climate with an average of annual rainfall of 600–800 mm [19]. The rain season lasts for six months (November/December–April/May), but the dry season can sometimes be quite long in drought years lasting for as much as eight months [20].

Combined factors have made soil erosion a serious problem in this arid and semi-arid area of Tanzania. The rainfall is sometimes inadequate for crops and often is poorly distributed, falling in intense storms with great eroding power. The main types of over exploitation that led to soil erosion in this semi-arid area are: flat farming or cultivating down the slope, overgrazing and trampling, excessive burning of grassland and woodland and excessive collection of wood for firewood, charcoal, building poles, timber and for other domestic uses.

The floristic composition of the study area consists of a mixture of miombo *Brachystegia-Acacia* woodland, which falls in the Somali–Maasai phytogeographical zone of Tanzania [21]. The dominant tree species in the area are *Brachystegia spiciformis*, *B. microphylla*, *Julbernardia globiflora*, *Combretum molle*, *Euphorbia candelabrum*, *Terminalia sericea* and *Markhamia obtusifolia*. Frequent fires and treeless grassland also occurs [7]. To the west and southwest, the study area is characterized by dense bushland. Most woody plants have multiple stems and form bushes or small bush like trees that are mostly fire resistant. Associated grasses include *Hyparrhenia*, *Themeda*, *Setaria* and *Panicum* species. The main tree and shrub species are *Acacia* and *Commiphora*. *Acacia* species include *Acacia tortilis*, *A. kirkii*, *A. senegal*, *A. seyal*, and *A. nilotica*.

2.1 Methods

This study used triangulation method to collect both qualitative and quantitative data. The primary data were collected using semi structured questionnaires, Focus Group Discussions (FGD), physical observations and market surveys [22, 23, 24]. Seven study villages were randomly selected from a list of 25 villages that make KEA. The villages selected forms 28% of the villages in the KEA, and about 4.6% of the total number of villages in Kondoa District. The villages selected were Bicha, Bolisa, Kolo, Baura, Mondo, Kidongo cheusi and Haubi (Figure 1).

A total of 66 Traditional Medicine Practitioners (TMPs) operating in the area were randomly selected from the 8 study villages for interviews in collaboration with the village government leaders. They included: healers who cure with herbal remedies only; healers with supernatural healing abilities - who cures using combination of herbal remedies and rituals, and the midwives.

Voucher specimens in duplicates were collected to document all medicinal plant species cited by TMPs. Botanical names were verified to the extent possible using experience and visual identification in the field by the researcher and by comparison with already identified herbarium collections at the Department of Botany, University of Dar es Salaam (UDSM), the National Herbarium of the Faculty of Science, Addis Ababa University and descriptions in the published taxonomic sources like Flora of Ethiopia and Eritrea [25].

A documentary review method was used to collect secondary data from published and unpublished reports on HADO "*Hifadhi Ardhi Dodoma*" A soil conservation project for Dodoma region from the Library of the UDSM and the Institute of Resource Assessment (IRA).

3. Results

3.1 Socio- economic characteristics of the respondents

3.1.1 Gender and educational level of the respondents'

The findings show that 45(68.2%) of the respondents were males and 21(31.8%) females. The findings show majority of respondents 35(53%) have attained primary education, followed by 20(30%) respondents with an

adult education. Respondents with secondary education were 03(4.5%) and only 1(1.5%) had attained tertiary level education/college.

