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AN ETHNO-BOTANICAL STUDY OF INDIGENOUS MEDICINAL PLANTS AND THEIR USAGE IN RURAL AND TRIBAL AREAS OF BICHHUA TEHSIL, MADHYA PRADESH, INDIA

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Abstract
Ethnobotanical research was carried out in the tribal areas of Bichhua Tehsil, Madhya Pradesh, to document the usage of native medicinal herbs by experienced individuals. quantitative measures like ranking and use categories.Informant Consensus Factor and Fidelity level were used to evaluate the importance of medicinal plant species. In the present study, A total of 84 medicinal plant species belonging to 42 families were collected and documented. Among the above families, Fabaceae (15.7 %)was the leading and contains the highest number of species;71 % plant species were wild; 52% were trees;leaves (31.6%) were the most used plant parts; and decoction (23.7%) was the major mode of remedy-preparation. The medicinal plants with the highest Fidelity level values were *Emblica officinalis*Gaertn., *Terminalia bellirica* (Gaertn.) Roxb., *Terminalia chebula* Retz. and *Zingiber officinale* Roscoe (each 96%).It is concluded that ethno-medicines have played significant role in the indigenous healthcare system of the study areaBichhua Tehsil.

Keywords: Ethnobotany, Quantitative indices, Informant Consensus Factor, Fidelity level

1. Introduction

Herbal remedies are utilised all around the world and are based on readily accessible, inexpensive, locally existent, and readily available plant resources. The usage of traditional medicines is typically influenced by variables like accessibility, availability, and cultural acceptability of the healthcare service (Bawistale*et al*., 2022).

Even though several tribal societies, including the Gond, Pardhan, Bharia, and Korku, of Bichhua Tehsil relies heavily on medicinal plants due to its favourable climate, to cure both

human and cattle problems, relatively little work has been done to investigate, record, and promote these commonly utilised plants(Dahare and Jain 2010; Vijendra and Kumar, 2017). Moreover, the related indigenous knowledge was also seriously threatened by reasons like deforestation, overexploitation of natural resources, overgrazing, habitat damage and fragmentation, as well as agricultural land development. In addition to giving the chance to recognise, promote, manage, and protect indigenous knowledge of a community on medicinal plants as an important part of a nation's heritage, such documents are important for defining and maintaining the cultural identity of the people.No previous ethnobotanic studies are reported to have been conducted in villages of Bichhua Tehsil. This study identifies not only the wild plants collected for medicinal purposes by locals of Bichhua Tehsil but also uses local names of these plantsHence, identification and documentation of medicinal plants and the accompanying ethnobotanical knowledge were the goals of this study.

2. Methods

2.1 Description of the study area

Bichhua Tehsil having a total size of 783 km^2,and 87,691 inhabitants, is situated in Chhindwara, the largest district in Madhya Pradesh.

2.2 Ethnobotanical data collection

The methods utilised to collect ethnobotanical data included semi-structured interviews, field observations, and escorted field outings with informants to find medicinal plants in the area.

2.3 Informant consensus factor (ICF)

An Informant consensus factor study was carried out to assess the relative importance of each application purely based on the respondents' level of agreement (Jima&Megersa, 2018; Karaköse 2022).

ICF = (nur ns)/(nur 1); ns = number of species used; nur = number of use citations in each category.

2.4 Fidelity level (FL)

The percentage of informants who stated using certain plant species to cure a specific condition in the research region is known as the fidelity level, or FL. This formula is used to determine the FL index: FL (%) equals 100 IpIU. where Iu is the total number of informants who cited the plant for any major sickness and Ip is the number of informants who independently indicated the usage of a species for the same major ailment. (Dash et al., 2008).

2.5 Preference ranking

There was a preference rating after G Martin. Key informants were asked to rank the medicinal plants in order of perceived value, giving the plant that they believed would be most effective at treating the selected ailment several five, and the one that they believed would be least effective several one. (Hong et al. 2015).

2.6 Paired comparison of medicinal plants

Five medicinal plants known to relieve stomach problems in the research area were compared side by side. These medicinal plant species were ranked by ten key informants according to their effectiveness as follows: 1 is the worst, 2 is good, 3 is very good, and 4 is superb (Nedi and Belachew S. 2023).

