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# Medicinal plants and their uses by the people in the Region of Randa, Djibouti



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## ABSTRACT

**Ethnopharmacological relevance:** The article presents the local knowledge on medicinal plants and their relevance in managing health problems. Important ethnobotanical leads are given with priority species and disease categories, casting insight on future phytochemical and pharmacological studies.

**Aim of the study:** The use of traditional medicinal plants has been an integral part of the traditional healthcare systems in Djibouti. However, scientific studies on the traditional herbal healing systems of the various cultural groups have never been undertaken. This study has, therefore, aimed at assessing plant-related ethnomedicinal knowledge of the people in Randa Region; prioritising the plants with respect to common disease categories and inferring about prospects of new pharmacological products.

**Materials and methods:** Interview-based ethnobotanical field study was carried out to document the plant-based ethnomedicinal knowledge handed down to the present by the oral tradition of people living in 24 villages in Tadjourah District of Randa Region (north Djibouti). Informant Consensus Factors (ICF) and Fidelity Level (FL) values of the medicinal plants were calculated to check the level of informant agreement and the healing potentials of the species.

**Results:** A total of 91 plant species that belong to 72 genera and 40 families were documented. Most of these species (92%) were collected from non-cultivated areas. Their local names and traditional uses in medicine were also studied. The plant family Fabaceae was represented by the highest number of taxa (17 species). Strong informant agreements hinted at good healing potentials of some species as shown by high values of consensus factors for eye diseases (0.98), mouth diseases (0.93), kidney problems (0.89) and microbial infections (0.84). *Dodonea angustifolia*, *Solanum cordatum*, *Grewia erythraea*, *Acalypha indica*, *Acacia etbaica*, *Fagonia schweinfurthii*, *Solanum coagulans*, *Senna alexandrina* and *Grewia tembensis* scored high FL values emerging as promising priority species for future pharmacological screening against microbial infections.

**Conclusion:** The results of this study may inspire further ethnobotanical and ethnopharmacological research and investigations toward drug discovery in Djibouti and beyond.

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## 1. Introduction

With a population of 818,159 and a total area of 23,200 km<sup>2</sup> (Ministere des Finances, 2009), Djibouti is part of the Horn of Africa and has three major officially recognised ethnic groups that include Somalis, Afars and Arabs. Each ethnic group in Djibouti has its own language with a writing system, and its own history and traditional

medical practices. A long period of interaction among ethnic groups has been going on in the multi-nationality Region of Randa where the present research was undertaken. These communities have interacted and are interacting with the plants of the area in general and with medicinal plants in particular.

In many developing countries, overexploitation of natural resources for medicinal use and other purposes are closely linked with rapid population growth, increasing cattle grazing and dryness of the environment (Kelbessa, 2013). Popular species, which are slow growing and slow reproducing, are especially vulnerable to excessive collection. In a similar way, many medicinal plant species of Djibouti are threatened and faced with the danger of extinction (Kelbessa, 2013). Paradoxically, no attention has been given to the study, conservation and prioritisation of promising traditional medicinal plant species in Djibouti.

**Abbreviations:** ETH, National Herbarium; AAU, Addis Ababa University; ICF, informant consensus factor; FL, fidelity level index; RI, relative importance value.

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In countries where western medicine is inaccessible to the rural population or too expensive with poor community acquiescence, the majority of the inhabitants rely on traditional herbal remedies. The reliance on traditional herbal medicine in such countries has been sustained by the additional fact that most health centres and hospitals are located far away from the rural people, and the communication system is poor. On the other hand, the herbal medicines are affordable, accessible and acceptable to the community. The majority of the population, therefore, resorts to traditional medicine as its primary healthcare systems wherein traditional herbal medicine looms very high (Fleurentin and Pelt, 1982; Samuelsson et al., 1991; Wondimu et al., 2007).

Despite its significant contribution to the society, especially in dealing with serious health problems including new and emerging diseases, Djiboutian traditional herbal medicine has not received the attention it deserves in modern research and development. The study aims at assessing the plant-based ethnomedicinal knowledge used by the people in Randa Region of Djibouti and documentation of the traditional medicinal plants. It also has the additional purpose of preparing the ground for exploring and facilitating the way to new drug discovery by following up the important ethnobotanical leads on traditional medicinal plants of Djibouti.

## 2. Materials and methods

### 2.1. Study area

An ethnobotanical study was conducted in Tadjourah District of Randa Region in north Djibouti. The location of the study area

centred around 11.8°N latitude, 42.6°E longitude, covering an area of 1191.38 km<sup>2</sup> that stretches over an altitudinal range of 400–1799 m a.s.l. The area receives an average annual rainfall of 250–300 mm (Nour et al., 2008). Randa Region (Fig. 1) is mostly inhabited by the Afar ethnic communities who live in villages in the vicinity of the forest area.

The population of the study area is composed of villagers who usually depend on forest products for their needs including firewood, building materials and other services including provision of medicinal plants. Most of the inhabitants are farmers while a few of them dwell in the forest. The type of livestock that the people raise depends on the long standing ethnic cultures, but generally they have goats as the main livestock type.

### 2.2. Data collection

The ethnobotanical information on medicinal plants was collected following standard ethnobotanical methods (Martin, 1995; Cotton, 1996) mainly through interviewing 184 respondents (117 males and 67 females) chosen by stratified random sampling. For cultural reasons, women could only respond if men gave permission and this explains the lower sample size for females. A semi-structured interview guide was used to collect data on local plant names, uses, parts used and the modes of preparation and administration of remedies. Informants were interviewed from July 2010 to February 2011. Eight key informants (traditional herbalists) were consulted to verify the information obtained from the household level and further confirmed by employing selected analytical research tools of ethnobotany (Heinrich, 2000).

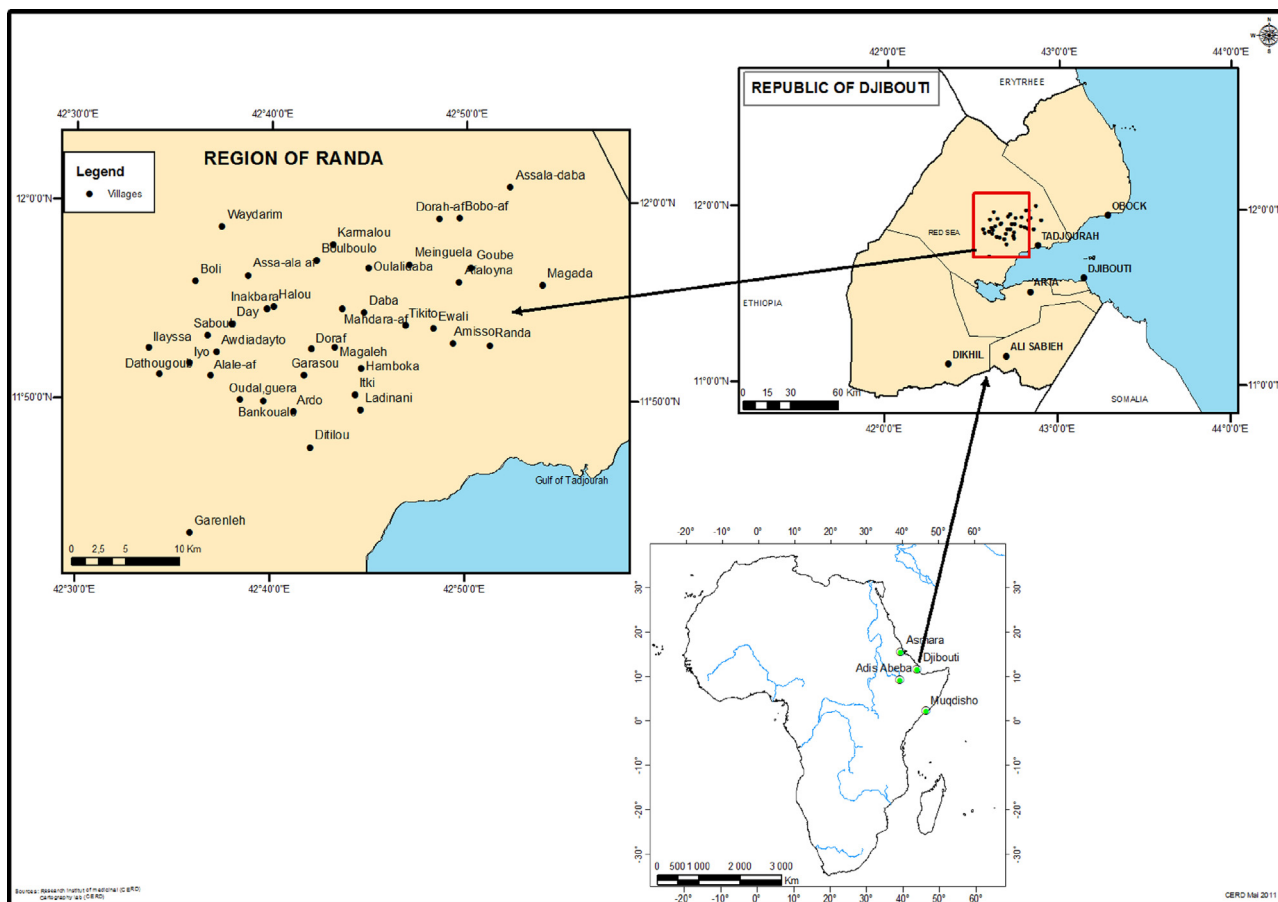


Fig. 1. Location of Randa Region in Djibouti and its villages.

