Annals of Plant and Soil Research 28(1): 58- 69 (2026)
https://doi.org/10.47815/apsr.2026.10514

A quantitative ethnomedicinal survey of locally used plants in Sonipat district, (Haryana) India

***PREETI RANI AND **NEELU SOOD**

*Department Of Botany, Govt College for Girls, Cheeka (Kaithal) Haryana

. Received: May, 2026; Revised accepted: June, 2026

ABSTRACT

The ethnobotanists, for long have embarked on the journey of searching, analyzing, and documenting well-established plant-based classical knowledge. Such efforts of theirs have now acquired new dimensions for the fear of such traditional know-how being lost permanently. Documentation and recording of plant-based conventional knowledge serve the purpose of conservation of selected plant species. The present study targets to identify conventional knowledge about local flora and its human carriers in rural areas of district Sonipat, Haryana in 2020. The focus of the study has been to mainly look for plants used by locals to treat various ailments. Statistical analysis of gathered data has led us to a few new facts. No such ethnobotanical investigation has ever been attempted in the areas before. The study sites were selected intentionally as local inhabitants were seen using wild flora either for self-treatment or for other purposes such as to treat their livestock. The study documented ethnomedicinally important 62 plant species which belongs to 39 families that were being used in treatment of 55 human and 3 animals' ailments in the area by local inhabitants. In terms of medicinal uses; Leguminosae, Liliaceae and Moraceae have been shown more dominant family. Reported ethnomedicinal uses of 4 plant species i.e. Brassica olaracea, Datura metel, Pennisetum glaucum and Prunus persica amounts to new findings which were not documented or published in earlier studies till date.

KEYWORDS: Haryana, local flora, ethnomedicinal plants, folklore

INTRODUCTION

Ethnobotany is scientific narration of past relationship between human civilization and plants across regions of the world.Vast literature on the subject throws light on the fact as to how humans have long been dependent on plants for survival and livelihood (Lepcha *et al.* 2019). Ethnobotany has established itself as multidisciplinary branch of biology which uncovers hidden complex relationship of plant and animal kingdom (Kala *et al.* 2006; Meena *et al.* 2009; Mamedov, 2012; Rana and Rana, 2014; Maheshwari *et al.* 2018; Lepcha *et al.* 2019; Saraci and Demo, 2021). India and China both have enormous and oldest registered ancient literature of traditional plant based natural medicines (Kala *et al.* 2006). Written works of ethnic communities and ancient medicinal literature: Charka Samhita, Shusruta Samhita, Agnivesh tantra, Madhava nidhan, Ramayana, Ashtang hridaya, Ayurveda, Bela Samhita, Wu Shi Er Bing Fang and The Herbal Tang have all been provided with numerous formulations and applications of medicinal plants. India, owing to its biodiversity rich vegetation and varied climatic conditions is amongst the largest producer of pulses, jute, wheat, rice, vegetables, fruits and medicines (Rana and Rana, 2014; Lepcha *et al.* 2019; Yang *et al.* 2019; Saraci and Demo, 2021; Nadaf *et al.* 2023).

Limited health care facilities force sections of rural population in India to count on plant based formulations (Vedavathy, 2003; Kala *et al.* 2006; Meena *et al.* 2009; Mamedov, 2012; Fuller, 2013; Rana and Rana, 2014; Oladeji, 2016; Maheshwari *et al.* 2018; Lepcha *et al.* 2019; Saraci and Demo, 2021). In developing countries, 70-95% patients use plant based formulations to treat themselves and get rid of ailments such as fever, allergy, cough and sneezing etc. (Ahmad and Wajid, 2013). Approximately 44% of medicinal plants are being used to deal with number of ailments by local people of northern India. Indigenous knowledge about such plant species plays a vital role in conservation of their population at local level (Kala *et al.* 2006; Nadaf *et al.* 2023). Owing to inadequate education and poor health care infrastructure, villages can be treated as remote sites. Sustained cultural maintenance in

*Email: *preetir622@gmail.com and **neelusood61@gmail.com, *Assistant Professor and **Ex. Professor**Department of Botany, Kurukshetra University, Kurukshetra*

rural areas over time also qualifies them to be in the category of remote sites. The local inhabitants conserve ethnobotanical information as cultural heritage but in unregistered form. Such meaningful knowledge is generally received and passed to posterity orally. Documentation of traditional knowledge will help in preservation of indigenous plant wealth of the studied sites. Moreover, ethnomedicinal data after being scrutinized has the potential to be utilized in pharmaceuticals' research. The present study has been initiated to explore, identify, evaluate, analyze, and document ethnomedicinal knowledge of indigenous local flora.

