



Pharmacological and ethnobotanical studies of angiosperms from Shamli region of district Meerut, Uttar Pradesh, India

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ABSTRACT

Plants are essential to our life as they provide us with food and, through photosynthesis, release oxygen into the atmosphere. Historical accounts about plants demonstrate their many benefits to humans and other living things. Rapid population growth and industrialization have damaged agricultural and forest flora. Raising awareness of the value of plants for sustainable development is necessary. This study focuses on the medicinal benefit of the phyto-diversity of angiosperms from the Shamli region of Uttar Pradesh and their medicinal value for mankind. Shamli is located near the Ganga River, on the eastern side of the Yamuna River at an elevation of 248 meters above sea level. This region's ideal temperature is between 13.8°C and 33.2°C. The vegetation of Shamli is enhanced by a variety of trees, shrubs, and plants. In addition to documenting fifty plant species that belong to several angiosperm genera and families, such as *Abutilon indicum*, *Aegle marmelos*, *Azadirachta Indica*, *Moringa oleifera*, and *Calotropis gigantea*, a critical study of the area's plant life has been conducted. The engagement with the locals of the Shamli region recorded the ethnomedicinal significance of the collected plants.

Introduction

The term Ethnobotany was coined by the American botanist, John Harshburger (Harshburger, 1896). Ethnobotany is developing and progressing beyond simple documentation to producing complex, durable drugs. Humans have used wild plants for food, medicine, fuel, and a variety of other practical purposes throughout history (Haq *et al.*, 2023; Mirzaman *et al.*, 2023). People that reside in less

developed locations depend heavily on the collection and use of these wild botanical resources for their livelihoods (Waheed *et al.*, 2023). Geographical and cultural variables have a significant influence on plant consumption patterns, which shapes human interactions with flora into a combination of behavior and wisdom (Morell-Hart *et al.*, 2019). However, the disappearance of

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ancestors' traditions and conversion of forests into other types of land use pose a serious threat to the priceless wealth of traditional knowledge (Haq *et al.*, 2022). In the wake of future advancement, there is a chance that this looming loss will vanish permanently (Arshad *et al.*, 2023). Therefore, it becomes imperative to carefully record and preserves the ancient botanical knowledge associated with these species (Haq *et al.*, 2023a).

The Greek terms angeion, which means "vessel," and sperma, which means "seed," are the source of the word "angiosperm," which together imply "enclosed seeds," referring to seeds that are carried inside fruits. *Magnoliophyta*, *Anthophyta*, and *Angiospermae* are other names for angiosperms, or blooming plants. With over 2,500 species spread across 350 families, they represent the most varied group in the plant kingdom (Kenrick, 1999; Simpson, 2006). They are found in nearly every type of habitat on the planet, including freshwater habitats, marine estuaries, high alpine peaks, and deserts. The number of flowering plant species that are now recognized, characterized, and accepted has been estimated by Christenhusz and Byng (2016) to be 95,383, of which 2,10,008 are eudicots and 74,273 are monocots. Put another way, about 96% of the species of angiosperms that are currently known belong to the monocotyledon (monocots) or eudicotyledon (eudicots) groups, with the remaining 4% of angiosperms being classified as magnoliids, or non-eudicots, a group of plants that are thought to exhibit primitive characteristics. Generally speaking, these can be separated into paleoherbs and woody magnoliids (www.bsienviis.nic.in/Database/Angiosperms_of_India_26171.aspx).

India's diverse physical environment, including variations in latitude, altitude, climate, and geology, contribute significantly to the country's great biological variety. Hooker (1904) said that Relating to the great degree of plant diversity in the country, "The Flora of British India is more varied than that of any other country of equal area in the eastern hemisphere, if not on the globe," Even though India only makes up 2.4% of the world's landmass, the nation is home to 55,048 taxa that are divided among 21,984 Angiosperms, 82 Gymnosperms, 1314 Pteridophytes, 2800 Bryophytes, 2989 Lichens, 15602 Fungi, 9008 Algae, and 1269 Microbes. These taxa account for approximately

11.4% of the entire world's currently known species (Anonymous, 2022). Additionally, approximately 25% of India's vascular plants are endemic. About 10% of India's blooming plant species are thought to be threatened (Nayar and Sastry, 1987–1990; Singh *et al.*, 2015; Lakshminarasimhan and Paul, 2023).