Two rounds of ethnobotanical surveys were made with general and key informants (traditional healers) on the plants, ailments treated and applications of medicines. The interview questions relied more on symptoms narrated by informants. To ensure reliability of information, each informant was visited twice. Health practitioners from the “poste de Santé de Day” clinic who were familiar with the socio-demographic and traditional primary healthcare conditions and practices of the study area were consulted to determine the clinical names of some of the ailments that were described by the respondents. The other dispensary “poste de santé de Randa” was in the village of Randa where midwives and caregivers helped in the recognition of the ailments. Relevant literature sources were used to further verify the match between the local names and the conventional medical terms.

Plant identification was carried out by taxonomic experts at the National Herbarium (ETH), Addis Ababa University (AAU) as there was no competent plant taxonomist in Djibouti. The plant specimens were sent to the Addis Ababa University for identification and later the identified voucher specimens were deposited with the Herbarium of Djibouti. The adjacent location with Ethiopia, similarities between the floras and the traditional uses of plant resources were factors of encouragement to get assistance of Ethiopian botanists for Djiboutian plant identification and sharing of related experiences.

### 2.3. Data analysis

Data collected from the field were prepared in Excel spreadsheet software format and tables and graphs were generated. The Informant Consensus Factor (ICF) was calculated for each ailment category to identify the agreements of the informants on the reported cures for the group of diseases (Heinrich, 2000; Heinrich et al., 1998). The Fidelity Level (FL) Index (Alexiades, 1996; Friedman et al., 1986) was computed to check the relative healing potential of each reported medicinal plant used against human ailments. The fidelity level shows the percentage of informants claiming the use of a certain plant for the same major purpose. This value was calculated for the most frequently reported diseases or ailments (Bennett and Prance, 2000). The Relative Importance Value (RI), a measure of the diversity of medicinal applications, was calculated for each medicinal plant cited by informants (Heinrich et al., 1998; Bennett and Prance, 2000). The highest possible RI value (2.0) indicates the species with the highest diversity of medicinal use.

## 3. Results and discussion

### 3.1. Medicinal plants and their status in Randa Region

A total of 91 medicinal plant species belonging to 72 genera and 40 families were recorded. The plant family that turned out contributing more number of medicinal species (17) was the Fabaceae and this was followed by the Lamiaceae (10), Solanaceae (7), Euphorbiaceae (5), Capparidaceae (7) and Boraginaceae (4). The medicinal plants collected from different habitats of the non-cultivated areas added up to 96% and the rest were from home gardens. The list of species along with their use in treatment of diseases and the manner of utilisation in herbal medicine is given in Table 1.

The fact that most of the medicinal plants were found in non-cultivated areas, including the natural vegetation, indicates that there is very little practice of keeping medicinal plants in home gardens and other cultivated premises. The practice of cultivating medicinal plants is not well developed, may be, because settlement has a short history in the area. A further reason may be the

fact that the villagers in Randa Region are living not very far from the forest, and that plants used in traditional medicine could still be accessed with relative ease from the nearby natural vegetation. Several studies conducted on medicinal plants in Ethiopia (Giday et al., 2003) have similarly shown that most medicinal plants were sourced from non-cultivated areas, including the natural vegetation, even where home gardens were well developed. This shows that the bulk of the medicinal plant resources are found outside cultivation, and this observation further provides a major reason why the natural vegetation must be conserved in Djibouti and other countries in order to achieve the dual goals of protecting the vegetation and the species used by communities as integral parts of their biocultural heritages.

A high proportion of the vegetation of Djibouti has been modified by cutting, cultivation, burning and grazing, and hence the original vegetation cover has been significantly reduced in quality and range over time (Kelbessa, 2013). These are the major factors threatening medicinal plants. In an assessment on Djibouti forest biodiversity, Kelbessa (2013) noted that more than 60% of the *Juniperus procera* trees which dominate the Day Forest were dead and 20% were on their way to death. The second dominant tree, described as being affected by lack of reforestation and/or establishment in the same report, was the medicinal plant *Buxus hildebrandtii*. The most worrying issue is the lack of regeneration of both the aforementioned species. Most likely, due to climate change manifested in the form of increased moisture stress, Meclab (*Melilotus suaveolens*) was not seen in the wild, but was found under cultivation in private gardens. This indicates the existence of a rudimentary tradition of cultivating wild useful plants, particularly when a species becomes rare and posited far away from villages. Simitri (*Nepeta azurea*) and Canxaxaf (*Cometes abyssinica*) are barely found in the dry season. Another species, Galqado (*Tarchonanthus camphoratus*), which used to be widespread in the forest has not been seen with fruits in recent years. The observed trend is one that may ultimately lead the taxa to extinction if things continue in the same way, and this appears to be the most probable scenario.

Invasive species pose yet another threat to the medicinal plants of Djibouti. Thus, the natural vegetation in Randa and some medicinal plants found there are threatened by eminent extinction. Urgent action is, therefore, needed to maximise on-going efforts in constructing water harvesting pools and also to control the propagation of *Prosopis* spp., since these could prove to be invasive (Kelbessa, 2013) as could be seen from the experience in the “Ambouli Garden” at the outskirts of Djibouti City as well as in the adjacent Afar Region of Ethiopia.

### 3.2. Vernacular and scientific plant names

The people of Randa are capable of naming and classifying the plants that they have been using for generations. For example, Qas-Cambokto and Qad-Cambokto are names used, respectively, for *Hibiscus hildebrandtii* and *Hibiscus vitifolius*. The people gave related local names to the two species belonging not only to the same plant family (Malvaceae) but also the same genus (*Hibiscus*). The scientific basis of the local nomenclatural systems can be noted from this example. A possible factor underlying the nomenclatural unity is related to the fact that people of Randa Region tend to be traditionalists, having originated from closely related families as a result of following the “absuma” tradition, which says “don't look far, look in your family”. In the “absuma” tradition, there is a practice where each man has a promised related bride starting from childhood. This relatedness among the people of Randa has resulted in just one language with a single dialect being spoken to date in the area.

**Table 1**

List of the medicinal plants recorded from Randa Region, diseases they were claimed to cure and ways of utilisation.