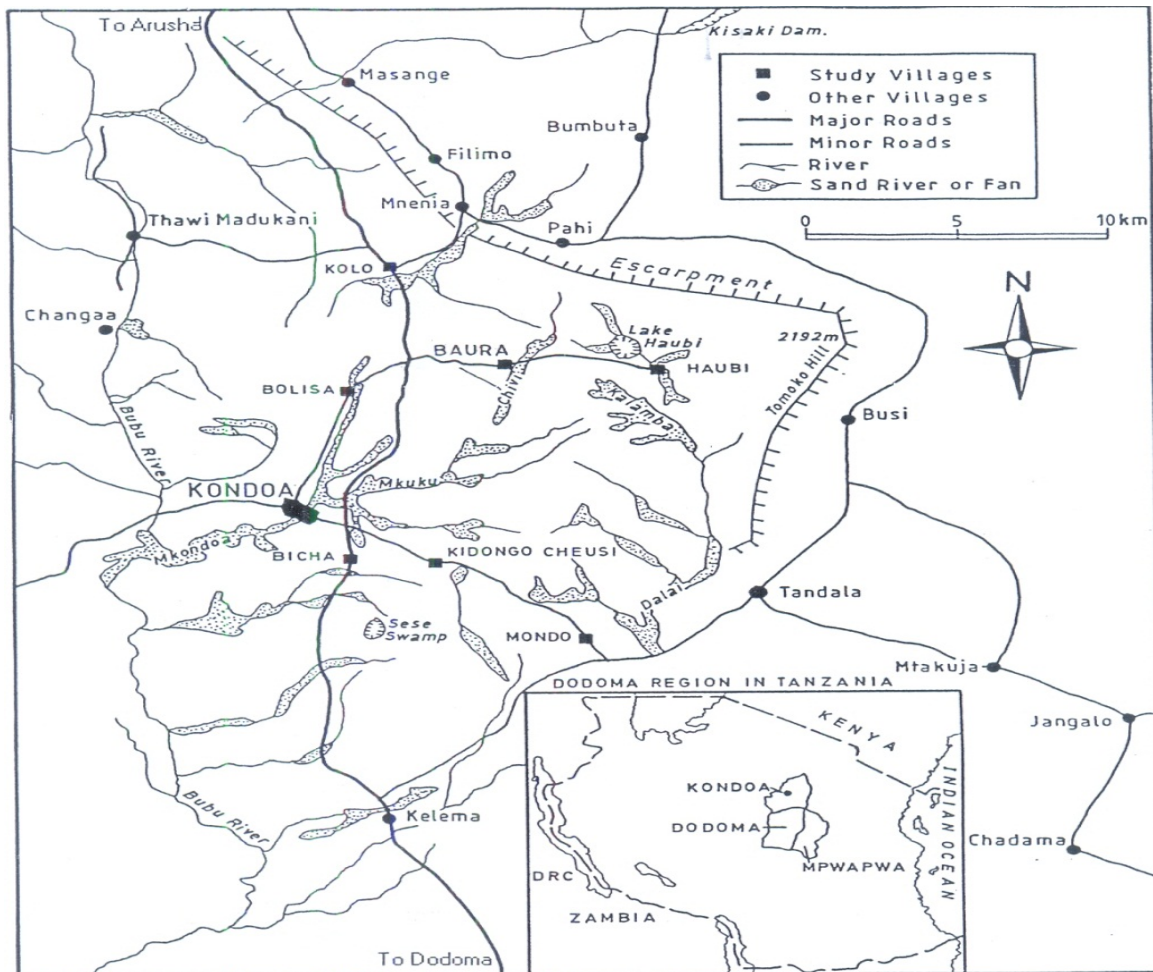


Figure 1: Map of Kondo District showing the study villages in the Kondo Erodea Area with insert showing location within Dodoma region in central Tanzania

3.2 Medicinal plants of the area and the diseases treated

The findings show that 58 medicinal plant species and the ailments treated were recorded and voucher specimens deposited Table 1. Most of medicinal plants were shrubs (34.5%) followed by trees (32.8%) and herbs (20.7%) Table 2. Medicinal preparations came from plant parts such as barks, fruits, leaves, roots, sap, seeds, and the stem (wood). In some instances the entire plant was used. The most frequently utilized medicinal plant parts were roots, 35 (54.7%) followed by the leaves 10 (15.6%) and barks 5 (7.8%). Some species for instance *Combretum zeyheri*, *Cucumis figarei*, *Enicostema axillare* subspecies *latilobum*, *Gynandropsis gynandra* and *Solanum incanum* more than one part was used Table 2.

The findings show that most of the medicines were grounded into powdery form so as to extend the storage period of the drugs. These had a positive impact of reducing frequency of harvesting the plants and therefore reduced pressure on the plants. In some cases, three or more medicinal plants were added together to treat one ailment.