2.7 Direct matrix ranking

A direct matrix ranking was done to compare the adaptability of a given plant species based on the data received from informants. A use value assignment was requested from each key informant (5 as the best, 4 as very good, 3 as good, 2 as less used, 1 as least used, and 0 not included. The average score was added up and positioned in ranking (Beche et al., 2016).

2.8 Statistical tools

One-Way Analysis of Variance (ANOVA) was performed to test the differences at 0.05 level of significance using IBM SPSS Statistics.

Results and Discussion

3.1. Information about respondents in the study area

96 respondents (66 men and 30 women) were surveyed utilising a semi-structured interview, field observations, and led field walks to gather information. Three age categories of respondents were identified: young (20–34 years), 16 (18.6%); middle-aged (35–49 years), 28 (32.55%); and elderly (50–80 years), 42 (48.83%). There were no significant differences in the knowledge of medicinal plants among the members and between the rural communities, according to the ongoing exchange of information on them.

Medicinal plants in the Bichhuadistrict

A total of 84 medicinal plant species belonging to 42 families were collected and documented which are frequently used for treating only human ailments in Bichhua District (Table 1). Among the above families, Fabaceae is the leading and contains the highest number of species 12 (15.8 %), followed by Combretaceae, Lamiaceae and Poaceae both 5 (6.57 %), Moraceae, Rutaceae andApocynaceae4 (5.26 %), Zygophyllaceae, Euphorbiaceaeand Anacardiaceae 3 (3.94 %), Leguminosae, Lythraceae, Meliaceae,and Malvaceae2 (2.63%). This result is in line with that of several studies that reported that Fabaceae is the leading family of plants that are used as medicinal plants.

3.2 Parts used to treat human ailments

Of all medicinal plants collected and identified, 54 plant species (71.052 %), were from natural habitat or considered wild, while 18 (23.7%) were cultivates plants; 12 species (15.8 %) were grown in home garden.

Among these 52 % plants were trees, 19% were herbs and 17% shrubs, grass 9% and 1 % were climber, succulent, twiner and vine each. The result is also in contrary to reports (Jima and Megersa 2018)that shrubs as the most used growth form in the preparation of remedies.

3.3 Remedy preparation in the study area

The major mode of preparation was decoction 23.68% followed by Crushing 14.473% followed by extraction and pounding 13.15%. 10.5% mode was by boiling and raw eating. The most used plant parts were Leaves 24 (31.57%), followed by Fruit 13 (17.105%), Stem & Bark each 10 (13.157%) whereas 8 (10.526%) were of Seeds and Rhizomes, 5 (6.57%) of flowers, 3 (3.947%) of gum resin and 1 (1.3157%) each of beans, bulb cloves, dried flowers and dried leaves. This research backs up the findings (Rakotoarivelo et al. 2015)who found that leaves were the most often used plant parts for making medicine treat human diseases.

3.4 Informant Consensus Factor

A medicinal plant with a high ICF suggests that informants agree that it can treat conditions and is well-known in the community.

3.5 Fidelity level

The FL values in this study ranged from 9% to 94% (Fig.6), making it necessary to determine which disease a specific species is more successful against. A high value means that the herb has many references and is the most popular species in the given disease.The medicinal plants with the highest FL values were *Emblica officinalis*, *Terminalia bellirica*Roxb., *Terminalia chebula* Retz. and *Zingiber officinale* Roscoe (each 96%), *Ocimum sanctum*(94%), and *Vitex negundo* L. (90%). *Emblica officinalis*Gaertnand *Zingiber officinale* Roscoe are the most recommended medicinal plant species for the treatment of common cold and fever. *Terminalia bellirica* (Gaertn.) Roxb., *Terminalia chebula* Retz are the most cited and preferred species used to pacify kapha and vata dosha and to induce purgation therapy, apart from being an integral part in Triphala.