The World Health Organization (WHO) estimates that up to 80% of people on the planet receive their primary medical treatment from traditional medicine. The utilization of medicinal plants to treat a variety of ailments and the advancement of indigenous medicine have significant positive economic effects (Azaizeh *et al.*, 2003). In rural and tribal India, medicinal plants have long held a significant place in the sociocultural, spiritual, and medical spheres. One of the richest, oldest, and most varied traditional medical systems is found in India. There is a long history of using plants to treat illnesses. Preparing medicinal plants that are readily available locally is still a crucial aspect of providing healthcare to people, particularly for those who live in rural regions without access to modern medical facilities or cannot afford the expensive synthetic pharmaceuticals. India's woods are a treasure trove of priceless medicinal plants that have been used for human health care ever since people discovered the preventative and therapeutic qualities of plants.

Native medicinal herbs are affordable to synthesize, easily accessible, biocompatible, and safe to use (Cavero and Calvo, 2015; Damor *et al.*, 2023). Worldwide, plants constitute the source of 25% of prescription drugs (Tribess *et al.*, 2015). There were 2,68,600 angiosperm plants in the globe overall, of which 18,386 (6.84% of the world's total) were found in India, according to B.S.I., West Bengal's Plant Statistics of India. Indian indigenous people use a wide range of herbal remedies to treat a wide range of illnesses. There are regional variations in the plant parts utilized, drug formulation, and drug delivery (Verma *et al.*, 2015). As the "cradle of flowering plants," Northeast India is home to more than 130 species of primeval angiosperms (Takhtajan, 1969). An estimated 3000 species of angiosperms are thought to have therapeutic potential; of these, roughly 1300 species are widely employed in various traditional medical systems, including Allopathy, Siddha, and Ayurveda. This region contains a

significant number of primitive angiosperm genera, including *Magnolia*, *Mangelieta*, *Tetracentron*, *Alnus*, *Aspidocarya*, *Betula*, *Decaisnea*, *Euptelea*, *Exbucklandia*, *Haematocarpus*, *Holboellia*, *Houttuynia*, and *Pycnarrhena* (Malhotra and Hajra, 1977). According to Shankar (2020), the Indian subcontinent is home to 34 species of magnolia, of which 9 are introduced or hybridized species.

In India, around 3000 plant species are recognized to offer health benefits such as anti-diabetic and antioxidant properties (Chhetri *et al.*, 2005; Chauhan *et al.*, 2010; Debbarma *et al.*, 2017).

Scientists worldwide have investigated the therapeutic characteristics of these plant species because of their composition, pharmacologic activity, minimum noxiousness, and commercial feasibility (Semwal *et al.*, 2010; Tewari *et al.*, 2014). Because contemporary health care facilities are expensive and inaccessible, Native Americans from low-income backgrounds rely heavily on traditional medicine. Ayurvedic clinical competence in rasayana tries to ward against disease and mitigate the signs of aging. These substances are said to be powerful antioxidants, nourishing nutrients, and rejuvenators (Chaturvedi, 2012).

Notably, in the current study area, there is a dearth of research examining the ethnomedicinal potential of native plants. Therefore, the purpose of this study was to methodically compile and record traditional ethnobotanical knowledge on a variety of plants from around the world. The present study focused on the collection of some angiosperms and the study of their medicinal importance in specific diseases like diabetes, blood pressure, colds and coughs, diarrhoea, dysentery, cholera, pneumonia, leprosy, bronchitis, sore throats, etc.

Material and Methods

Study area

Uttar Pradesh is the most populous and fourth-largest state in India. Situated in the north-central region of the country, it shares borders with the states of Uttarakhand, Nepal, Bihar, Jharkhand, Chhattisgarh, and Madhya Pradesh to the east, and Rajasthan, Haryana, and the national capital territory of Delhi to the west. On January 26, 1950, the state of Uttar Pradesh was renamed as the "Northern State" when India became a republic.

The capital of the state is Lucknow. Of the 75 districts of Uttar Pradesh, 26 are located solely in Western Uttar Pradesh.

One of Uttar Pradesh's districts, Shamli is comprises of three tehsils, five blocks, and 134 villages under the jurisdiction of Shamli tehsil (Figure 1). This region features strong humus content, clayey soil that is rich in fertility, and a high water-retaining capacity. Alluvial soil is found in the majority of the district, which is the Gangetic plain, and is formed from silt that the Yamuna and Ganga rivers have deposited. It is located in the nation's North Central area. Many different types of medicinal plants can be found in the northern area of India due to its distinct topography and environmentally marginal conditions. The people who live in northern India continue to honor the traditional medical practices that are ingrained in their culture. These traditional techniques have been used to treat complex disorders for more than three millennia (Kumar *et al.*, 2015).