MATERIALS AND METHODS

Geographical Location of Study Area

Four villages: Chhatehra, Ahmadpur Majra, Sikanderpur Majra, and Tewari (Teori), comprised rural model of study, in district Sonipat. The villages were selected as study sites, to look for undocumented folklore medicinal information. The average literacy rate of the district is 76.93% (Census-2011, India), situated at 29°7'58"N, 76°54'29"E (Figure 1).

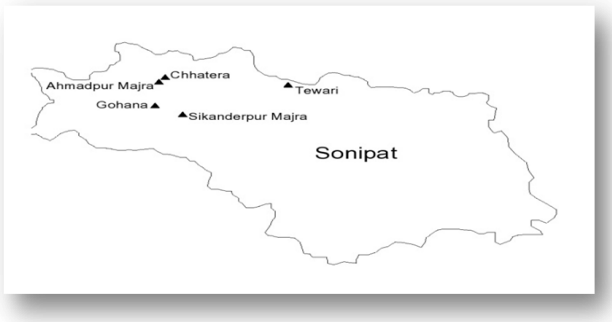

Figure 1: Studied Sites Map of District Sonipat, Haryana, India (Source: Surfer Software, Self designed)

Methodology

The study has been initiated with an extensive field survey that sought to collect ethnobotanical information from people above 18 years of age, regardless of their education and social background. Randomly, 50 people were interviewed from each of the above mentioned four villages in search of prospective ethnomedicinal information. We found 78 informants who provided relevant ethnobotanical information about local plant species. The task of surveying the representative villages has been accomplished in January, 2020. Collection of information with regard to local name of wild flora, plant's part used method of formulation, mode of utilization, side effects, precautions, experience of usage of plant as medicines etc. have been all part of ethnobotanical investigation employed in the study.

Ethnobanically important plant species of the area that have been in use by the locals were verified and validated from the websites: Encyclopedia of Indian medicinal plants, International plant name index, The plants database, National medicinal plant board of India. Few research papers too helped in identification too; (Chaudhary and Prasad, 2014; Farzana *et al.* 2014; Sharma and Chaudhary, 2014; Nagaratna and Hegde, 2015; Singh *et al.* 2017; Balkrishna *et al.* 2018; Kumar *et al.* 2018; Kumar *et al.* 2019; Shankar *et al.* 2019).

The survey has led to generation of huge data on native flora of the area that has been analyzed qualitatively and quantitatively using various statistical indices (Table 1). The samplings (interviewees) were categorized on the basis of sex (male and female), age groups, qualification (illiterate, literate and below matriculation, matriculation and above) (Table 2).

Accumulated ethnobotanical information was translated and converted into numerical values such as Use Report (UR), Medicinal Uses (MU), and Non-Medicinal Uses (NU) etc. described in Table 3. Medicinal uses of reported plant species were compared with previous studies to arrive at significant conclusion. Informant Consensus Factor has been calculated for reported ailments and disease categories given in Table 4.

RESULTS

The status of health care services in rural pockets was noted quite unsatisfactory and poor. The practice of traditional medicines appeared to be playing an important role in health sovereignty of the rural sites. The 35 male and 43 female; 29 illiterate, 25 with below matriculation and 24 with matriculation and above educational qualification interviewees were found to possess relevant information;

Table 1: Statistical Indices Used To Analyze Ethnobotanical Data

Abbreviated form	Formula's expansion Explanation	References
RFC (**R**elative **F**requency of **C**itation)	$RFC = \frac{FC}{N}$ FC (Frequency of citation) is the no of informants reporting the medicinal and non-medicinal use of particular plant species and N is total no of informants for all uses.	Hamilton *et al.* 2003; Virapongse *et al.* 2004; Hoffman and Gallaher 2007; Parthiban *et al.* 2016 ; Nadaf *et al.* 2023
ΣUi (**S**ummation of **U**ses)	$\Sigma Ui = NU + MU$ Sum of non-medicinal and medicinal uses	
UV (**U**se **V**alue of plant)	$UV = \frac{\Sigma Ui}{N}$ ΣUi is sum of all uses.	
FL (**F**idelity **L**evel)	$FL = \frac{Np}{N} \times 100$ Np is the no of informants for major therapeutic use of plant.	
RPL (**R**elative **P**opularity **L**evel)	$RPL = \frac{MU}{N}$ MU is the no of medicinal or therapeutic uses of particular plant.	
ROP (**R**ank **O**rder **P**riority)	$ROP = FL \times RPL$ Rank order priority is the multiplication of fidelity level and relative popularity level.	
ICF (**I**nformant **C**ensus **F**actor)	$ICF = \frac{Nur - Nt}{Nur - 1}$ Nur is the total no of use reports for particular plants and Nt is the total no plant species used to treat said disease category.	
UR (**U**sed **R**eports)	Total no of use reports for particular plants	