Table 1: Medicinal plants of Kondoa area

No	Species name	Part used	Use report	Ailment/disease	Rank
1	<i>Acacia albida</i>	Ro	2	Roundworms	14
2	<i>A. senegal</i>	Ba	2	Nervous system	14
3	<i>Achyranthes aspera</i>	Ro	1	Afterbirths	29
4	<i>Agave angustifolia</i>	Sa	1	Dysentery	29
5	<i>Albizia petersiana</i>	Le	2	Milk production in cattle	14
6	<i>Allophylus rubiifolius</i>	Le	1	Eye	29
7	<i>Aloe secundiflora</i>	Sa	6	Rheumatism	3
8	<i>Ampelocissus africana</i>	Ro	2	Diarrhoea	14
9	<i>Asparagus falcatus</i>	Ro	1	Hernia	29
10	<i>Astripomoea malvacea</i>	Ro	2	Epilepsy	14
11	<i>Boscia salicifolia</i>	Le	3	Cold and pains	8
12	<i>Cadaba farinosa</i>	Ro	1	Chest pain	29
13	<i>Carallum dummeri</i>	Sa	1	Abscess	29
14	<i>Cissus trothae</i>	Ro	1	Cholera	29
15	<i>Combretum zeyheri</i>	Ro, Le	1	Pain	29
16	<i>Conyza pyrropappa</i>	Ro	3	Pain	8
17	<i>Cucumis figarei</i>	Ro, Fr	2	Ulcers	14
18	<i>Englerina kagehensis</i>	Wp	2	Milk production in cattle	14
19	<i>Enicostema axillare</i> subsp <i>latilobum</i>	Ro, Le	2	Malaria	14
20	<i>Erythrina abyssinica</i>	Ba	1	Malaria	29
21	<i>E. burtii</i>	Ba	1	Headache	29

22	<i>Euclea natalensis</i>	St	3	Toothache	8
23	<i>Euphorbia candelabrum</i>	Sa	5	Newcastle disease	5
24	<i>E. grantii</i>	Sa	2	Cholera	14
25	<i>E. tirucalli</i>	Sa	2	Newcastle disease	14
26	<i>Grewia microcarpa</i>	Ro	1	Syphilis	29
27	<i>Gynandropsis gynandra</i>	Le, Ro	3	Headache	8
28	<i>Indigofera kirkii</i>	Ro	1	Gonorrhoea	29
29	<i>I. rhynchocarpa</i>	Ro	6	BP	3
30	<i>I. swaziensis</i>	Ro	1	Headache	29
31	<i>Maerua angolensis</i>	Ro	1	Headache	29
32	<i>Markhamia obtusifolia</i>	Le	1	Tonsillitis	29
33	<i>Ocimum gratissimum</i>	Ro	1	Sterility	29
34	<i>Pappea capensis</i>	St	1	Dysentery	29
35	<i>Pavetta stuhlmannii</i>	Ro	1	Sterility	29
36	<i>Pergularia daemia</i>	Wp	2	Skin rushes	14
37	<i>Pollichia campestris</i>	Ro	2	Coagulated milky	14
38	<i>Polygala liniflora</i>	Ro	1	Eye	29
39	<i>Rhynchosia hirta</i>	Ro	1	Wound	29
40	<i>Ricinus communis</i>	Se	3	Round worms	8
41	<i>Rumex usambarensis</i>	Ro	1	Tapeworms	29
42	<i>Secamone parviflora</i>	Ro	1	Bilharzia	29
43	<i>Senna abbreviata</i>	Ro	8	STD's	1
44	<i>S. singueana</i>	Ro	2	Sterility	14
45	<i>Solanum incanum</i>	Ro, Fr	7	Dysentery	2
46	<i>Sonchus oleraceus</i>	Le	2	Chicken pox	14
7	<i>Steganotaenia araliacea</i>	Le, Ba	1	Swelling of legs	29
48	<i>Strychnos potatorum</i>	Ba	1	Boils	29
49	<i>Synadenium molle</i>	Sa	1	East coast fever	29
50	<i>Tephrosia pumila</i>	Ro	1	Worms	29
51	<i>Vernonia glabra</i>	Ro	2	Abdominal pains	14
52	<i>Vitex mombassae</i>	Ro	1	Sterility	29
53	<i>Wahlenbergia acta</i>	Ro	1	Coagulated	29

					milky
54	<i>Waltheria indica</i>	Ro	1	Ulcers	29
55	<i>Ximenia americana</i>	Le	1	Cough	29
56	<i>Zanha africana</i>	Ro	3	Headache	8
57	<i>Zanthoxylum chalybeum</i>	Ro	5	STD's	5
58	<i>Ziziphus mucronata</i>	Ro	5	Diabetes	5

Key: Ba = Bark; Se = Seed; Fr = Fruit; Le = Leaf; St = Stem; Wp = Whole plant; Ro = Root; Sa = Sap; STD's = Sexually Transmitted Diseases; BP = Blood Pressure.