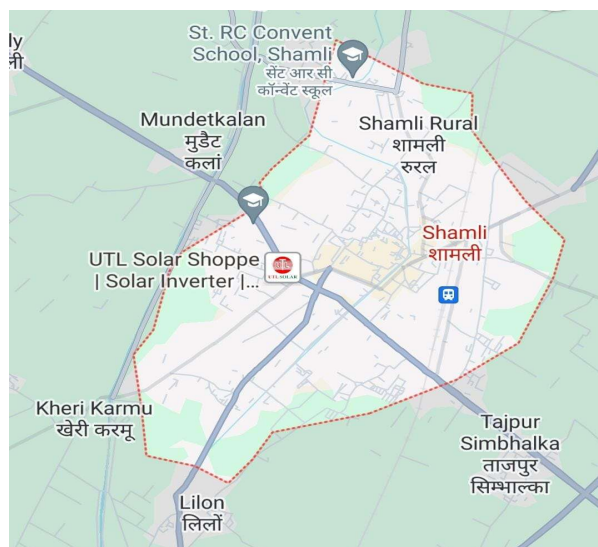


Figure 1: Map showing sampling sites

Sampling and Identification

Beginning with a collection of plants from Shamli (Uttar Pradesh), the work was carried out in the Laboratory of Department of Botany, Keral Verma Subharti College of Science at Swami Vivekanand Subharti University, Meerut (UP). In order to gather information, a survey was conducted in various villages within the Shamli district of Uttar Pradesh between December 2022 and May 2023.

These villages included Bhaju, Kurmali, Choonsa, Adampur, Kairana, Un Rural, Babri, Banat, Bantikhera, Jalalabad, Salahkhedi, Karmukhedi, Sikka, Silawar, and Lilaun. Additionally, Vaidyas and herbal practitioners were consulted regarding the medicinal significance of the collected plants. While many of them felt uncomfortable sharing information, a few mentioned the plant names in their native tongues as well as the natural compounds that were utilized to treat particular diseases. By gathering samples from the area, these plant names from the local dialect were confirmed. With the aid of online taxonomic literature, these collected plant specimens were identified (eFloras 2008). The region's documented ethnomedical data is also cross-referenced with primary source data, including books and herbal pharmaceutical firms. Additional details about the therapeutic applications of plants and their parts were gathered using questionnaires, which were then shared with senior villagers and the local Vaidya. The plants from this survey were compared to other surveys of historically utilized plants.

Results and Discussion

In Table 1, ethnomedical plants are listed alphabetically by botanical name, family, and the term or portion of the plant that is being used.

This study demonstrates the ethnomedicinal significance of 45 local and wild plant species found in the Shamli region, which is still uncharted scientific territory with few records of additional local and wild plants as well as ethnomedicinal plants (Figure 2). The plant species under study are either regularly grown or occur naturally in the surrounding area. According to Table 2, the main family with the most plants is the *Asteraceae* (4 plant species), which is followed by the *Fabaceae*, *Malvaceae*, and *Annonaceae* (3 plant species each), and finally the *Myrtaceae*, *Solanaceae*, *Annonaceae*, *Lamiaceae*, *Rutaceae*, and other families (2 plant species each).

The survey also reveals that leaves are the most common plant portion used for therapeutic purposes. Nearly all plants under study have leaves that are extremely therapeutic and frequently used to cure various illnesses. The next most useful plant element after leaves is fruit, which is followed by some species' bark. Many plants are utilized in their complete form to treat a variety of illnesses. In

addition, a variety of plant parts, including seeds, stems, roots, aerial roots, rhizomes, buds, flowers, calyxes, and others, are employed in the treatment of various illnesses. The current study demonstrates the great ethnomedicinal worth of the native plants in the Shamli region, which can be further explored and examined to record their medicinal value and gain a wealth of knowledge. There are many medicinally valuable plants in the examined area, and the study documents the ethnomedicinal value of these plants. While some of the locals are still ignorant of the health benefits offered by the plants, many of them rely on the medicinal qualities of diverse plants. Many diseases have been observed to respond quite well to the plants. Many plants have been shown to be highly effective in treating various human diseases. For example, a number of plants, including *Abelmoschus esculentes*, *Aloevera*, *Annona squamosa*, *Azadirachta indica*, *Memordica charantia*, *Psidium guajava*, *Syzygium cumini*, *Tinospora cordifolia*, *Morus alba*, and *Catharanthus roseus*, have been shown to help lower the level of diabetes.