Voucher#	Scientific name	Family name	Local name	Disease	Ways of utilisation
52	<i>Acacia ehrenbergiana</i> Hayne	Fabaceae	Makqani	Injuries Wound infections Red eyes Eye infections	Leaf paste is applied topically Leaf paste is applied topically Grind the leaves in water and wash the eye Grind the leaves in water and wash the eye
26	<i>Acacia etbaica</i> Schweinf.	Fabaceae	Kasalto	Gastric	Soaking crushed bark and fruits in water and the water is taken orally
29	<i>Acacia mellifera</i> (Vahl) Benth.	Fabaceae	Makqarto	Injuries Whitlow Haemorrhage Wound infections Angina Burns	Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically Fresh leaves in chewed Heated leaf powder is applied topically
3	<i>Acacia oerfota</i> (Forssk.) Schweinf.	Fabaceae	Sisakto	Food poisoning Infections Wound infections Wounds	Soaking crushed leaves in water and the water is taken orally Grind the leaves in water and wash Leaf paste is applied topically Leaf paste is applied topically
46	<i>Acacia seyal</i> Del.	Fabaceae	Qadgento	Stomach aches	Soaking crushed bark in water for 30 min and the water is taken orally
41	<i>Acacia tortilis</i> (Forssk.) Schweinf.	Fabaceae	Eqebto	Dysentery After abortion Dry coughs Coughs Diphtheria Wounds	Soaking crushed bark or root in water and the water is taken orally Soaking bark in water and the water is taken orally The plant is applied on burning charcoal and smoke is inhaled nasally The root is applied on burning charcoal and smoke is inhaled nasally Soaking crushed roots in water and the water is taken orally Heated leaves or roots are applied topically or leaves or root paste is applied topically
7	<i>Acalypha fruticosa</i> Forssk.	Euphorbiaceae	Darmuusa	Malaise Wounds Colds Fevers Infections Sores Tooth decays Haemorrhage Wound infections Skin infections Diphtheria	Soaking the crushed plant for 3 h in water and the water is taken orally Leaf paste is applied topically Soaking crushed leaves in water and the water is used as nose drop Soaking crushed fresh leaves in water and the water is taken orally Leaf paste is applied topically Leaf paste is applied topically Soaking leaves in water and water is used as mouthwash Leaf paste is applied topically Leaf paste is applied topically Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally
96	<i>Acalypha indica</i> L.	Euphorbiaceae	Horrisa	Ganglions	Leaf paste is applied topically
99	<i>Achyranthes aspera</i> L.	Amaranthaceae	Qadda	Pruritic	Leaf paste is applied topically
30	<i>Aerva javanica</i> (Burm.f.) Schultes	Amaranthaceae	Oylayto	Haemorrhage Bone problems (gamra) Renal calculus Kidney problems Wounds	Soaking the crushed fresh plant in water and the water is taken orally Soaking the stems in boiled water and the water is applied topically or insert drops in the nose Soaking crushed roots in water and the water is taken orally Soaking crushed fresh leaves for 12 h in water and the water is taken orally
69	<i>Aizoon canariensis</i> L.	Aizoaceae	Illidubbiyta	Wounds	Leaf paste is applied topically
10	<i>Aloe mcloughlinii</i> Christian	Aloaceae	Qurreyta	Laxative Snake bites Eye infections Eye problems Conjunctivitis	Soaking crushed leaves or branches or stems in water for 12 h and the water is taken orally Soaking crushed stems for 12 h in water and the water is taken orally Soaking fresh leaves in water and the water is used as eye drop Soaking fresh leaves in water and the water is used as eye drop Soaking fresh leaves in water and the water is used as eye drop
68	<i>Alternanthera pungens</i> Kunth.	Amaranthaceae	Qaskena	Furuncles Skin infections	Leaf paste is applied topically Soaking fresh leaves in water and the water is used as shower bath
16	<i>Argemone mexicana</i> L.	Papaveraceae	Bangi	Wounds	Leaf paste is applied topically
25	<i>Aristolochia bracteolata</i> Lam.	Aristolochiaceae	Suqsuuqi	Angina Laxative Tooth decays Diphtheria Pains Ganglions Snake bites Ears	Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves and fruits in water and the water is taken orally Fresh leaves in chewed Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Leaf paste is applied topically Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed leaves in water and the water insert drops in the ears
32	<i>Balanites aegyptiaca</i> (van Tieghem) Blatter	Balanitaceae	Udda	Wounds Haemorrhage Tuberculosis	Leaf paste is applied topically Leaf paste is applied topically Soaking crushed roots in water and the water is taken orally or insert the drops in the nose
14	<i>Balanites rotundifolia</i> (van Tieghem) Blatter	Balanitaceae	Alayto	Laxative Diabetes Fevers	Soaking crushed fresh leaves in water for one hour and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally

Table 1 (continued)

Voucher#	Scientific name	Family name	Local name	Disease	Ways of utilisation
					Leaf and branch powder are sprinkled on burning charcoal and smoke is inhaled nasally or Soaking crushed fresh leaves and fruits in water and the water is taken orally
				Gastric Jaundice	Soaking crushed fresh leaves and bark in water and the water is taken orally Branch powder is sprinkled on burning charcoal and smoke is inhaled nasally or soaking crushed fresh leaves and fruits in water and the water is taken orally
				Malaria Whitlows Parasites Side aches Back pains	Soaking crushed fresh fruits in water and the water is taken orally Leaf paste is applied topically Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in boiled water and the water is taken orally
91	<i>Barleria homioitrichia</i> C. B. Clarke	Acanthaceae	Gansalto		
4	<i>Becium filamentosum</i> (Forssk.) Chiov	Lamiaceae	Dowdowya	Snake bites	Leaf paste is applied topically
80	<i>Blepharis edulis</i> (Forssk.) Pers.	Acanthaceae	Yamarukto	Siatic nerves	Soaking crushed fresh leaves and roots in water and the water is taken orally
74	<i>Buxus hildebrandtii</i> Baill.	Buxaceae	Gaydarto	Parasites Diabetes Infections	Soaking crushed fresh leaves in water for 6 h and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally
42, 140	<i>Cadaba farinosa</i> Forssk.	Capparidaceae	Urramoyti Xune leyta	Sores Wounds Wounds	Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically
95	<i>Cadaba glandulosa</i> Forssk.	Capparidaceae	Ududdo	Haemorrhage Menstruation problems	Soaking leaves in boiled water and apply topically Soaking crushed fresh leaves in water for one hour and the water is taken orally
35	<i>Cadaba rotundifolia</i> Forssk.	Capparidaceae	Anaagalliyya	Antibiotic	Soaking crushed fresh leaves in water for 12 h and the water is taken orally
59	<i>Capparis cartilaginea</i> Decn.	Capparidaceae	Xaxaq laynota	Diphtheria Coughs	Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves and bark in water and the water is taken orally
97	<i>Cleome brachycarpa</i> Vahl ex DC.	Capparidaceae	Sageeri	Foot problems	Leaf paste is applied topically or boil crushed fresh leaves in water and the water is taken orally
102	<i>Cocculus pendulosus</i> (J. R. & G. Forst.) Diels	Menispermaceae	Cayyukto	Headaches	Leaves powder is sprinkled on burning charcoal and smoke is inhaled nasally
49	<i>Coffea arabica</i> L.	Rubiaceae	Buna	Haemorrhage	Heat crushed seeds and apply locally
21	<i>Cometes abyssinica</i> Wall.	Caryophyllaceae	Kanxaxaf	Haemorrhage	Heat crushed leaves and apply locally
37	<i>Commicarpus squarrosus</i> (Heimerl) Standl.	Nyctaginaceae	Ansaqaqadda	Allergies	Oil leaf paste is applied topically
66	<i>Commiphora</i> sp.	Burseraceae	Kurbeyta	Infections Haemorrhage Laxative Urinary tract problems Diarrhoea	Oil leaf paste is applied topically Crush resin into powder and apply locally Mix fresh resin in water and the water is taken orally Soaking crushed resin in water and the water is taken orally
64	<i>Cordia sinensis</i> Lam.	Boraginaceae	Maderto	Gastric Infection diseases	Soaking crushed bark in water and the water is taken orally Soaking crushed bark in water and the water is taken orally Soaking fresh leaves in water for 30 min and the water is used as shower bath
86	<i>Cucumis prophetarum</i> L.	Cucurbitaceae	Facfacto	Wounds	Leaf paste is applied locally
48	<i>Cymbopogon commutatus</i> (Steud.) Stapf	Poaceae	Dambahu	Kidney problems Jaundice Bladder inflammations	Boiling crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Boiling crushed fresh leaves in tea
33	<i>Dodonaea angustifolia</i> Lf.	Sapindaceae	Gaydarceela	Infections Sores	Leaf paste is applied topically Leaf paste is applied topically
70	<i>Dracaena ombet</i> Heuglin ex Kotschyb et Peyritsch	Agavaceae	Waramali esqerto	Wounds	Bark paste is applied topically
60	<i>Euphorbia triaculeata</i> Forssk.	Euphorbiaceae	Ingiddaqtto	Laxative	Soaking crushed fresh leaves in water and the water is taken orally
83	<i>Fagonia schweinfurthii</i> Hadidi	Zygophyllaceae	Urramo	Malnutrition, swollen stomach	Leaf powder is sprinkled on burning charcoal and smoke is inhaled nasally
154	<i>Ferula communis</i> L.	Apiaceae	Kamuune	Food Poisoning	Soaking crushed fresh fruits in water and the water is taken orally
81	<i>Gomphocarpus fruticosus</i> (L.) R.Brown	Asclepiadaceae	Qagri aboya	Skin diseases	Soaking fresh leaves in water for two hours and the water is used as shower bath
47	<i>Grewia erythraea</i> Schweinf.	Tiliaceae	Cedayto	Furuncle Diphtheria	Root paste mixed with water is applied locally Root paste mixed with water is applied locally
53	<i>Grewia tembensis</i> Fresen.	Tilaceae	Serrekto	Abscess Furuncle	Root paste is applied topically Root paste is applied topically
17	<i>Heliotropium aegyptiacum</i> Lehm.	Boraginaceae	Amqadda	Rashes	Soaking crushed fresh leaves in water for 30 min and the water is taken orally
58	<i>Heliotropium longiflorum</i> (DC.) Burger	Boraginaceae	Data amqadda	Infections Allergies	Leaves paste is applied locally Soaking fresh leaves in water for 15 min and the water is used as shower bath
98	<i>Hibiscus hildebrandtii</i> Speg. & Hutch.	Malvaceae	Qas-cambokto	Stomach aches	Soaking crushed fresh leaves in water and the water is taken orally