3.6 Ranking preferences or side-by-side comparisons of medicinal herbs

For medicinal plants used to treat respiratory illnesses, a preference rating was done. *Zingiber officinale* Roscoe was ranked highest among the responders, followed by *Curcuma longa* L. (Table 3).

3.7 Direct matrix ranking for several medicinal plant applications

Five medicinal plants were ranked directly on a matrix using a range of values from 0 to 5. According to Table 4, 5 represents exceptional, 4 very good, 3 good, 2 less, 1 least, and 0 does not represent a benefit. *Azadirachta indica*A.Juss. followed by *Emblica officinalis*Gaertn.came out with multipurpose uses**.**Most human remedy preparations were harmless, in which 78 (81.25%) species with no adverse side effects. This study shows that most of the traditional medicines prepared by herbalists are free from adverse side effects, so that anyone can take the prepared medications without frustration (Ekor, 2014; Rai, 2016). There is a loss of medicinal plants in the rural and tribal parts of Bichhua Tehsil, district Chhindwara, the reason being manmade factors such deforestation,firewood, construction, grazing, and drought (Vijendra and Kumar 2017).

3. Conclusion

Due to the lack of written records, conservative inheritance patterns, and the low interest in traditional medicinal knowledge among young people, our inquiry and group discussions revealed that traditional medicinal knowledge is seriously threatened. Additionally, the availability of medicinal plant resources and related traditional knowledge decreased because of agricultural operations, firewood collecting, excessive grazing, logging, and overharvesting of medicinal plants. Hence, it becomes vital to motivate the Bichhua people to conserve medicinal plants both in and outside of their natural habitats.The outcomes also showed that the region's medicinal plants represent a significant source of herbal medicines used in rural communities' basic healthcare.This work can serve as a starting point for future scientific investigations to enhance new commercial plant-based medications, and it may transfer the conventional understanding of medicinal herbs to new generation.

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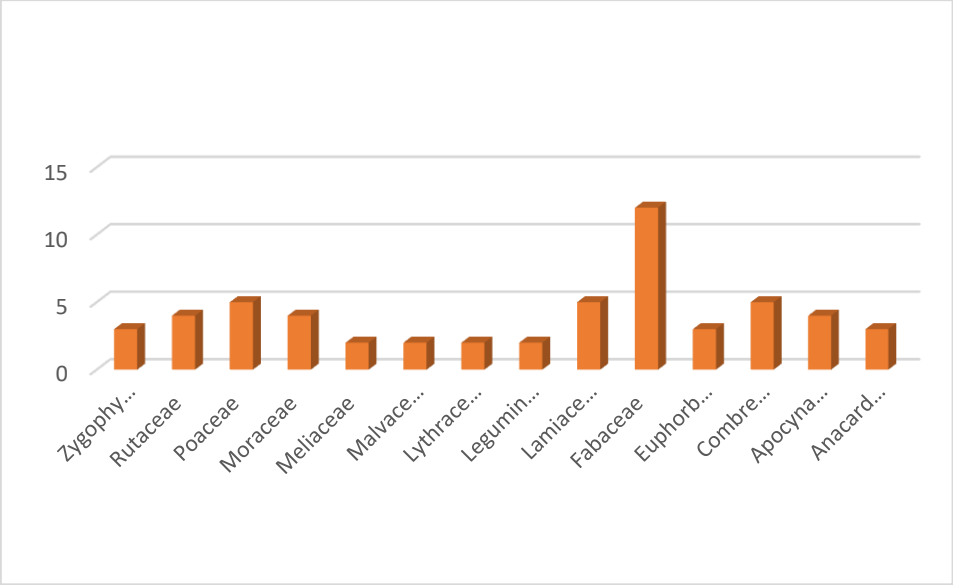
5. Conflict of Interest: There is no Conflict of Interest.