Aegle marmelos, *Aloe vera*, *Azadirachta indica*, and *Curcuma longa* are examples of plants that have both antimicrobial and anti-inflammatory properties. *Cassia fistula*, *Eclipta prostate*, *Lagerstroemia speciosa*, *Moringa oleifera*, and numerous other species have antimicrobial properties. Another health concern is dysentery, which can be addressed with a variety of plant species such as *Abutilon indicum*, *Solanum nigrum*, *Muraya koeingii*, and various plant parts of *Achyranthes aspera*, *Calotropis gigantea*, *Carrisa carandas*, *Euphorbia hirta*, and *Prosopis cineraria*. Certain species, such as *Cassia fistula*, *Cannabis sativa*, and *Argemone Mexicana*, have anti-cancer qualities. Plants that help with venomous reptile bites include *Achyranthes aspera*. Aside from these, many plant parts can be consumed or applied as a tonic, paste, or in any other form to treat a wide range of additional illnesses and allergies. Numerous plants can help with a wide range of illnesses, allergies, and conditions. They are said to be more successful than allopathic medicine in healing the body organically. In the village and surrounding area, traditional medical knowledge about numerous plants and their diverse sections is still in use and highly respected (Table 1 and Figures 2-6).

Table 1: List of Ethno-medicinal plants being used

SN	Botanical Name	Name's of family	Vernacular Names	Plant part used	Ethno-pharmacological application
1	<i>Abelmoschus esculentus</i>	Malvaceae	Bhindi	Fruits	Used in diabetes, chopped fruits soaked in water overnight and aqueous extract taken in morning
2	<i>Abutilon indicum</i>	Malvaceae	Kanghi	Whole plant	Extract of fresh leaves mixed with a tea spoon honey is taken during Dysentery. Fresh roots are crushed and consumed with milk in Weakness.
3	<i>Achyranthes aspera</i>	Amaranthaceae	Chirchita	Whole plant	Plant is crushed and given in case of pneumonia, also helpful in asthma, cough and piles. Spikes or seed paste is used to cure snake and venomous reptile bites.
4	<i>Aegle marmelos Correa</i>	Rutaceae	Bel	Leaves, fruits	It has antiviral and antimicrobial properties. Leaves give extreme benefit during ulcers, digestive disorders and tuberculosis.
5	<i>Aloe vera</i>	Asphodelaceae	Gwarpatha, Gheekwar	Leaves	Pulp used for various skin infection and acne. Helps in lowering sugar level. It has antimicrobial properties.
6	<i>Annona squamosa</i>	Annonaceae	Sitaphal	Leaves, seed	Helps in diabetic conditions, improves immunity and eyesight. Seed oil acts as an antioxidant.
7	<i>Argemone mexicana</i>	Papaveraceae	Peeli kateri	Stem, leaves	Aqueous extracts have anticancerous and antifungal properties.
8	<i>Azadirachta indica</i>	Meliaceae	Neem	Bark, leaves	Paste of bark is used in healing skin injuries. Extraction of leaves and roots is helpful in treating skin problems and jaundice.
9	<i>Calotropis gigantea</i>	Asclepiadaceae	Safed Akara	Leaves, Crushed roots	Used to treat asthma, cold and cough, diarrhoea, fever, indigestion, leprosy, leukoderma, and rheumatism.
10	<i>Cannabis sativa</i>	Cannabinaceae	Bhang	Buds, leaves, flowers	Used in asthma, cancer, cystitis, diarrhea, dysentery, diuretic, epilepsy and fever.
11	<i>Capsicum annum</i>	Solanaceae	chilli	Leaves, Fruit	Used in the treatment of diabetes, sore throat, arthritis. It has analgesic effect and relieves sore throat.
12	<i>Carissa carandas(linn.)</i>	Apocynaceae	Karonda	Fruit and leaves	Leaves decoction is used in cough, cold, asthma and various skin disease.it also cures diarrhea and chronic constipation
13	<i>Cassia fistula</i>	Fabaceae	Amaltas	Leaves	It has antitumor, antimicrobial properties. Pulp is effective in easing bowel. Plant juice helps with various skin disorders.
14	<i>Catharanthus roseus</i>	Apocynaceae	Sadabahar	Leaves, fflower	Aqueous extract and fresh leaves are chewed daily empty stomach in morning. Raw flowers are chewed in treating diabetes.
15	<i>Croton bonplandianum</i>	Euphorbiaceae	Jangli jamal ghotia	Stem, leaves	Leaf decoction is used in dandruff removal. Juice of stem is used in eye infection.
16	<i>Curcuma longa</i>	Zingiberaceae	Haldi	Rhizome	Anti-inflammatory, acts as anticoagulant have antimicrobial and nephron protective properties.
17	<i>Eclipta prostrata</i>	Asteraceae	Bhringraj	Whole plant	Fresh leaves juice is used in treating fever, skin disorders and joint pains. Shows antimicrobial and antifungal properties and helps in hair growth when paste is applied to scalp.
18	<i>Euphorbia hirta</i>	Euphorbiaceae	Dudhiya	Leaves	Leaves juice is taken to treat bronchitis and cough.
19	<i>Ficus benghalensis</i>	Moraceae	Bargad	Aerial roots	Tips of fresh prop roots chewed in morning empty stomach with water.
20	<i>Ficus religiosa</i>	Moraceae	Pipal	Bark, leaves	Bark has antibacterial, antiprotozoal properties. Leaves are used in the treatment of different infections and diseases.
21	<i>Hibiscus rosasinensis</i>	malvaceae	gudhal	Leaves, calyx	Acts as sedative, antiseptic and astringent etc. emollient leaves boiled calyx is helpful in nauseous conditions.
22	<i>Lagerstroemia speciosa</i>	Lythraceae	Pride of India, Jarul	Leaves, fruit, bark	Bark extracts have antimicrobial effects, Leaves extract shows antioxidant activity and decreases blood glucose level.
23	<i>Mangifera indica</i>	Anacardiaceae	Aam	Bark, leaves, seeds	Seeds and kernels are used for vaginal and uterus problem. Bark is used during jaundice and coughing. It is even used during diabetes.

