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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 $40^0$ 40' to $50^0$ 0' South and longitudes $35^0$40' to $36^0$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, Julbernadia 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.

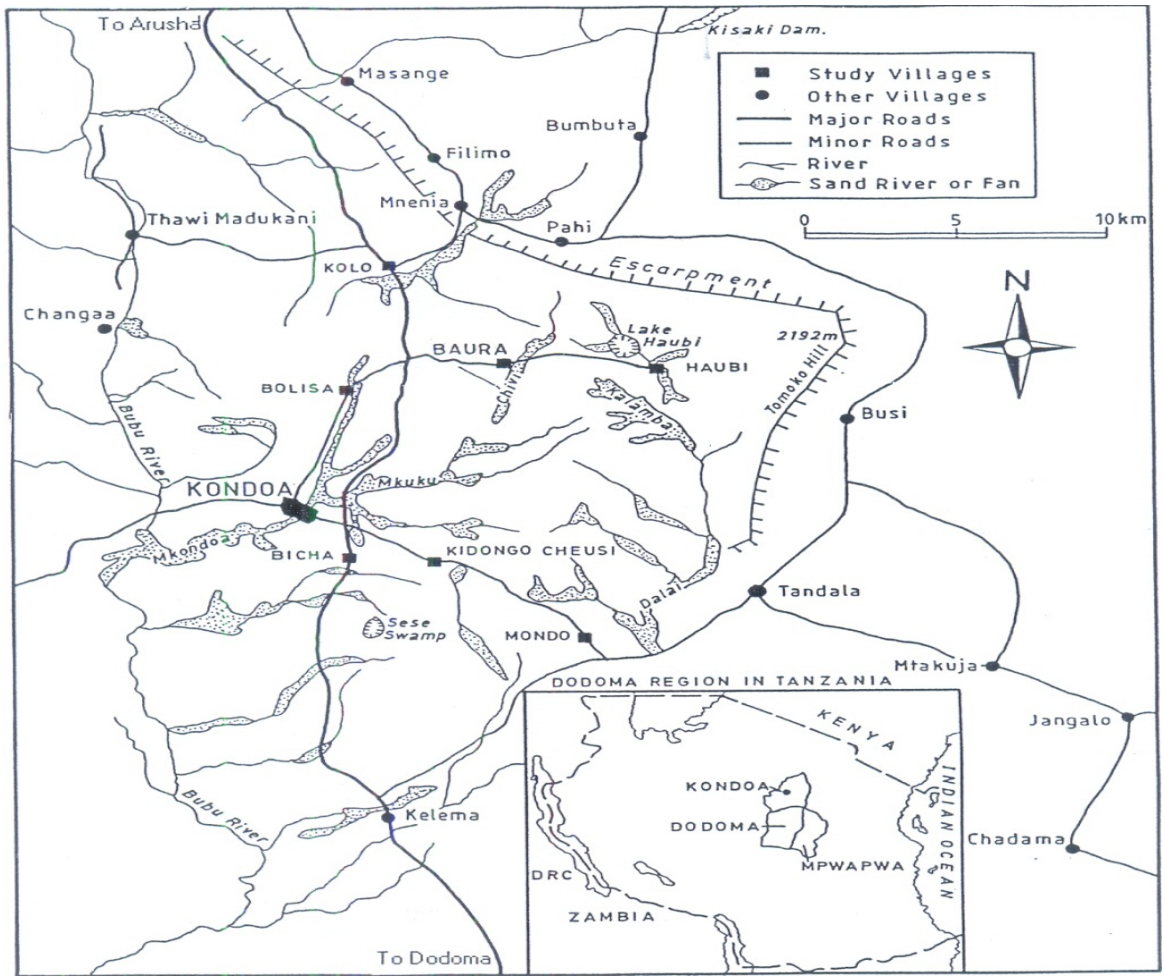


**Figure 1:** Map of Kondoa District showing the study villages in the Kondoa Erodea Area with insert showing location within Dodoma region in central Tanzania

### *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 | *Acacia albida* | Ro | 2 | Roundworms | 14 |
| 2 | *A. senegal* | Ba | 2 | Nervous system | 14 |
| 3 | *Achyranthes aspera* | Ro | 1 | Afterbirths | 29 |
| 4 | *Agave angustifolia* | Sa | 1 | Dysentery | 29 |
| 5 | *Albizia petersiana* | Le | 2 | Milk production in cattle | 14 |
| 6 | *Allophylus rubiifolius* | Le | 1 | Eye | 29 |
| 7 | *Aloe secundiflora* | Sa | 6 | Rheumatism | 3 |
| 8 | *Ampelocissus africana* | *Ro* | 2 | Diarrhoea | 14 |
| 9 | *Asparagus falcatus* | *Ro* | 1 | Hernia | 29 |
| 10 | *Astripomoea malvacea* | Ro | 2 | Epilepsy | 14 |
| 11 | *Boscia salicifolia* | Le | 3 | Cold and pains | 8 |
| 12 | *Cadaba farinosa* | Ro | 1 | Chest pain | 29 |
| 13 | *Carallum dummeri* | Sa | 1 | Abscess | 29 |
| 14 | *Cissus trothae* | Ro | 1 | Cholera | 29 |
| 15 | *Combretum zeyheri* | Ro, Le | 1 | Pain | 29 |
| 16 | *Conyza pyrrhopappa* | Ro | 3 | Pain | 8 |
| 17 | *Cucumis figarei* | Ro, Fr | 2 | Ulcers | 14 |
| 18 | *Englerina kagehensis* | Wp | 2 | Milk production in cattle | 14 |
| 19 | *Enicostema axillare* subsp *latilobum* | Ro, Le | 2 | Malaria | 14 |
| 20 | *Erythrina abyssinica* | *Ba* | 1 | Malaria | 29 |
| 21 | *E. burtii* | Ba | 1 | Headache | 29 |

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

| | | | | | |
|---|---|---|---|---|---|
| | | | | milky | |
| 54 | *Waltheria indica* | Ro | 1 | Ulcers | 29 |
| 55 | *Ximenia americana* | Le | 1 | Cough | 29 |
| 56 | *Zanha africana* | Ro | 3 | Headache | 8 |
| 57 | *Zanthoxyllum chalybeum* | Ro | 5 | STD's | 5 |
| 58 | *Ziziphus mucronata* | 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 Kondoa District.

### *4.2 Ailment treated by medicinal plants*

The findings show that diversity of plant specifies around KEA had medicinal value and have been used by local communities in the studyarea 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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