6. **Contributors:** Naveen Kumar Chourasia: Data Collection; Kavita Chahal: Analysis and interpretation; Bhavna Bawra: Writeup of the manuscript; Ram Manohar Ahirwar: Writeup of the manuscript



Footnote: List of Families which have two or more than two plants

Figure 1. Distribution of plants according to families

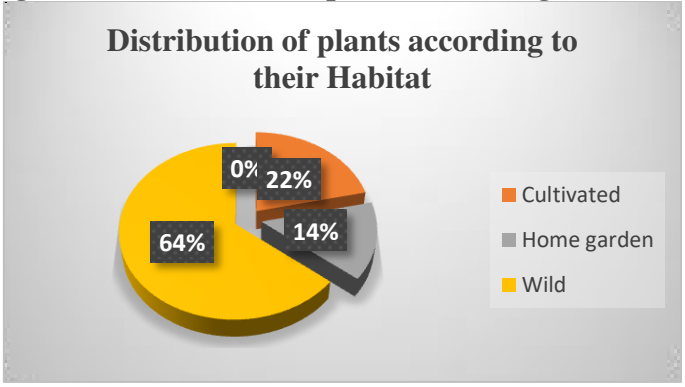


Figure 2. Distribution of plants according to their Habitat

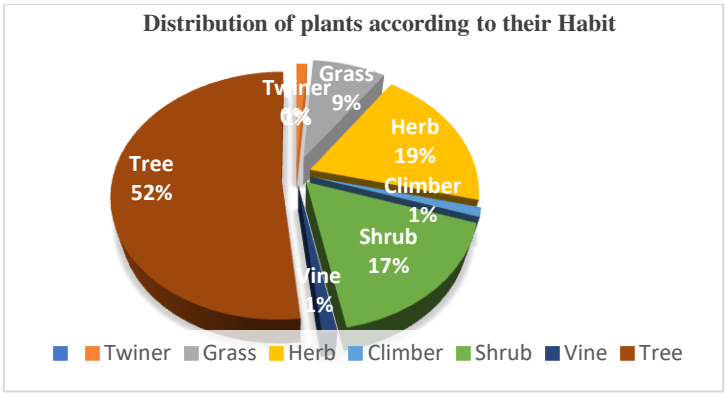


Figure 3. Distribution of plants according to their Habit

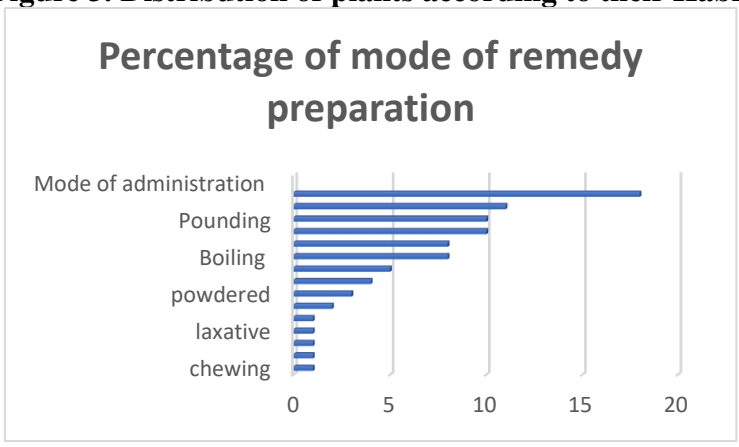


Figure 4. Different modes of remedy preparation used in the present study

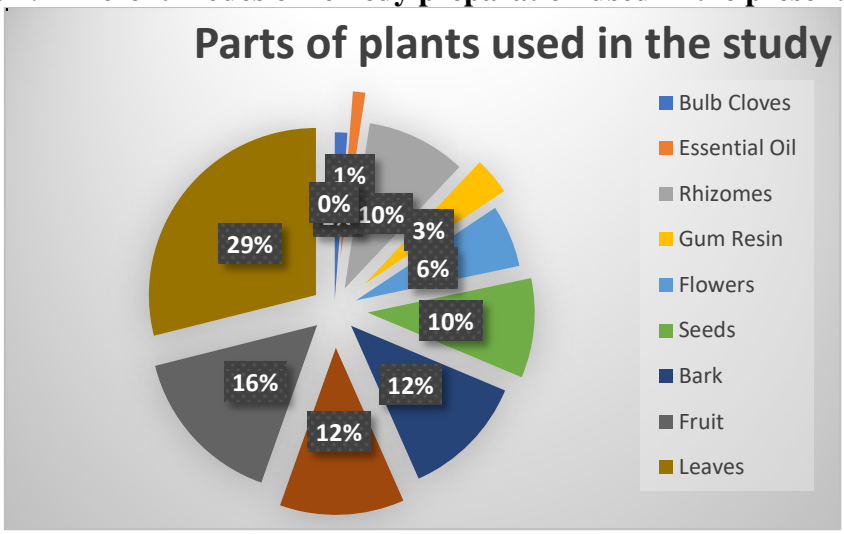


Figure 5. Different parts of plants used in the study

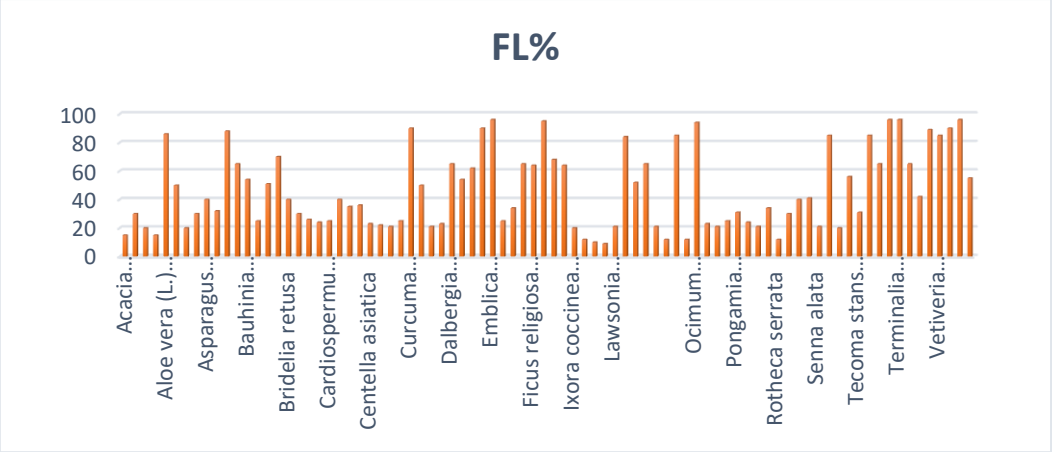


Figure 6. Fidelity level (%) of most preferred species used in different ailments

Table1. Details of the medicinal plants used in the present study

SN	Botanical name	Common Name	Family
1.	*Acacia catechu (L.f.) Willd.*	Khair, Kachu	Fabaceae
2.	*Aegle marmelos*	Bael	Rutaceae
3.	*Albizia lebbeck*	Vagai	Mimosaceae
4.	*Allium sativum L.*	Garlic	Amaryllidaceae
5.	*Aloe vera (L.) Burm.f.*	Gwarpata	Asphodelaceae
6.	*Andrographis paniculate (Burm.f.) Nees*	Kalmegh, Bhunimba	Acanthaceae
7.	*Anogeissus latifolia Wall.ex Guill. & Perr.*	Bakli, Dhau	Combretaceae