Table 1 (continued)

Voucher#	Scientific name	Family name	Local name	Disease	Ways of utilisation
85, 72	<i>Hibiscus vitifolius</i> L.	Malvaceae	Qad-cambokto Garba	Wounds Smooth the hair	Leaf paste mixed with soil is applied locally Leaf paste is applied topically
8, 139	<i>Indigofera articulata</i> Gouan	Fabaceae	Ayrobeya  Warabekala	Allergies Injuries Tuberculosis Haemorrhage Wound infections Injuries Wound infections Haemorrhage Snakebites	Soaking crushed fresh leaves in water and the water is taken orally Leaf paste is applied topically Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Leaf paste is applied locally Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically Plant paste mixed with oil is applied topically
107	<i>Indigofera oblongifolia</i> Forssk.	Fabaceae	Xacanle	Torn foot	Plant paste mixed with oil is applied topically
19	<i>Jasminum grandiflorum</i> L.	Oleaceae	Bisaani xuuga	Furuncle Allergies	Soaking crushed fresh leaves in water and the water is taken orally Soaking fresh leaves and stems in water and the water is used as shower bath Leaf paste is applied topically
62	<i>Jatropha glauca</i> Vahl	Euphorbiaceae	Qaballe caxa	Ganglions Haemorrhoids	Soaking crushed fresh leaves in water and the water is taken orally
57	<i>Justicia flava</i> (Forssk.) Vahl	Acanthaceae	Qas caduwto	Stomach aches	Soaking crushed fresh leaves in water and the water is taken orally
87	<i>Lantana viburnoides</i> (Forssk.) Vahl	Verberaceae	Arraba dattos	Fevers	Soaking fresh leaves in water and the water is used as shower bath
105	<i>Launaea hafunensis</i> Chiov	Asteraceae	Baaxo qaxis	Sleeplessness	Soaking crushed fresh leaves in water for one hour and the water is taken orally
27	<i>Lavandula coronopifolia</i> L.	Lamiaceae	Dananwada	Stomach aches Diabetes  Sun burns  Kidney problems Side ache problems Gastric	Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed plants without the leaves in water and the water is taken orally Soaking crushed plants without the leaves in water and the water is taken orally Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed plants in water and the water is taken orally
92	<i>Lepidagathis calycina</i> Nees	Acanthaceae	Gandiya	Gastric	Soaking crushed fresh leaves in water and the water is taken orally
90	<i>Lycium shawii</i> Roem. & Schult.	Solanaceae	Kakooma	Headaches	Mixed powder is sprinkled on burning charcoal and smoke is inhaled nasally
79	<i>Maerua triphylla</i> A. Rich.	Capparidaceae	Ruqaysi	Gastric Diphtheria Furuncle	Soaking crushed fresh leaves in water and the water is taken orally Soaking crushed fresh leaves in boiled water and the water is taken orally Leaf paste is applied topically
101	<i>Melia azedarach</i> L.	Meliaceae	Dat caxa	Wound infections Diabetes	Leaf paste is applied topically Soaking crushed whole plant in water and the water is taken orally
136	<i>Melilotus suaveolens</i> Ledeb.	Fabaceae	Meclab	Poliomyelitis  Against sterility of women	Oil leaf paste is applied topically or soaking crushed leaves in water and the water is taken orally Soaking crushed leaves in water and the water is taken orally
9	<i>Nepeta azurea</i> R.Br. Ex Benth.	Lamiaceae	Simitri	Diphtherias Kidney diseases Asthma Diabetes	Soaking crushed leaves in boiled water and the water is taken orally Soaking crushed leaves in water and the water is taken orally Soaking crushed leaves and stems in water and the water is taken orally Soaking crushed leaves in boiled water and the water is taken orally
103, 18	<i>Ochradenus baccatus</i> Del.	Resedaceae	Malboyta Lusali	Diphtheria Ganglions Allergies	Soaking crushed leaves in water and the water is taken orally Soaking crushed leaves in water and the water is taken orally Soaking crushed leaves in water and the water is taken orally
39	<i>Ocimum basilicum</i> L.	Lamiaceae	Laynoyta	Parasites	Soaking crushed leaves in water and the water is taken orally
93	<i>Ocimum spicatum</i> Defl.	Lamiaceae	Bolbolli	Pruritic	oil leaf paste is applied topically
12	<i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall.ex G. Don) Cif.	Oleaceae	Wagarto	Gonorrhoeas	Soaking crushed leaves in water and the water is taken orally or boiling crushed leaves in water and meat and the water is taken orally
5, 67	<i>Orthosiphon pallidus</i> Royle ex Benth.	Lamiaceae	Abursaafiqi  Ganduwayto	Sun burns Kidney diseases Stomach aches Parasites Snake bites Haemorrhage	Soaking crushed leaves in water for 12 h and the water is taken orally Soaking crushed leaves in water for 1 h and the water is taken orally Soaking crushed leaves in water for 1 h and the water is taken orally Soaking crushed leaves in water and the water is taken orally Soaking crushed leaves in water and the water is taken orally Leaf paste is applied topically
78	<i>Parkinsonia scioana</i> Chiov.	Fabaceae	Sokocto	Haemorrhage	Leaf paste is applied topically
31	<i>Plicosepalus nummularifolius</i> (Franch.) Wiens & Polhill.	Loranthaceae	Qatute	Gastric	Soaking crushed leaves in water for 2 or 6 h and the water is taken orally
100	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Gaarua	Stomach aches	Soaking crushed leaves in water and the water is taken orally
71	<i>Psiadia punctulata</i> (DC.) Vatke	Asteraceae	Data aximto	Wounds	Leaf paste is applied topically
82	<i>Ruellia patula</i> Jacq.	Acanthaceae	Xoqto	Ear diseases	

Table 1 (continued)