indicating partial loss of vital ethnobotanical knowledge. Elderly, Literates and below matriculation group of people shared significant knowledge regarding usage of local wild flora (Table 2). A heterogeneous distribution of 62 plant species across 39 families was recorded. In terms of medicinal uses, the study predicted 'Leguminosae' as dominant family with 5 species, Liliaceae and Moraceae contained 4 species each), Apiaceae, Euphorbiaceae and Myrtaceae comprised 3 species each. The details of reported plant species are given in Table 3.

Table 2: Percentage Proportion of Informants in Entire Studied Sites of District Sonipat

Selected Groups of Informants		Percentage Proportion of Informants			
		Studied Rural Sites			
		Ahmadpur Majra	Chhatehra	Sikanderpur Majra	Teori (Tewari)
Age Group (in years)	20 to 50 years	27.78	50	72.73	54.55
	50 and above	72.22	50	27.27	45.45
Sex	Male	77.78	45	18.18	45.45
	Female	22.22	55	81.82	54.55
Qualification Group	Illiterate	22.22	30	45.45	36.36
	Below Matriculation	44.44	35	9.09	45.45
	Matriculation and Above	33.33	35	45.45	18.18

The frequency of ethnobotanical uses have been found to vary according to plants' part used. The percentage of formulations prepared with leaves, stem, fruits & aerial parts, roots and seeds, bark, flowers and rhizome were 88.46, 38.46, 29.48, 26.92,

Table 3: Quantitative Analysis of Ethnomedicinal Indigenous Plant Species of Study Area (N=78 informants)

Family name	Botanical name (Vernacular name)	FC	RFC	NU	MU	ΣUi	UVs	MTA	Na	FL (%)	RPL	ROP	Previously Reported
Acanthaceae	*Adhatoda vasica* Nees. (Bansa)	1	0.01	0	1	1	1	Cough	1	100	0.01	1	Revathi and Parimelazhagan, 2010
	Barleria cristata L. (Kala bansa)	6	0.07	0	1	1	0.17	Cough	6	100	0.01	1	Kumar *et al.* 2018
Amaranthaceae	*Achyranthes aspera* Linn. (Jharbhita)	21	0.27	1	8	9	0.43	Toothache	15	71.42	0.1	7.14	Sharma and Chaudhary, 2014
Amaryllidaceae	*Crinum latifolium* var. crilae Tram and Khanh (Sudarshna)	1	0.01	0	1	1	1	Earache	1	100	0.01	1	Solanki *et al.* 2011
Anacardiaceae	*Mangifera indica* L. (Aam)	8	0.10	4	7	15	1.87	Stomachache	2	25	0.09	2.25	Kumar *et al.* 2019
Apiaceae	*Cuminum cyminum* L. (Jeera)	1	0.01	2	1	3	3	Diarrhea	1	100	0.01	1	Singh *et al.* 2017
	Centella asiatica L. Urban (Brahmi)	4	0.05	1	3	4	1	Diarrhea	2	50	0.04	2	Uniyal and Shiva, 2005
	Daucus carota L.(Gajar)	1	0.01	2	1	3	3	Abortifacient	1	100	0.01	1	Bahrami *et al.* 2018
Apocynaceae	*Thevetia peruviana* (Pers.) K. Schum (Pilikaner)	1	0.01	2	1	3	3	Toothache	1	100	0.01	1	Balkrishna *et al.* 2018
Asclepiadaceae	*Calotropis procera* Aiton (Aak)	10	0.13	1	9	10	1	Arthritis	5	50	0.11	5.5	Balkrishna *et al.* 2018
Asteraceae	*Pergularia daemia* Forssk. Chiov. (Aksand)	3	0.04	1	2	3	1	Boils and sores	2	66.7	0.02	1.33	Bhaskar and Balakrishnan, 2009
	Centratherum anthelminticum (L.) Kuntze. (Kali jiri)	1	0.01	1	1	2	2	Uterus swelling	1	100	0.01	1	Shiddamallayya *et al.* 2016
Boraginaceae	*Cordia dichotoma* G.Forst. (Lasora)	4	0.05	3	3	6	1.5	Mouth ulcer	3	75	0.04	3	Balkrishna *et al.* 2018
Brassicaceae	*Brassica oleracea* L. (Fulgobi)	1	0.01	2	1	3	3	Boils and sores	1	100	0.01	1	Not reported earlier
Leguminosae	*Senna occidentalis* (Linn.) Rose. (Kasaundi)	5	0.06	2	5	7	1.4	Skin allergy	2	40	0.06	2.4	Balkrishna *et al.* 2018
	Senna tora Linn.(Panwar)	1	0.01	2	0	2	2	----	0	0	0	0	---
Capparaceae	*Capparis zeylanica* L. (Hins)	1	0.01	0	1	1	1	Burnt body part	1	100	0.01	1	Panda and Padhy, 2008
Caricaceae	*Carica papaya* Linn. (Papeeta)	1	0.01	2	4	6	6	Fever	1	100	0.01	1	Balkrishna *et al.* 2018