8.	*Artocarpus heterophyllus Lam.*	Kathal	Moraceae
9.	*Asparagus racemosus Willd.*	Satavar, Shatamull	Asparagaceae
10.	*Averrhoa carambola L.*	Karmakh	Oxalidaceae
11.	*Azadirachta indica A.Juss., 1830*	Margosa, Neem	Meliaceae
12.	*Bambuseae*	Baans, Vanoo	Poaceae
13.	*Bauhinia purpurea L.*	Bauhini	Fabaceae
14.	*Bixa Orellana L.*	Arnotta, Sindoori	Bixaceae
15.	*Bombax cebia Linn*	Śālmali. semal	Malvaceae
16.	*Boswellia serrata Roxb.*	Shallaki, Kundur	Burseraceae
17.	*Bridelia retusa*	Asan, Monj	Euphorbiaceae
18.	*Buchananialanzan Spreng.*	Char, Chironji, Piyal	Anacardiaceae
19.	*Butea monosperma (Lam.) Taub.*	Tesu, Dhak, Palash	Fabaceae
20.	*Calotropis procera (Aiton) W.T.Aiton*	Madaar, Aak, Ark	Apocynaceae
21.	*Cardiospermum halicacabum L.*	Latafatkari	Sapindaceae
22.	*Cassia tora Linn.*	Panwarh,Chakrmard	Leguminosae
23.	*Cascabelathevetia (L.) Lippold*	Peela Kaner	Apocynaceae
24.	*Cedrela toona, Roxb.*	Toona	Meliaceae
25.	*Centella asiatica*	Gotu Kola	Apiaceae
26.	*Chloroxylon swietenia (Roxb.) DC*	Bhera, Bhirra	Rutaceae
27.	*Clitoriaternatea*	Aparajita	Fabaceae
28.	*Corynocarpuslaevigatus*	Karaka	Corynocarpaceae
29.	*Curcuma longa L.*	Haldi	Zingiberaceae
30.	*Cymbopogon citratus (DC.) Stapf, 1906*	Lemon Grass	Poaceae
31.	*Cynodondactylon (L.) Pers.*	Dhoob, Dūrvā	Poaceae
32.	*Cyperus rotundus L.*	Java Ghaas	Cyperaceae