Table 2: Parts of the plant used and their percentages

Bark	Seed	Fruit	Leaf	Stem	Whole plant	Root	Sap	Total
5(7.8%)	1(1.6%)	2(3.1%)	10(15.6%)	2(3.1%)	2(3.1%)	35(54.7%)	7(10.9%)	64(100%)

4. Discussion

4.1 Medicinal plants of the area

The findings show that about 58% of plant species of medicinal value were documented from the area where the roots were the most utilized plant parts contributing 54.7%. [26 & 27] reported similar findings with medicinal plants of Kenya. Possible explanation for this observation is that Rangi herbalists through their long experiences have been able to ascertain that roots were the most effective plant part. This observation has a scientific support of [28] who reports that the alkaloid composition of *Strychnos* species in South America was two folds higher in roots and barks relative to the amount found in leaves. It can therefore be concluded that roots play an important role in the indigenous healing systems.

Popular and widely used medicinal plants in the area include *Senna abbreviata*, *Solanum incanum*, *Aloe secundiflora* and *Indigofera rhynchocarpa*. Possible explanation for this observation is that healers use these plant species more often in treating diseases like sexually transmitted diseases, chest complications, blood pressure, abdominal pains and dysentery, which are prevalent in the area.

Most of the medicines were processed-ground into powder so as to extend the storage period of the drugs. These have a positive impact of reducing frequency of harvesting medicinal plants and therefore reduce pressure on these plants in the area. [29] reported similar results in northeastern Tanzania.

Collection of medicinal plants, nature of illness (e.g. emergency cases), the kind of medicine needed and the knowledge of the collector were the main factors which determine who actually collects the medicines. In cases of emergency whoever was closer to the incident and had the knowledge of the plant needed would go for it. However, if the medicine needed required spending more time and energy (e.g. digging tree roots) then it was mostly men who go for the medicine. Locally recognized traditional healers whether men or women frequently carry out the collection themselves in the forests and bushes partly to maintain secret of knowledge on relevant species. [30] reported similar results in East Usambara forests of northern Tanzania.

It was observed that TMPs have developed skills of protecting ethnomedicinal inventions for several reasons and in various ways. For example, some healers believed that sharing herbal knowledge with others resulted in the loss of their healing powers. Others believe that herbal medicines are owned by *varumu* from consent was needed and monetary tribute was paid for the use of medicines. The consent from a natural being was requested through prayers, and tributes were made by pouring flour at the base of a plant and slaughtering a goat at the same place prior to collection of the materials. Others claimed that herbal remedies were private property and charge large sums of money for any ethnomedicinal information. [31] reported similar results with Miskitu healers of Eastern Nicaragua. This is considered an intellectual property rights exercised in the Kondo District.

4.2 Ailment treated by medicinal plants

The findings show that diversity of plant species around KEA had medicinal value and have been used by local communities in the study area in treating different ailments both in human, cattle and in chicken. The study revealed that most of the ailments treated were from human being.

5. Conclusion

The study has indicated that the four most popular and widely medicinal plants used were *Senna abbreviata*, *Solanum incanum*, *Aloe secundiflora* and *Indigofera rhynchocarpa*. Roots were the most prominent plant parts used followed by leaves. Both men and women collected medicinal plants. Reliance of local communities on traditional herbal remedies for curing is reflected on the diversity of plants used in their pharmacopoeia. These uses remained despite the introduction of western medicine.

The processing of medicinal plant remedies had a positive impact of reducing frequency of harvesting medicinal plants and therefore reduced pressure on these plants in the area. The study demonstrated that TMPs knew the medicinal plants of the area, their uses and have developed knowledge of their conservation. The youths should be encouraged to learn medicinal plants knowledge and means of preserving it from being lost with the older

generation. The survey on the trade of medicinal plants to ascertain volume traded and their impact on *Senna abbreviata*, *Solanum incanum* and *Aloe secundiflora* species is recommended.

6. Constraints and limitations of the study

Kondoa Eroded Area has twenty five (25) villages. Due to limited resources (time and financial constraints), only seven (7) villages were involved. In other areas, some of the study villages were not accessible by road/car, so I had to walk long distance to reach households on foot. In addition, other respondents did not return back some of the questionnaires distributed. The problem was solved by distributing questionnaires in excess.

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