Combretaceae	*Terminalia arjuna* (Roxb. ex DC.) Wight and Arn. (Arjun)	10	0.13	1	1	2	0.2	Cardiovascular problems	10	100	0.01	1	Balkrishna *et al.* 2018
	Terminalia chebula (Gaertn.) Retz. and Willd. (Harad)	1	0.01	0	1	1	1	Diarrhea	1	100	0.01	1	Balkrishna *et al.* 2018
Crassulaceae	*Kalanchoe pinnata* (lam.) Pers. (Patharchatta)	5	0.06	0	3	3	0.6	Kidney stone	3	60	0.04	2.4	Balkrishna *et al.* 2018
Cucurbitaceae	*Lagenaria siceraria* Molina Standley (Lauky, ghiya)	1	0.01	1	1	2	2	Cardiovascular problem	1	100	0.01	1	Balkrishna *et al.* 2018
	Citrullus lanatus (Thunb.) Mats and Nakai (Tarbooj)	1	0.01	1	1	2	2	Kidney stone	1	100	0.01	1	Islam *et al.* 2015
Cuscutatceae	*Cuscuta reflexa* Roxb. (Amarbel)	8	0.10	0	1	1	0.12	Arthritis	8	100	0.01	1	Balkrishna *et al.* 2018
Ebenaceae	*Diospyros melanoxylon* Roxb. (Kendu)	1	0.01	0	1	1	1	Paralysis	1	100	0.01	1	Balkrishna *et al.* 2018
Euphorbiaceae	*Croton tiglium* Linn. (Jaiphal)	1	0.01	1	1	2	2	GI problems	1	100	0.01	1	Balkrishna *et al.* 2018
	Euphorbia hirta L. (Chhotidudhi)	1	0.01	0	1	1	1	Diarrhea	1	100	0.01	1	Balkrishna *et al.* 2018
	Euphorbia prostrata Ait. (Dudhi)	4	0.05	0	2	2	0.5	Diarrhea	2	50	0.02	1	Balkrishna *et al.* 2018
Fabaceae/ Leguminosae	*Acacia nilotica* Benth. Brenan (Babul, Keekar)	13	0.17	3	10	13	1	Toothache	4	30.8	0.13	4	Balkrishna *et al.* 2018
	Butea monosperma (lam.) Taub. (Dhak)	5	0.06	3	5	8	1.6	Oral health maintenance	2	40	0.06	2.4	Balkrishna *et al.* 2018
	Dalbergia sissoo Roxb.(Shisham)	7	0.09	5	6	11	1.6	Toothache	2	28.6	0.08	2.3	Kumar *et al.* 2019
Lamiaceae	*Ocimum sanctum* L. (Tulsi)	9	0.11	1	4	5	0.5	Cough	8	88.9	0.05	4.44	Balkrishna *et al.* 2018
	Origanum majorana L. (Marwa)	1	0.01	1	1	2	2	Gastro-intestinal Diseases	1	100	0.01	1	Balkrishna *et al.* 2018
Liliaceae	*Allium cepa* L. (Piyaj)	2	0.02	3	1	4	2	Eyesight	1	50	0.01	0.5	Balkrishna *et al.* 2018
	Allium sativum L. (Lehsun)	2	0.02	4	3	7	3.5	Arthritis	2	100	0.04	4	Balkrishna *et al.* 2018
Liliaceae	*Aloe vera* (Linn.) Burm. f. (Aloe)	6	0.08	2	2	4	0.7	Arthritis	2	33.3	0.02	6.7	Balkrishna *et al.* 2018
	Asparagus racemosus Wt. (Shtawar)	1	0.01	0	1	1	1	Sexual disorder	1	100	0.01	1	Kumar *et al.* 2019