33.	*Dalbergia sissoo Roxb.*	Shisham	Fabaceae
34.	*Dioscorea villosa L.*	JangalaiRatalu	Dioscoreaceae
35.	*Diospyros melanoxylon Roxb.*	Tendu, Kendu	Ebenaceae
36.	*Ecliptaprostrata (L.) L.*	Guntagalagara Aaku	Asteraceae
37.	*Emblica officinalis Gaertn.*	Amla	Phyllanthaceae
38.	*Erythrina suberosaRoxb.*	Mandaar	Fabaceae
39.	*Feronia limonia (L.) Swingle*	Kaitha	Rutaceae
40.	*Ficus benghalensis L.*	Banyan, Bargad	Moraceae
41.	*Ficus religiosa L.*	Bodhi, Pipal	Moraceae
42.	*Glycyrrhiza glabra L.*	Mulaithi	Fabaceae
43.	*Hibiscus rosa-sinensis L.*	GurhalJasund	Malvaceae
44.	*Ipomoea paniculatum*	Badarikand	Convolvulaceae
45.	*Ixora coccinea L.*	Viruchi, Kiskaara,	Rubiaceae
46.	*Jatropha curcas L.*	Ratanjot	Euphorbiaceae
47.	*Lagerstroemia parviflora Linnaeus*	Vilayati Mendhi	Lythraceae
48.	*Lantana camara L.*	Ramuniya	Verbenaceae
49.	*Lawsoniainermis*	Henna	Lythraceae
50.	*Madhucalongifolia J.F.Macbr.*	Madkam, Mahuwa	Sapotaceae
51.	*Mangifera indica L.*	Aam, Amlaki	Anacardiaceae
52.	*Mentha piperita*	Pudina, Putiha	Lamiaceae
53.	*Mimosa pudica Linn.*	Lajwanti	Fabaceae
54.	*Morus alba L. 1753*	Shahtoot	Moraceae
55.	*Murrayakoenigii (L.) Sprengel*	Mithinim	Rutaceae
56.	*Nyctanthesarbor-tristis*	Parijat	Oleaceae
57.	*Ocimum sanctum*	Holy Basil, Tulsi	Lamiaceae
58.	*Parkia speciosa Hassk*	Supota, Kharial	Fabaceae
59.	*Pinus gerardiana Wall. ex D. Don*	Chilghoza	Pinaceae
60.	*Plumieria Scop*	Champa,Golokcapa	Apocynaceae
61.	*Pongamia pinnata*	Karanj	Fabaceae
62.	*Prosopis cineraria (L) Druce*	Shami	Fabaceae
63.	*Prunus amygdalus Batsch,*	Badam	Rosaceae
64.	*Ricinus communis L.*	Arandi	Euphorbiaceae
65.	*Rotheca serrata*	Bharangi	Lamiaceae
66.	*Saccharum munjaRoxb*	Baruwa Sugarcane	Poaceae
67.	*Saracaasoca (Roxb.) Willd.*	Sita Asoka	Caesalpiniaceae
68.	*Semecarpus anacardium L.f.*	Bhallataka	Anacardiaceae
69.	*Senna alata*	Peetamber	Leguminosae
70.	*Syzygiumcumini (L.) Skeels*	Jamun, Java Plum	Myrtaceae
71.	*Tabernaemontanadivaricata R.Br. ex Roem. & Schult.*	Chandani, Jasmine	Apocynaceae
72.	*Tamarindus indica L.*	Tamarind	Fabaceae
73.	*Tecoma stans (L.) Juss. ex Kunth*	Yellow Bells	Bignoniaceae
74.	*Tectona grandis L.f.*	Sagwan Saag, Teak,	Lamiaceae
75.	*Terminalia arjuna (Roxb.) Wight &Arn.*	Arjuna	Combretaceae
76.	*Terminalia bellirica (Gaertn.) Roxb.*	Baheda, Beleric	Combretaceae
77.	*Terminalia chebula Retz.*	Haritaki, Harad	Combretaceae
78.	*Terminalia tomentosa Wight &Arn.,*	Saaj	Combretaceae
79.	*Tinosporacordifoloa*	Guduchi, Giloe	Menispermaceae