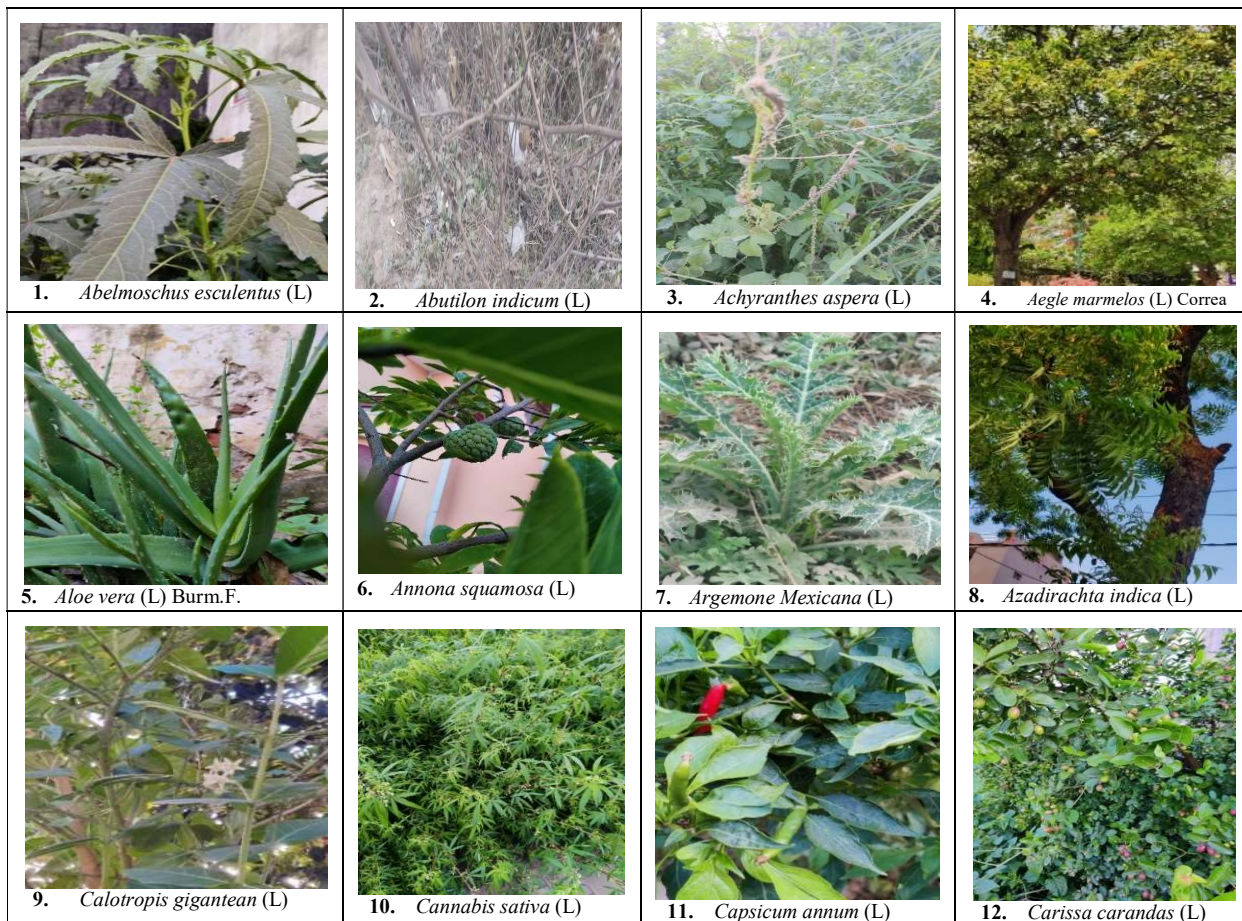
24	<i>Memordica charantia</i>	Cucurbitaceae	Karela	Fruits	Extremely helpful in diabetic condition due to its bitter taste.
25	<i>Mimosa pudica</i>	Mimosideae	Chhui-mui	Seeds	One teaspoon of powdered seeds are taken with milk/water twice a day
26	<i>Moringa oliefera</i> Lam.	Moringaceae	Shahjan	Leaves, Pods	It has anti-inflammatory, antimicrobial properties. Leaves are used in treating various skin related problems, asthma and conjunctivitis.
27	<i>Morus alba</i>	Moraceae	Shahtoot	Leaves, Fruits	Leaves have ant diabetic and antioxidant effect.
28	<i>Muraya koeingii</i> Spreng	Rutaceae	Curry Patta	Leaves	Leaves are crushed and taken during piles, dysentery etc.
29	<i>Nyctanthus arbor-tristis</i>	Oleaceae	Harsingar	Leaves, fruits	Dried fruits are taken during cough. Fresh Leaf extract is used to treat ringworm and for other inflammatory problems.
30	<i>Ocimum tenuiflorum</i>	Lamiaceae	Tulsi	Leaves	It acts as mosquito repellent, anti-arthritic, antimicrobial etc. Raw Leaves are chewed. It also helps in DNA repair when consumed and eliminates toxic compounds from the body.
31	<i>Origanum majorana</i>	Lamiaceae	Marva	Leaves	Extract used as essential oil to treat toothache, soothes muscular pain. It also acts as antidote and shows antiseptic properties.
32	<i>Phyllanthus emblica</i>	Phyllanthaceae	Amla	Fruits, Leaves	Used as tonic and as a source of vitamin C. also helps to cure diarrhea, inflammation and jaundice.
33	<i>Polyathia longifolia</i>	Annonaceae	Ashok	Seed, bark and flowers	Cytotoxic function, antiulcer, hypoglycemic and hypotensive effect.
34	<i>Prosopis cineraria</i>	Fabaceae	Shami	Bark, flowers, pods	Bark extracts have antibacterial properties. It is also beneficial in bronchitis, cough and asthma. Leaves extract reduces blood sugar level.