Lythraceae	*Lawsonia inermis* L. (Mehandi)	1	0.01	1	0	1	1	Skin diseases	1	100	0.01	1	Kumar *et al.* 2019
Malvaceae	*Gossypium herbaceum* Linn. (Kapaas)	1	0.01	2	0	2	2	----	0	0	0	0	----
Menispermaceae	*Tinospora cordifolia* Willd. Miers Hk. (Giloy)	7	0.09	0	2	2	0.23	Anti-pyretic effect	6	85.71	0.02	1.71	Kumar *et al.* 2019
Moraceae	*Ficus benghalensis* L. (Bargad)	16	0.20	5	12	17	1.06	Spermatorrhea	4	26.7	0.15	4	Panda and Pdhey, 2008
	Ficus racemosa L. (Gular)	2	0.02	1	2	3	1.5	Gastro-intestinal problems	2	100	0.02	2	Balkrishna *et al.* 2018
	Ficus religiosa L.(Peepal)	6	0.08	4	5	9	1.5	Diarrhea	2	33.3	0.06	1.98	Balkrishna *et al.* 2018
	Morus alba L. (Sehtoot)	1	0.01	1	1	2	2	Hemorrhoids	1	100	0.01	1	Panda and Pdhey, 2008
Musaceae	*Musa* × *paradisiaca* L. (Kela)	1	0.01	2	1	3	3	Prolapse of uterus	1	100	0.01	1	Jambu and Wath, 2018
Myrtaceae	*Eucalyptus globulus* Hill ex Maid. (Safeda)	5	0.06	1	3	4	0.8	Toothache	2	40	0.04	1.6	Kumar *et al.* 2019
	Psidium guajava Linn. (Amrood)	12	0.15	1	7	8	0.7	Cough	8	66.7	0.09	6	Kumar *et al.* 2019
	Syzygium cumini L. Skeels. (Jamun)	16	0.20	2	9	11	0.7	Diabetes	5	31.25	0.11	3.43	Balkrishna *et al.* 2018
Onagraceae/ Trapaceae	*Trapa bispinosa* (Roxb.) Makino (Singhada)	1	0.01	2	1	3	3	Leucorrhea	1	100	0.01	1	Kumar *et al.* 2019
Papaveraceae	*Argemone mexicana* L. (Satyanashi)	3	0.04	1	2	3	1	Skin allergy	2	66.7	0.02	1.33	Balkrishna *et al.* 2018
Pedaliaceae	*Sesamum indicum* Linn. (Til)	1	0.01	1	1	2	1	Paralysis	1	100	0.01	1	Kumar *et al.* 2019
Poaceae	*Pennisetum glaucum* (Linn.) R.Br. (Bajra)	1	0.01	2	1	3	3	Typhoid	1	100	0.01	1	Not reported earlier
	Saccharum officinarum Linn. (Ganna, eekh)	1	0.01	2	1	3	3	Constipation	1	100	0.01	1	Kumar *et al.* 2019
Punicaceae/ Lythraceae	*Punica granatum* Linn. (Anar)	1	0.01	1	1	2	1	Mouth ulcer	1	100	0.01	1	Kumar *et al.* 2019
Rhamnaceae	*Ziziphus jujube* Mill. (Ber)	3	0.04	2	1	3	1	Foot swelling	2	66.7	0.01	0.7	Balkrishna *et al.* 2018
Rosaceae	*Prunus persica* L. (Aaru)	1	0.01	1	1	2	2	Enlarged prostrate	1	100	0.01	1	Not reported earlier
Rutaceae	*Aegle marmelos* (Linn.) Correa (Bailpathar)	1	0.01	4	1	5	5	Arthritis	3	100	0.01	1	Balkrishna *et al.* 2018
Solanaceae	*Datura metel* Linn. (Dhatura)	1	0.01	0	1	1	1	Hemorrhoids	1	100	0.01	1	Not reported earlier
	Solanum nigrum Linn. (Palpotan)	5	0.06	1	6	7	1.4	Swelling	5	100	0.08	8	Kumar *et al.* 2019
Vitaceae	*Vitis vinifera* Linn. (Angoor)	1	0.01	2	1	3	3	Body heat	1	100	0.01	1	Kumar *et al.* 2019
Zingiberaceae	*Zingiber officinale* Roscoe (Adrak, sonth)	1	0.01	3	1	4	4	Cold and cough	1	100	0.01	1	Balkrishna *et al.* 2018