80.	*Tribulus terrestris L.*	Gokhru, Gokshura	Zygophyllaceae
81.	*Vetiveriazizanoides*	Khas	Poaceae
82.	*Vitex negundo L.*	Nisinda	Lamiaceae
83.	*Zingiber officinale Roscoe*	Ginger	Zingiberaceae
84.	*Ziziphus jujuba Mill.*	Kandiyari, Ber	Rhamnaceae

Table 2. ICF of the given diseases category

S. N	Type of Disease	Ns	% s	Nr	% r	ICF
1.	Respiratory diseases	21	27.63158	90	35.15625	0.775281
2.	Febrile illness	18	23.68421	52	20.3125	0.666667
3.	Internal diseases/ diabetes	11	14.47368	14	5.46875	0.230769
4.	Livestock diseases	3	3.947368	23	8.984375	0.909091
5.	Organ malfunctioning	2	2.631579	15	5.859375	0.928571
6.	Parasitic/bacterial infections	6	7.894737	15	5.859375	0.642857
7.	Skin / Dermatological problems	9	11.84211	23	8.984375	0.636364
8.	Snakebite/scorpion bite	5	6.578947	20	7.8125	0.789474
9.	others	1	1.315789	4	1.5625	1

Ns: number of species, Nur: number of use report or citation; ICF:Informant Consensus Factor

Table 3. Paired comparison on medicinal plants used for treating respiratory disease

Medicinal Plants	Respondents (R1-R10)										Score	Grade
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Andrographis paniculate (Burm.f.)	4	5	1	1	2	3	1	3	4	1	**25**	**VI**
Asparagus racemosus	2	5	1	2	2	1	1	2	4	3	**23**	**VII**
Curcuma longa L.	4	3	2	4	4	4	3	3	4	2	**33**	**II**
Glycyrrhiza glabra L	2	3	3	4	3	4	4	3	2	3	**31**	**IV**
Ocimum sanctum	5	4	5	3	2	2	1	1	5	4	**32**	**III**
Zingiber officinale	2	5	4	3	4	5	2	3	3	3	**34**	**I**
Tinospora cordifolia	2	2	3	1	1	1	3	4	5	4	**26**	**V**

Score is given to the most effective plant in curing respiratory disease

Table 4. Average direct matrix reading score by the five key informants for five plants

Use diversity	*Allium sativum L.*	*Azadirachta indica A.Juss.*	*Bombax cebia Linn.*	*Curcuma longa L.*	*Emblica officinalis*
Medicine	3	5	2	5	4
Food	5	1	0	5	4
Fuel	4	5	3	2	2
Furniture	0	1	1	0	2
Forage	4	5	2	2	4
Storage	3	5	3	4	4
Total	**19**	**22**	**11**	**18**	**20**
Rank	**III**	**I**	**V**	**IV**	**II**