35	<i>Psidium guajava</i>	Myrtaceae	Amrood	Leaves, fruits	Leaf extracts helps in diabetes, diarrhea. Pulp of the fruit helps in increasing the platelet count during dengue.
36	<i>Punica granatum</i>	Punicaceae	Anaar	Fruit, bark	Fruits act as an important astringent. Fruit juice is useful in leprosy, fever and dyspepsia.
37	<i>Solanum nigrum l.</i>	Solanaceae	Makoi	Whole plant	Used in fever, stomach problems, ulcers, skin diseases, dysentery. Fruits are used for asthma and cough.
38	<i>Sonchus asper</i>	Asteraceae	Prickly sowthistle	Leaves	It has anti-fungal properties and cure many skin related problems.
39	<i>Sonchus oleraceus</i>	Asteraceae	Common sowthistle/peeli dudhi	Leaves	Used in treatment of inflammatory diseases and gastrointestinal tract disorders. Leaves are used in salads.
40	<i>Stellaria media</i>	Caryophyllaceae	Chickweed	Whole plant	Whole plant is crushed and applied during skin inflammation and allergy. Leaves are taken as tea to relieve pain.
41	<i>Syzygium cumini</i>	Myrtaceae	Jamun	Fruits, seeds and leaves	Seed powder consumed to cure diabetes. It purifies blood. Fruit removes bad smell from mouth and is ant diabetic.
42	<i>Terminalia arjuna</i>	Combretaceae	Arjun	Bark, Leaves	Used as tonic during heart failure, anemia. Used in treatment of fractures, Ulcers and shows antioxidant, antimicrobial effects
43	<i>Tinospora cordifolia</i>	Menispermaceae	Giloy	Leaves	It helps in improvement of immunity, also beneficial in detoxifying skin and releases toxins from body, boon for a diabetic patient.
44	<i>Trifolium repens</i>	Fabaceae	White clover	Whole plant	Used in treating cold and cough and leucorrhoea. Flower Mixture is used as Eyewash.
45	<i>Xanthium Strumarium</i>	Asteraceae	bhurunt	Seed, root, fruit	Seeds are useful to get relief during headaches whereas roots are helpful during tumor treatment. It's fruits are used for treating constipation.