Table 4: Informant Census Factor (ICF) for Reported Ailments and Reported Plants Species N=78, TNP=62

Disease category/ Medicinal use	Reported Ailments	Nur	Ur (%)	NPs	NPs (%)	ICF	Prioritized Species Used
Arthritis	Joints pain, inflammation in joints and swelling	17	21.8	6	9.7	0.69	*Allium sativum, Aegle marmelos, Calotropis procera, Cuscuta reflexa, Dalbergia sissoo*
Cardiovascular disorders	Blood pressure, Denser blood, more than normal range of Hemoglobin, Increased Cholesterol level in blood	12	15.4	3	4.83	0.81	*Carica papaya, Lagenaria siceraria, Terminalia arjuna*
Contraceptive	Abortifacient, Birth control	2	2.6	2	3.2	0	*Carica papaya, Daucus carrota*
Dental problems	Toothache	26	33.3	7	11.3	0.76	*Achyranthes aspera, Acacia nilotica, Butea monosperma, Dalbergia sissoo, Eucalyptus globulus, Thevetia peruviana, Psidium guajava*
Diabetes	Diabetes	12	15.4	3	4.83	0.81	*Calotropis procera, Psidium guajava, Syzygium cumini*
Gastrointestinal diseases	Acidity, Constipation, Diarrhea, Digestion Problem, Flatulence, Helminthic, Hemorrhoids, Jaundice, Stomach-Ache, Stomach And Intestinal Swelling, Vomiting	55	70.5	24	38.7	0.57	*Achyranthes aspera, Acacia nilotica, Aegle marmelos, Aloe vera, Butea monosperma*, *Centella asiatica, Calotropis procera, Senna occidentalis, Croton tiglium, Cuminum cyminum, Datura metel, Dalbergia sissoo, Euphorbia hirta, Euphorbia prostrata, Ficus benghalensis, Ficus religiosa, Ficus racemosa, Mangifera indica, Morus alba, Psidium guajava, Saccharum officinarum, Solanum nigrum, Terminalia chebula, Tinospora cordifolia*
Glandular disorders	Imbalance of Male and Female Hormones, spermatorrhea	3	3.85	3	4.84	0	*Asparagus racemosus, Ficus benghalensis, Withania somnifera*
Gynecological disorders	Fallopian Tube Blockage, Leucorrhea, Menstrual Pain, Menstrual Irregularity, Prolapse of Uterus, Uterine Muscle Strengthening, Uterus Swelling, Vaginal Infection	22	28.2	12	19.35	0.48	*Achyranthes aspera, Argemone mexicana, Centratherum anthelminticum, Cordia dichotoma, Dalbergia sissoo, Ficus benghalensis, Ficus racemosa, Mangifera indica, Musa paradisiaca, Solanum nigrum, Syzygium cumini, Trapa bispinosa*
Hairs problems	Dandruff, Hair Fall, Hair Louse	5	6.4	3	4.83	0.5	*Allium cepa, Lawsonia inermis, Ziziphus jujube*
Inflammation	Headache, Pain, Swelling	7	8.9	4	6.45	0.5	*Allium sativum, Calotropis procera, Solanum nigrum , Ziziphus jujube*
Injury	Burn Injury, Bone Fracture, Cut, Sprain, Thorn Injury, Wound, Internal Injury	13	16.7	7	11.29	0.5	*Achyranthes aspera, Aloe vera, Calotropis procera, Capparis zeylanica, Dalbergia sissoo, Ficus benghalensis, Syzygium cumini*