Voucher#	Scientific name	Family name	Local name	Disease	Ways of utilisation
					Soaking crushed leaves in water for 30 min and the water is applied topically
2	<i>Ruta chalepensis</i> L.	Rutaceae	Sidaaba	Diphtheria	Soaking crushed leaves in water and garlic and the water is taken orally
63	<i>Seddera arabica</i> (Forssk.) Choisy	Convolvulaceae	Data dubnayto	Laxative	Soaking crushed leaves in water the water is taken orally
89	<i>Seddera bangshawei</i> Rendle	Convolvulaceae	Dalcimagga	Furuncles Vomiting	Leaf paste is applied topically Soaking crushed leaves in water for 30 min and the water is taken orally
94	<i>Seddera latifolia</i> Steud.	Convolvulaceae	Eger barra	Sun burns	Soaking crushed leaves in water for 30 min and the water is taken orally
22	<i>Senna alexandrina</i> Mill.	Fabaceae	Sanu	Constipation, injuries, skin diseases	Leaf paste is applied topically or soaking crushed leaves in water for 30 min and the water is taken orally
13	<i>Senna italica</i> Mill.	Fabaceae	Sanu	Laxative	Soaking crushed leaves in water for 30 min and the water is taken orally
84	<i>Solanum coagulans</i> Forssk.	Solanaceae	Qalullusto	Tooth decays	Leaf paste is applied topically
38	<i>Solanum cordatum</i> Forssk.	Solanaceae	Calawali	Ganglions	Root paste is applied topically
20	<i>Solanum incanum</i> L.	Solanaceae	Ombokkoqsto	Ears Wounds	Leaf paste is applied topically Leaf paste is applied topically
34	<i>Solanum somalense</i> Franch.	Solanaceae	Garbaqaddoyta	Haemorrhage Headaches	Leaf paste is applied topically Soaking crushed leaves and root in water and the water is taken orally
1	<i>Tagetes minuta</i> L.	Asteraceae	Miski	Colds Fevers Wounds Injuries Allergies Kidney diseases	Soaking crushed leaves in water for and the water is inserted in the nose Soaking crushed leaves in water the water is taken orally Leaf paste is applied topically Leaf paste is applied topically Leaf paste is applied topically Soaking crushed leaves in water for 30 min and the water is taken orally
54	<i>Tarchonanthus camphoratus</i> L.	Asteraceae	Galqaddo	Bladder inflammations Diabetes	Soaking crushed leaves in water for 30 min and the water is taken orally Soaking crushed leaves in water for 30 min and the water is taken orally
104	<i>Tephrosia</i> sp.	Fabaceae	Qabal mafaxa	Dysentery, diarrhoea, bleeding Jaundice	Soaking crushed leaves in water for 1 h and the water is taken orally Soaking crushed leaves in boiled water and the water is taken orally
23	<i>Terminalia brownii</i> Fresen.	Combretaceae	Wayboyta		Soaking crushed bark in water and the water is used as shower bath
135	<i>Thymus shimperi</i> Ronniger	Lamiaceae	Saq-dar	Sun burns Fevers  Colds  Parasites Siatic nerves Kidney diseases	Soaking crushed leaves in water and the water is taken orally Leaf and branch powder are sprinkled on burning charcoal and smoke is inhaled nasally  Branch powder is sprinkled on burning charcoal and smoke is inhaled nasally, soaking crushed leaves in water and the water is taken orally Soaking crushed leaves or bark in water the water is taken orally Soaking crushed leaves in water for 2 h and the water is taken orally Soaking crushed leaves in tea
76	<i>Tragia mixta</i> M. Gilbert	Euphorbiaceae	Ciinisso	Stomach aches	Oil leaf paste is applied topically
6	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Bunkat	Kidney diseases	Soaking crushed plant in water and the water is taken orally
11	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Qubaabulto	Bronchitis	Soaking crushed root in water and the water is taken orally
15	<i>Ximenia americana</i> L.	Olacaceae	Muxxaqa	Haemorrhage Urinary tract infections Headaches  Tuberculosis  Ring worms Angina	Root paste is applied topically Soaking crushed root in water the water is taken orally or apply drops in the nose Leaves powder is sprinkled on burning charcoal and smoke is inhaled nasally Soaking crushed root in water the water is taken orally or apply drops in the nose Leaf paste is applied topically
28	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Kusra	Wounds Spitting snake Dysentery Snake bites Sun burns Allergies Laxative Haemorrhage Eye infections	Leaf paste is applied topically Soaking crushed bark in water and the water is taken orally Soaking fresh leaves in water and the water is used as eye wash Soaking crushed leaves in water and the water is taken orally Soaking fresh leaves and stems in water and the water is used as eye wash Soaking crushed leaves and stems in water and the water is taken orally Soaking crushed leaves in water and the water is taken orally Soaking crushed leaves and stems in water and the water is taken orally Leaf paste without water is applied locally Soaking fresh leaves and stems in water and the water is used as eye wash

In few cases, different local names stood for a single species such as Lusali and Malboyta for *Ochradenus baccatus* or Abursaafiqi and Ganduwayto for *Orthosiphon pallidus*. Only few informants can make the difference between these two species and hence most of the villagers did not distinguish the two species, assuming that the names Lusali and Malboyta referred to the same species. Another example is Ayro-Beya (*Indigofera articulata*), which has a different local name (Warabekala) according to healers. This is perhaps a

secret name used only by healers as a way to conserve and protect the traditional recipes, reminiscent of a form of traditional property rights protection scheme. Many healers in Ethiopia use Geez (an ancient Ethiopian language now extinct from the public domain), not understood by ordinary people, as names for many plants.

A further striking observation involves the use of two different local names that correspond to a single species: Urraamoyti and

Xune-Leyta (for *Cadaba farinosa*), Garba and Qad-cambokto (for *Hibiscus vitifolius*). This may be a possible limitation of the local nomenclatural systems as it usually relies on single or few distinguishing features in contrast to that of modern plant taxonomists who tend to use more elaborate taxonomic characters to distinguish plant taxa. Whereas it is noted that similarity in naming related plants, careful checking is in order to minimise chances of ambiguity in future ethnopharmacological study. Also, from the list of local names, it is interesting to note that some plants share nearly the same local names and uses in Ethiopia and Djibouti as in the case of *Terminalia brownii*, which is called Wayboyta in Djibouti and Weybata/Weyba in Ethiopia. This observation may trigger insights into further investigations on such similarities so that experiences can be widely shared between the two countries.

### 3.3. Plant parts used of the medicinal plants

The plant parts used for preparation of medicines were leaves, bark, resin, roots, branches, stems, fruits, seeds, all the above-ground parts and the whole plant. Fig. 2 shows that the most frequently utilised plant part was the leaves (92%) followed by the sap/juice (77%). The results are similar to other countries where the preference towards leaves may be due to their abundance compared to other plant parts (Giday et al., 2003). It may also be due to their efficacy as a result of their role as sites of chemical reactions and in acting as reservoirs for metabolites like photosynthesases, exudates and others (Balick and Cox, 1996). The other two main plant parts used were roots and bark, which may be related to the dropping of leaves under drought conditions or the level of concentration of chemicals. The utilisation of roots and to some extent bark for the preparation of medicines could be a worrying issue due to the risk for the survival of the concerned medicinal plants (Abebe and Ayehu, 1993).

Woody plants (trees and shrubs) were the main sources of medicinal plants in terms of the number of species (about 47% of shrubs 41% of trees of total species) followed by 12% of herbs (Fig. 3). The fact that most of the claimed medicinal plants are woody is an indication of their relatively higher abundance in the study area as compared to herbs. This could be explained by the fact that their availability throughout the year (or over decades) rather than the herbs which are short lived as opposed to their efficacy as medicinal plants. This could also be due to grazing by cattle and dryness of the environment, both of which are increasing over time.

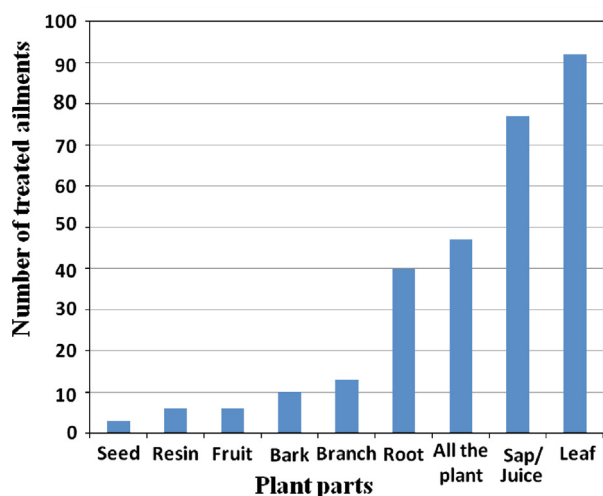


Fig. 2. Plant parts used as medicine and the number of ailments treated.

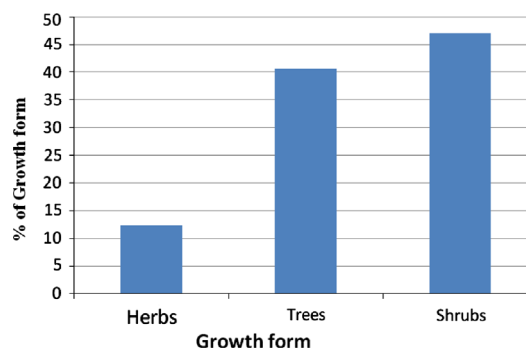


Fig. 3. Growth form of the medicinal plants in Randa.

### 3.4. Mode of preparation of plant medicines

Generally, the plants are used when fresh or dry essentially in the form of a decoction, maceration, infusion, juice, oil paste, powder and sometimes as ash infusion. In all these preparations, there is a standardized maceration (54%) in water prepared with a handful of plant material. Raw and paste material are the second (13%) most used preparation methods. In order to improve the acceptability of certain remedies, which are bitter and taken orally, some additives were frequently used in some cases (3%). Most of the remedies were taken once or twice a day. Almost all medical remedies were based on the preparation of a single plant. Exceptions to this were found in the case of medicine preparation and administration by healers, which may also be partly related to secrecy through camouflage of the identity of the important medicinal plants.

### 3.5. Administration of medicines

The main administration routes of the remedies were oral (taken by mouth) (40%) followed by poultice (23%) and topical application/bathing (13% and 11%). However, there was a general lack of precision in the determination of the exact amount of doses given to patients. This is related to the diversity in knowledge and skills of the traditional systems, which is most of the time individualised with limited sharing of knowledge on medicinal plants due to many factors.