The importance of ethnobiological knowledge in leading the way toward new avenues for scientific research on ecology and conservation monitoring has received considerable attention in resource management (Berkes *et al.*, 2000; Huntington, 2000). Through their "people and plants" project,

international organizations such as the World Wildlife Fund (WWF) and UNESCO have provided assistance for research on ethnobotanical knowledge and the integration of local populations' viewpoints and practices in resource management (Cunningham, 2014).

Table 2: Distribution of Plant species with reference to family

SN	Name of Family	Number of Species	S. No.	Name of Family	Number of Species
1.	Asteraceae	4	16.	Moraceae	3
2.	Asclepiadaceae	1	17.	Moringaceae	1
3.	Meliaceae	1	18.	Mimosideae	1
4.	Fabaceae	3	19.	Cucurbitaceae	1
5.	Menispermaceae	1	20.	Anacardiaceae	1
6.	Combretaceae	1	21.	Lythraceae	1
7.	Myrtaceae	2	22.	Malvaceae	3
8.	Caryophyllaceae	1	23.	Euphorbiaceae	2
9.	Solanaceae	2	24.	Zingiberaceae	1
10.	Punicaceae	1	25.	Apocynaceae	2
11.	Annonaceae	2	26.	Cannabinaceae	1
12.	Phyllanthaceae	1	27.	Papaveraceae	1
13.	Lameaceae	2	28.	Asphodelaceae	1
14.	Oleaceae	1	29.	Amaranthaceae	1
15.	Rutaceae	2	-	-	

Figure 2: Photos of collected plants

 <p>13. <i>Cassia fistula</i> (L)</p>	 <p>14. <i>Catharanthus roseus</i> (L)</p>	 <p>15. <i>Croton bonplandianum</i> (L)</p>	 <p>16. <i>Curcuma longa</i> (L)</p>
 <p>17. <i>Eclipta prostrata</i> (L)</p>	 <p>18. <i>Euphorbia hirta</i> (L)</p>	 <p>19. <i>Ficus benghalensis</i> (L)</p>	 <p>20. <i>Ficus religiosa</i> (L)</p>
 <p>21. <i>Hibiscus rosa sinensis</i> (L)</p>	 <p>22. <i>Lagerstroemia speciosa</i> (L)</p>	 <p>23. <i>Mangifera indica</i> (L)</p>	 <p>24. <i>Memordica charantia</i> (L)</p>
 <p>25. <i>Mimosa pudica</i> (L)</p>	 <p>26. <i>Moringa oliefera</i> (L)</p>	 <p>27. <i>Morus alba</i> (L)</p>	 <p>28. <i>Muraya koeingii</i> (L)</p>
 <p>29. <i>Nyctanthus arboritis</i> (L)</p>	 <p>30. <i>Ocimum tenuiflorum</i> (L)</p>	 <p>31. <i>Origanum majorana</i> (L)</p>	 <p>32. <i>Phyllanthus emblica</i> (L)</p>



The incorporation of local-use patterns and the institutional and social environment that determines human-nature relationships into biological and ecological studies has led to a greater understanding of the interplay between social and ecological dynamics (Kumar *et al.*, 2011). Many common weeds have medicinal properties, and for over 3,000 years, traditional medical systems have cultivated them for both culinary and medicinal uses (Kareti *et al.*, 2023; Arya *et al.*, 2022; Mukherjee *et al.*, 2006). Chhetri *et al.* (2005) explore the antidiabetic plants of Sikkim state and found that about 37 species belonging to 28

families of plants were utilized as antidote for diabetes. Kumar *et al.* (2011) studied the ethnomedicinal and ecological status of Garhwal Himalaya and reported a total of 57 species of plants including 24% tree species, 17.5% shrub species, and 57.90% herb species. Vibha *et al.* (2019) wrote a review on ethnobotanical applications of two species (*Acampe praemorsa* (Roxb.) Blatt. & McCann)] of *Orchidaceae* families of angiosperms. The authors concluded that the selected plant species can be used as antidote for cancer and bacterial infections. In Mastuj tehsil of Chitral, Pakistan, Dastagir *et al.*