MENE diseases	Oral Hygienic Maintenance, Earache, Eyes Infection And Allergy, Mouth Ulcer	13	16.7	10	16.12	0.25	*Acacia nilotica*, *Allium cepa*, *Argemone mexicana, Cordia dichotoma, Crinum latifolium, Dalbergia sissoo, Ficus religiosa, Mangifera indica, Thevetia peruviana, Punica granatum, Diospyros melanoxylon, Sesamum indicum*
Nervous disorders	Paralysis	2	2.6	2	3.22	0	
Pyrexia	Dengue, Viral Fever, Malaria Fever, Typhoid	9	11.54	4	6.45	0.62	*Carica papaya, Ocimum sanctum, Pennisetum glaucum, Tinospora cordifolia*
RS diseases	Enlargement of Prostate Gland, Urine Retention, Kidney stone	1	1.2	1	1.6	0	*Kalanchoe pinnata, Butea monosperma, Senna occidentalis, Citrullus lanatus, Mangifera indica*
Respiratory diseases	Cold, Cough, Pneumonia, Tuberculosis Infection	32	41.02	10	16.12	0.7	*Achyranthes aspera, Acacia nilotica, Allium sativum, Barleria cristata, Eucalyptus globulus, Ficus benghalensis, Ficus religiosa, Adhatoda vasica, Ocimum sanctum, Psidium guajava*
Skin diseases	Acne, Pimples Boils And Sores, Cyst, Face Freckled, Hair Furuncle, Leucoderma, Paronychia, Skin Allergy, Scabies	25	32.05	14	22.5	0.46	*Acacia nilotica, Aloe vera, Argemone mexicana, Brassica oleraceae*, *Kalanchoe pinnata, Butea monosperma, Calotropis procera, Senna occidentalis, Lawsonia inermis , Dalbergia sissoo, Ficus benghalensis, Ficus religiosa, Pergularia daemia, Zingiber officinale*

Table 5: Frequency of Plant Parts Used and Reported plant species for Various Types of formulations in the study area

Percentage of plant parts used in various types of formulations		Percentage of reported plant species in various types of formulations		Percentage of reported plant species according to mode of administration	
Plant Parts Used	Percentage Proportion	Types of Formulations	Percentage Proportion	Mode of Administration	Percentage Proportion
Aerial Parts	29.48	Ash	4.9	Anal Region	3.28
Bark	20.51	Decoction	21.31	Basking	8.20
Flowers	7.69	Extract	37.70	Inhale	9.63
Fruits	29.48	Fresh Form	42.62	Oral	73.70
Leaves	88.46	Poultice	11.47	Toothbrush	8.20
Rhizome	1.28	Powder	18.03	Topical	34.42
Roots	26.92			Vaginal Region	3.28
Seeds	26.92				
Stem	38.46				

20.51, 7.69 and 1.28 percent respectively (Table 5). Percentage usages of reported plants' species in terms of types of formulations were: 42.62, 37.70, 21.31, 18.03, 11.47 and 4.9 percent for fresh form, extract, decoction, powdered, poultice and ash respectively (Table 5).

Percentage usages of reported plants' species in terms of mode of administration were: 73.70, 34.42, 9.63, 8.20 and 3.28 as oral, topical, inhale, toothbrush & basking and anal & vaginal application respectively percent (Table 5). RPL (Relative Popularity Level) and ROP (Rank Order Priority) values indicates that *Solanum nigrum*, *Achyranthes aspera*, *Senna occidentalis*, *Calotropis procera*, *Acacia nilotica*, *Ficus benghalensis*, *Psidium guajava*, *Syzygium cumini*, *Allium sativum*, *Aloe vera* and *Kalankoche pinnata* were substantially used plant species in the study area.

DISCUSSION

In an attempt to corroborate and validate the present study, we compared 62 reported plant species from the study with previously published work pertaining to ethnomedicinal properties of local flora across different sites of Haryana. The findings of our study were similar to those reported by Panghal *et al.* (2010) for 30 species in Jajjhar, 19 in Mahendergarh (Yadav and Bhandoria 2013), 20 in Karnal (Kaur and Vashistha, 2014) and Bhiwani (Singh *et al.* 2015), 13 in Yamuna-nagar (Parul and Vashistha, 2017), another 12 in Bhiwani (Singh, 2016), 6 in Kurukshetra (Lal and Groach, 2016), 16 in Karnal, Kurukshetra, Ambala, Yamunanagar, Hisar; Sirsa, Fatehabad, Panipat, Jind, Rohtak, Jajjhar, Panchkula and Sonipat (Singh *et al.* 2016), 6 in Gurugram (Parul *et al.* 2017), 14 in Rewari and Mahendergarh (Ashish, 2018), 23 in Jind (Rani, 2019), another 25 in Karnal (Gupta and Malhotra. 2020) and 15 in Gurugram (Kumar and Khurana, 2017).