Few plants were reported with side effects when used in excess such as Ciinisso (*Tragia mixta*) that gives itchy feelings and Bangi (*Argemone mexicana*) that is claimed to cause mental instability, which were claimed to have laxative effects and leading to internal haemorrhage when used in excess.

### 3.6. Ailments treated by medicinal plants

The highest number of citations (237) was for microbial infections while the highest ICF value (0.98) was obtained for eye problems. Values for twelve common disease categories are given in Table 2.

It is interesting to note that the lowest ICF value was nil and it concerned plants used against diseases affecting women and skin problems. The results regarding the percentage of informants against each disease category captured further attention (Fig. 4). More species were cited for general health conditions (pain, allergy, fevers, sunburn, flu, colds, sinusitis, diarrhoea, diabetes) leading with 22.3% followed by microbial infections (18%), digestive tract and wounds (11.6% and 10.6% respectively), skin diseases and blood problems (7.4% each) while the numbers of species cited were 48, 39 and 25 for general health conditions, microbial infections, and digestive tract problems, respectively.



**Table 2**

Informant consensus factor (ICF) by category of diseases. (ICF is the number of use citations in each category minus the number of species used, divided by the number of use citations in each category minus one).

Category	Species	Citations	ICF
Eye problems	3	91	0.98
Mouth diseases	3	33	0.93
Kidney problems	11	95	0.89
Microbial infections	39	237	0.84
Digestive tracts	25	123	0.80
Wounds	23	99	0.77
Bites	7	25	0.75
General conditions <sup>a</sup>	48	167	0.71
Head problems	3	7	0.67
Blood problems	16	45	0.66
Women	4	4	0.0
Skin problems	16	16	0.0

<sup>a</sup> General health conditions includes pains, allergies, fevers, sun burns, flu, colds, sinusitis, diarrhoeas, diabetes.

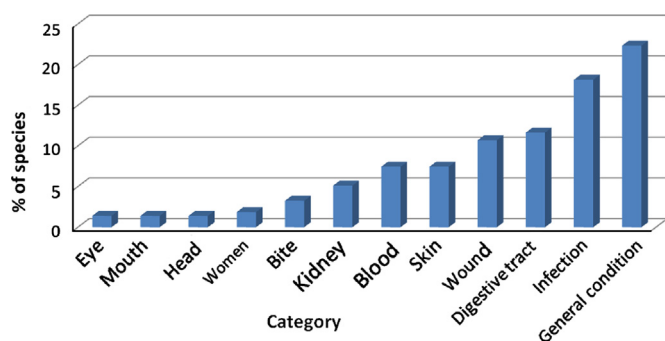


Fig. 4. Percentage of species for each category of diseases.

In addition to microbial infections, one of the major ailments is gastrointestinal complaints related to the problems of the digestive tract, which probably results from the low food quality observed in Randa Region. Vegetables are barely eaten in Randa Region since many households cannot afford them. One of the consequences is the high percentage of constipation (12%), which is one of the most frequently mentioned ailments among the informants. On top of this, the kidney problems found in the area could mainly be due to poor water quality, which is high in inorganic salts (2000–4000  $\mu\text{S}/\text{cm}$ ) (Awaleh, 2011). Nearly 20% of the medicinal plants recorded in this study are those used against microbial infections. This is related to the high prevalence in Djibouti of infectious diseases, probably caused by poverty and the general unhygienic conditions observed in many parts of Randa Region. Poor prevention systems and resistance to drugs are generally regarded as the two main factors aggravating microbial infections in Djibouti.

### 3.7. Diversity use of medicinal plants

Most of the species were found to have more than a single therapeutic use which means that different plant parts have different uses. Thirty two recorded medicinal plants were cited by three or more informants, which presented more than three therapeutic values (Table 3). High versatility of medicinal plants could indicate higher diversity of active compounds contained by the species. The data indicated that some plants have more diversified medicinal uses or applications than others. Accordingly, *Darmuusa (Acalypha fruticosa)* with the highest RI level (RI=2) was found to have the highest diversity of medicinal uses (used for the treatments of 13 different ailments) and was described to treat malaise, wounds, colds, fevers, microbial infections, tooth decay,

haemorrhage, diphtheria and skin infections. This was followed by *Qubaabulto (Withania somnifera)* with (RI=1.48) and *Kusra (Ziziphus mauritiana)* with RI=1.41, which are used against ten and nine ailments respectively. The lowest RI value was down to 0.2 and it referred to 41 different species (Table 3).

### 3.8. Efficacy of the medicinal plants

Plants which are used in some repetitive fashion are more likely to be biologically active (Trotter and Logan, 1986). In order to find therapeutically potent plants for chemical screening, the Fidelity Level values of 38 medicinal plants (Table 4) cited by three or more informants, acknowledging use against a given ailment category, were used for the analysis of the efficacy of the medicinal plants. There were nine plant species: *Gaydarceela (Dodonea angustifolia)*, *Calawali (Solanum cordatum)*, *Cedayto (Grewia erythraea)*, *Horrisa (Acalypha indica)*, *Kasalto (Acacia etbaica)*, *Urraamoyti (Fagonia schweinfurthii)*, *Qalulusto (Solanum coagulans)*, *Sanu (Senna alexandrina)*, *Serekto (Grewia tembensis)* with the highest (100%) FL values that proved their good healing potential against a specific disease (Table 4). The least FL value was for *Suqsuuqi (Aristolochia bracteolata)* with a 7% FL value against insect bites. Comparing the same plant for toothache, the FL value is equal to 65%. This may inform us on the fact that each plant may be specific to a specific ailment despite its use diversity. The species that gave the highest fidelity level values are considered more promising candidate plants for further pharmacological investigations and deserve priority attention. At this juncture it must be underlined that the forest, which is an emblematic environment in Randa and the main reservoir of medicinal plants, must be protected. It has to continue to be the pride of the region and to ensure the continuity of the medicinal plants and the associated ethnomedicinal knowledge of the local communities.

### 3.9. Comparison of some Djiboutian medicinal plants with the literature

Comparison of the pharmacological literature (Table 5) published from different countries with the present ethnobotanical data showed that many of the plants have earlier been reported to have activities against specific diseases. Examples include *Terminalia brownii* used to treat jaundice and *Dodonea angustifolia* used to treat skin problems. Such observations hinted at the trustworthiness of the claims made by the communities and the healers in Randa Region. Through their indigenous knowledge systems, the communities have been able to keep track of potent medicinal plants from among many others that grew in their environment. Other medicinal plants are used differently in Djibouti when compared with other traditional practices. For example, *Heliotropium longiflorum* was used against tooth decay in Djibouti but for febril cases in Ethiopia. There are also some species used in Djiboutian traditional medicine such as *Indigofera articulata* but not mentioned in the literature may be because they have not been successful in other medicinal therapies. Plant species that are widely used as remedies for treating microbial infections were compared with information obtained from the pharmacological literature and described in Table 5.

## 4. Conclusions

The forest in Randa Region is important in many ways, including as a reservoir of traditional medicinal plants with potential for the development of modern therapeutics. On the other hand, previous biodiversity studies have identified several problems associated with forest degradation and problems posed by

**Table 3**  
Relative importance (RI) values for Randa medicinal plants used against specific ailments. (RI=NP+NCS where NP is obtained by dividing the number of properties (reported specific ailments) attributed to a species divided by the total number of properties attributed to the most versatile species (species with the highest number of properties). NCS is the number of body systems (ailment categories) treated by a given species divided by the total number of body systems treated by the most versatile species.).