From the present study and having scrutinized the previous published work on the subject it was predicted that the family 'Leguminosae or Fabaceae' has maximum citation with regard to ethnomedicinal uses. Comparative analysis at family level has also led us to conclude that families: Solanaceae, Apocynaceae, Asteraceae, Moraceae and Euphorbiaceae have been used less frequently in different parts of state of Haryana (Panghal *et al.* 2010; Yadav and Bhandoria 2013; Kaur and Vashistha, 2014; Parul and Vashistha 2017; Singh *et al.* 2015; Singh, 2016; Lal and Groach 2016; Singh *et al.* 2016; Parul *et al.* 2017; Ashish, 2018; Rani, 2019; Gupta and Malhotra, 2020; Kumar and Khurana 2017). Variation in regional traditional practice of plants can also be seen in different geographical boundaries of Haryana.

Reported ethnomedicinal uses of recorded plant species were compared with previous studies conducted across India, as shown in Table 3. The ethnomedicinal uses of 4 plant species i.e. *Brassica olaracea* (for boils and sores), *Datura metel* (for hemorrhoids), *Pennisetum glaucum* (for typhoid) and *Prunus persica* (for enlarged prostate and urine retention) were not found reported in published work yet. Mustard oil coated gentle warmed leaves of *Brassica olaracea* are used to tie on boils and sores for treatment. Root decoction of *Pennisetum glaucum* is used to treat typhoid. Decoction of leaves of *Prunus persica* is taken orally to treat enlarged prostate and urine retention. The new herbal formulation of *Datura metel* has been recorded to cure hemorrhoids i.e. poultice prepared using seeds or fruit (100g) of *Datura metel*, alum (50 g), lemon juice (about 2-3 tablespoon) and water by giving gentle heat, is used to apply on anal region. The plant species with new documented uses and those having high relative popularity level must be discussed, understood and investigated further to look for novel biochemical compounds in plant bodies with the help of pharmaceutical and pharmacological research.

CONCLUSION

The analysis of collected data enabled us to arrive at few interesting conclusions. Female participants have been found to contain more ethnomedicinal knowledge than male. Most of the data claimed in these areas is only get from above age of 40 years and people of young generations are not interested in practicing the same. Hence, this is the right time to document the disappearing ethnomedicinal uses of this area and to explore

this data to globe. All recorded 62 plant species belong to angiosperm division of the plant kingdom. Family Leguminosae found its larger use in maintaining oral health. All informants were actual users and carrier of ethnobotanical information.

Recommendations:

High value of Relative Popularity Level (**RPL**) and Informant Consensus Factor (**ICF**) indicates popularity of plant species to treat specific ailment/diseases in a particular studied area. Reported plant species having high value of RPL and ICF makes them worthy of being subjected to deep phytochemical and pharmacological evaluation. Novel information on the preparation of herbal medicine from medicinal plants in this study will be useful for future generations to discover novel drugs.

ACKNOWLEDGEMENT

We would like to sincerely acknowledge the contribution of all the participants who have shared valuable ethno botanical information with us. We also express our feeling of gratitude to Mr. Rupinder Kumar for his immense support in surveying and successful completion of this work. Tony Kumar has been a great help as local coordinator for the survey. Gurjant Singh and Ashish Kumar helped us in drawing the map of the study area.

ABBREVIATIONS USED

Abbreviated Form	FULL Form
FC	Frequency of Citation for Particular Plant Species
NU	Non-Medicinal Uses
MU	Medicinal Uses
ΣUi	Summation of All Reported Uses (Medicinal + Non-medicinal)
UVs	Use value for Particular Plant Species
MTA	Major Treated Ailment using Particular Plant Species
Na	Number of informants for MTA
FL	Fidelity Level
RPL	Relative Popularity Level
ROP	Rank Order Priority
MENE Diseases	Mouth, Ear, Nose, Eyes Diseases
Nur	Number of Use Reports for Particular disease category/Medicinal use
NPs	Number of Plant species used for Particular disease category/Medicinal use
TNP	Total Number of Reported Plants species
RS Diseases	Renal System Diseases

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