Scientific names	NP	NCS	RI
<i>Acalypha fruticosa</i>	13/13	7/7	2.00
<i>Withania somnifera</i>	10/13	5/7	1.48
<i>Ziziphus mauritiana</i>	9/13	5/7	1.41
<i>Aristolochia bracteolata</i>	8/13	5/7	1.33
<i>Commiphora</i> sp.	7/13	5/7	1.25
<i>Balanites rotundifolia</i>	11/13	3/7	1.27
<i>Aloe mcloughlinii</i>	6/13	5/7	1.18
<i>Solanum somalense</i>	7/13	4/7	1.11
<i>Aerva javanica</i>	5/13	5/7	1.10
<i>Acacia mellifera</i>	6/13	4/7	1.03
<i>Orthosiphon pallidus</i> , <i>Indigofera articulata</i> , <i>Ruta chalepensis</i>	5/13	4/7	0.96
<i>Balanites aegyptiaca</i>	6/13	3/7	0.89
<i>Lavandula coronopifolia</i>	5/11	3/7	0.88
<i>Indigofera articulata</i>	4/13	4/7	0.88
<i>Acacia tortilis</i> , <i>Maerua triphylla</i> , <i>Acacia oerfota</i>	5/13	3/7	0.81
<i>Acacia ehrenbergiana</i>	4/13	3/7	0.74
<i>Terminalia brownii</i>	5/13	2/7	0.67
<i>Acacia seyal</i> , <i>Argemone mexicana</i> , <i>Capparis cartilaginea</i> , <i>Buxus hildebrandtii</i> , <i>Senna italica</i> , <i>Melia azedarach</i>	3/13	3/7	0.66
<i>Dodonea angustifolia</i> , <i>Ximenia americana</i>	2/13	3/7	0.58
<i>Cymbopogon commutatus</i>	3/11	2/7	0.56
<i>Jasminum grandiflorum</i> , <i>Tribulus terrestris</i> , <i>Melilotus suaveolens</i> , <i>Tagetes minuta</i> , <i>Alternanthera pungens</i> , <i>Grewia tembensis</i> , <i>Nepeta azurea</i>	3/13	2/7	0.52
<i>Parkinsonia scioana</i> , <i>Tragia mixta</i> , <i>Cucumis prophetarum</i> , <i>Coffea arabica</i> , <i>Heliotropium longiflorum</i> , <i>Cadaba farinosa</i> , <i>Tarchonanthus camphoratus</i> , <i>Solanum cordatum</i> , <i>Cometes abyssinica</i> , <i>Ochradenus baccatus</i> , <i>Solanum incanum</i> , <i>Justicia flava</i>	2/13	1/7	0.44
<i>Grewia erythraea</i> Schweinf., <i>Ochradenus baccatus</i> , <i>Solanum coagulans</i>	2/13	1/7	0.30
<i>Launaea hafunensis</i> , <i>Ocimum spicatum</i> , <i>Cocculus pendulosus</i> , <i>Seddera bangshawei</i> , <i>Psiadia punctulata</i> , <i>Seddera latifolia</i> , <i>Lepidagathis calycina</i> , <i>Barleria homioitrichia</i> , <i>Hibiscus vitifolius</i> , <i>Plumbago zeylanica</i> , <i>Lycium shawii</i> , <i>Cordia sinensis</i> , <i>Jatropha glauca</i> , <i>Tephrosia</i> sp., <i>Achyranthes aspera</i> , <i>Gomphocarpus fruticosus</i> , <i>Cleome brachycarpa</i> , <i>Cadaba glandulosa</i> , <i>Fagonia schweinfurthii</i> , <i>Olea europaea</i> subsp. <i>cuspidata</i> , <i>Indigofera oblongifolia</i> , <i>Ruellia patula</i> , <i>Blepharis edulis</i> , <i>Seddera arabica</i> , <i>Becium filamentosum</i> , <i>Orthosiphon pallidus</i> , <i>Acalypha indica</i> , <i>Aizoon canariensis</i> , <i>Euphorbia triaculeata</i> , <i>Ferula communis</i> , <i>Acacia etbaica</i> , <i>Ocimum basilicum</i> , <i>Heliotropium aegyptiacum</i> , <i>Plicosepalus nummulariifolius</i> , <i>Senna alexandrina</i> , <i>Thymus schimperi</i> , <i>Dracaena ombet</i> , <i>Cadaba rotundifolia</i> , <i>Commicarpus squarrosus</i> , <i>Lantana viburnoides</i>	1/13	1/7	0.22

**Table 4**  
Fidelity level (FL) values of medicinal plants cited by three or more informants. (FL=Ip/Iu × 100, where Ip is the number of informants who independently indicated the use of a species for the same major ailment and Iu the total number of informants who mentioned the plant for any major ailment.).

Scientific names	Category	IP	Iu	FL (%)
<i>Dodonea angustifolia</i> L.f.	Wounds	4	4	100
<i>Solanum cordatum</i> Forssk.	General conditions	4	4	100
<i>Grewia erythraea</i> Schweinf.	Microbial infections	16	16	100
<i>Acalypha indica</i> L.	General conditions	3	3	100
<i>Acacia etbaica</i> Schweinf.	Digestive transits	3	3	100
<i>Fagonia schweinfurthii</i> Hadidi	Wounds	4	4	100
<i>Solanum coagulans</i> Forssk.	Mouth diseases	4	4	100
<i>Senna alexandrina</i> Mill.	Digestive transits	51	51	100
<i>Grewia tembensis</i> Fresen.	Microbial infections	4	4	100
<i>Tribulus terrestris</i> L.	Kidney problems	17	18	94
<i>Ochradenus baccatus</i> Del. (Malboyta)	Microbial infections	16	17	94
<i>Cymbopogon commutatus</i> (Steud.) Stapf	Kidney problems	14	15	93
<i>Aerva javanica</i> (Burm.f.) Schultes	Kidney problems	27	30	90
<i>Ruta chalepensis</i> L.	Kidney problems	25	28	89
<i>Ximenia americana</i> L.	General conditions	7	8	88
<i>Acacia oerfota</i> (Forssk.) Schweinf.	Wounds	21	24	88
<i>Terminalia brownii</i> Fresen.	Microbial infections	98	114	86
<i>Euphorbia triaculeata</i> Forssk.	Digestive transits	6	7	86
<i>Melilotus suaveolens</i> Ledeb.	Microbial infections	5	6	83
<i>Aloe mcloughlinii</i> Christian	Eye problems	83	100	83
<i>Balanites rotundifolia</i> (van Tieghem) Blatter	General conditions	63	76	83
<i>Acacia mellifera</i> (Vahl) Benth.	Wounds	12	25	48
<i>Acacia seyal</i> Del.	Microbial infections	13	17	76
<i>Aristolochia bracteolata</i> Lam.	Mouth diseases	28	43	65
<i>Parkinsonia scioana</i> Chiov.	Blood problems	12	19	63
<i>Maerua triphylla</i> A. Rich.	Skin problems	6	10	60
<i>Nepeta azurea</i> R. Br.ex Benth.	General conditions	3	5	60
<i>Indigofera articulata</i> Gouan (Warabekala)	Blood problems	9	15	60
<i>Lavandula coronopifolia</i> L.	General conditions	9	17	53
<i>Ziziphus mauritiana</i> Lam.	Bites	14	29	48
<i>Balanites aegyptiaca</i> (L.) Del.	Wounds	4	9	44

Table 4 (continued)

Scientific names	Category	IP	Iu	FL (%)
<i>Lavandula coronopifolia</i> L.	Digestive tracts	7	17	41
<i>Indigofera articulata</i> Gouan (Ayrobeya)	Wounds	4	10	40
<i>Indigofera articulata</i> Gouan (Ayrobeya)	Blood problems	4	10	40
<i>Orthosiphon pallidus</i> Royle ex Benth. (Abursaafiqi).	Microbial infections	6	16	38
<i>Parkinsonia scioana</i> Chiov.	Wounds	7	19	37
<i>Solanum somalense</i> Franch.	Head problems	4	10	40
<i>Acacia tortilis</i> (Forssk.) Hayne	Wounds	3	9	33
<i>Acacia tortilis</i> (Forssk.) Hayne	Microbial infections	3	9	33
<i>Acacia tortilis</i> (Forssk.) Hayne	General conditions	3	9	33
<i>Solanum somalense</i> Franch.	Wounds	4	12	33
<i>Withania somnifera</i> (L.) Dunal	Microbial infections	6	18	33
<i>Balanites aegyptiaca</i> (L.) Del.	Microbial infections	3	9	33
<i>Indigofera articulata</i> Gouan (Ayrobeya)	Wounds	5	15	33
<i>Orthosiphon pallidus</i> Royle ex Benth. (Abursaafiqi)	Digestive transits	5	16	31
<i>Acalypha fruticosa</i> Forssk.	Wounds	9	29	31
<i>Commiphora</i> sp.	Kidney problems	3	10	30
<i>Commiphora</i> sp.	Digestive transits	3	10	30
<i>Acalypha fruticosa</i> Forssk.	General conditions	8	29	28
<i>Solanum somalense</i> Franch.	General conditions	3	15	20
<i>Orthosiphon pallidus</i> Royle ex Benth. (Abursaafiqi)	General conditions	4	16	25
<i>Ziziphus mauritiana</i> Lam.	Microbial infections	7	27	26
<i>Aristolochia bracteolata</i> Lam.	General conditions	10	43	23
<i>Acalypha fruticosa</i> Forssk.	Microbial infections	6	29	21
<i>Withania somnifera</i> (L.) Dunal	General conditions	3	12	25
<i>Acacia mellifera</i> (Vahl) Benth.	Blood problems	3	17	18
<i>Acacia seyal</i> Del.	Digestive transits	3	17	18
<i>Withania somnifera</i> (L.) Dunal	Kidney problems	3	18	17
<i>Withania somnifera</i> (L.) Dunal	Blood problems	3	18	17
<i>Aloe mcloughlinii</i> Christian	Digestive transits	15	100	15
<i>Terminalia brownii</i> Fresen.	General conditions	16	114	14
<i>Ziziphus mauritiana</i> Lam.	General conditions	4	30	13
<i>Ziziphus mauritiana</i> Lam.	Digestive transits	4	30	13
<i>Balanites rotundifolia</i> (van Tieghem) Blatter	Digestive transits	6	76	8
<i>Balanites rotundifolia</i> (van Tieghem) Blatter	Microbial infections	6	76	8
<i>Aristolochia bracteolata</i> Lam.	Bites	3	43	7

Table 5

Comparison of the uses of medicinal plants recorded with information gathered from the literature.

Scientific name	Local (Afar) name	Ailments recorded in Djibouti in the present study	Some traditional medicines reported in the literature
<i>Acacia seyal</i>	Qadgento	Dysentery, wounds, stomach aches, after miscarriage	Antimalarial (Ngutaa et al. 2010; Trotter and Logan, 1986), against diarrhoeas (Geissler et al. 2002; Ngutaa et al. 2010).
<i>Acacia tortilis</i>	Eqebto	Diphtheria, vomiting, coughs, wounds, baby diseases	Against stomach aches and skin ailments, anti- coughs and indigestions, (Geissler et al., 2002; Koch et al., 2005; Saini et al., 2008) anti-malaria, strengthen bones, and anti-kidney problems (Koch et al., 2005; Saini et al., 2008).
<i>Acalypha fruticosa</i>	Darmuusa	Diphtheria, parasite infections, colds, discomfoted baby, general sickness, wounds, fevers, tuberculosis	Venom antidotes, snake bite remedies (Hedberg et al., 1983; Koch et al., 2005) cure stomach aches (Watt and Brandwijk, 1962; Hedberg et al. 1983; Koch et al., 2005; Ashokan and Muthuraman, 2011), antifungal, against skin diseases or skin infections (Ashokan and Muthuraman, 2011; Hamza et al., 2006) treat cough and gonorrhoea (Hedberg et al., 1983; Watt and Brandwijk, 1962) anti-constipations (Cotton, 1996), cure chest pains, and anti-cholera (Watt and Brandwijk, 1962; Hedberg et al., 1983), treat conjunctivitis (Hedberg et al., 1983; Koch et al., 2005; Watt and Brandwijk, 1962), infected wounds sedative (Samuelsson et al. 1991), treat smallpox, chickenpox, measles (Hamza et al., 2006) cure for eczma (Fleurentin and Pelt, 1983; Lefloc'h et al., 1985), anti-epilepsy (Fleurentin and Pelt, 1983, Zaidi and Crow, 2005)
<i>Balanites rotundifolia</i>	Alayto	Parasites, malaria, jaundice, asthma, diabetes, stomach aches	Anti-diarrhoeas, against tiredness against GIT complications (emetic) and cure eye infections (Zaidi and Crow, 2005, Teklehaymanot and Giday, 2010)
<i>Melilotus suaveolens</i>	Meclab	Polio, women sterility	Against digestion disorders (Moskalenko, 1987; Teklehaymanot and Giday, 2010), eye, nose, throat, ear and teeth problems (Moskalenko, 1987; Dung and Loi, 1991)
<i>Ochradenus baccatus</i>	Malboyta	Diphtheria	Back pains (Dung and Loi, 1991; El-Ghazali et al., 2010).
<i>Orthosiphon pallidus</i>	Abursaafiqi	Parasites, sun burns, stomach aches, kidney problems	Against urinary lithiasis, oedema, fevers, influenza, rheumatism, hepatitis and jaundice (Watt and Brandwijk, 1962; Ashokan and Muthuraman, 2011)
<i>Terminalia brownie</i>	Wayboyta	Jaundice	Against body swellings, allergies, eye, kidney problems, worms, yellow fevers of hepatitis (Mbwambo et al., 2007; El-Ghazali et al., 2010) abortions, eye infections, fungal infections, ring worms, and malaria (Kareru et al., 2007; Mbwambo et al., 2007)
<i>Ziziphus mauritiana</i>	Kusra	Dysentery, haemorrhage, eye infections, allergies, snake bites, constipations, snake spits, sun burns	Against diarrhoeas (Kareru et al. 2007, Tetalia et al., 2009), boils (Inngjerdingen et al., 2004; Tetalia et al., 2009) internal heat, measles, impotency (Behera and Misra, 2005; Inngjerdingen et al., 2004) cough, and asthma (Hedberg et al., 1983; Koch et al., 2005) also antihelmetic (Hedberg et al., 1983; Watt and Brandwijk, 1962).

Table 5 (continued)

Scientific name	Local (Afar) name	Ailments recorded in Djibouti in the present study	Some traditional medicines reported in the literature
<i>Grewia erythraea</i>	Cedayto	Furuncles, diphtheria	Anti-coughs and cold respiratory diseases (Fleurentin and Pelt, 1983, Zaidi and Crow, 2005).
<i>Solanum somalense</i>	Garbaaqaddoyta	Disorders characterised by abdominal extension, loss of body, headaches, wounds, colds, fevers, dysentery	Against colds and headaches, also fortifying weight (Behera and Misra, 2005; Inngjerdingen et al., 2004).
<i>Indigofera articulata</i> <i>Dodonea angustifolia</i>	Ayro-beya Gaydar-cela	Haemorrhage Skin problems, wounds	– Anti-malaria (Behera and Misra, 2005; Giday et al., 2007), analgesic, laxative, antipyretic, anti-rheumatism, cure eczema, and treat skin ailments (Watt and Breyer-Brandwijk, 1981; Giday et al., 2007) treat cancer, fevers and tuberculosis (Watt and Breyer-Brandwijk, 1981; Mativandlela, 2009), against intestinal worms, and dysentery, cure external injuries cure internal diseases, un-identified swellings and neck cancer (Behera and Misra, 2005; Giday et al., 2007).
<i>Withania somnifera</i>	Qubaabulto	Headaches, urinary infections, coughs, side aches, fungus, bronchitis, tuberculosis, haemorrhage	Treatment of wounds (Watt and Breyer-Brandwijk, 1981; Samuelsson et al., 1993).
<i>Commiphora</i> sp.	Kurbeyta	Allergies, infections, diarrhoeas, gastric, urinary infections against constipations	Detergent for mouth and throat, anti-bronchitis, against face and skin problems, antiseptic, anti-coughs (Al-fatimi et al., 2007; Samuelsson et al., 1993), skin problems and wounds, against snakebites, gonorrhoea, stomach disorders and livestock related diseases (Al-Fatimi et al., 2007, Ali et al., 2008).
<i>Heliotropium longiflorum</i> <i>Balanites aegyptiaca</i>	Data- amqada Udda	Allergies, teeth decays Burns, lepra, wounds, tuberculosis, haemorrhage, infected wounds	Against commonly occurring diseases, like febrile diseases (Wondimu et al., 2007). Purgative, anti-syphilis, antimalarial, antihelminthic, (Watt and Brandwijk, 1962; Hedberg et al., 1983), bilharzias purgative, (Hussein et al., 1981; Hammiche and Maiza, 2006; Ali et al., 2008 Iwu, 1993) against stomach diseases, anti-jaundice, cure diabetes (Hammiche and Maiza, 2006), against sexually transmitted diseases, anti-rheumatism, digestion problems, and anti-dysentery (Iwu, 1993; Hammiche and Maiza, 2006)

invasive species. This calls for concerted efforts towards ecosystems protection. The current practice of harvesting medicinal plants directly from the forest is also adding to the problem as far as some commonly used species are concerned, which requires introduction of methods that ensure the sustainable use of the resource. Despite attempts by the government of Djibouti to plant seedlings of *Juniperus procera*, the situation is worsening. To ease this situation, the forest development programme in Djibouti needs to work towards encouraging plant cultivation with possible ultimate domestication of selected priority species and their protection in nature; the former action is expected to reduce pressure on wild habitats.

Since there is a complete lack of phytotherapeutic evidence for many of the species, a logical step forward is to carry out phytochemical and pharmacological studies in order to confirm the validity of the claims and properties attributed to these species. This will be a gateway to the promotion of the cultivation and commercialisation of medicinal plants in Randa Region for creating job opportunities and providing income for the un-employed members of the local community.

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