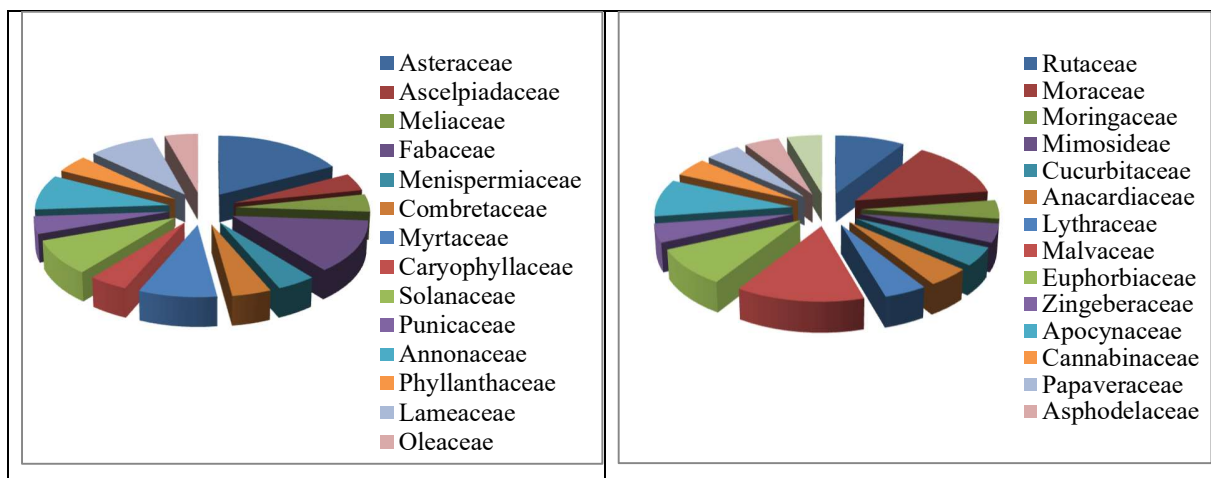


Figure 3: Graphical representation of distribution of Plant species with reference to family

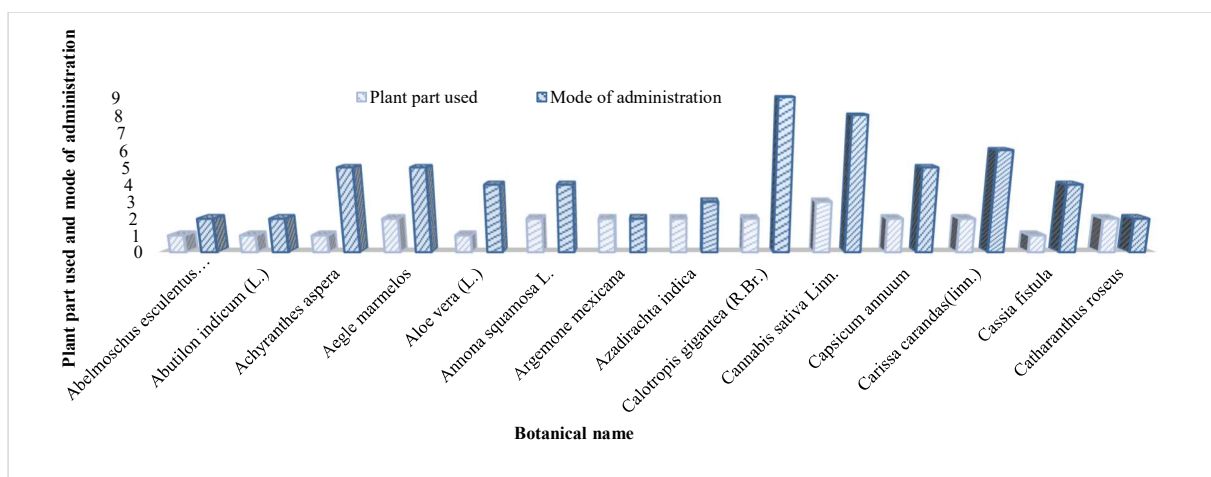


Figure 4: Ethno-medicinal plants and their mode of administration

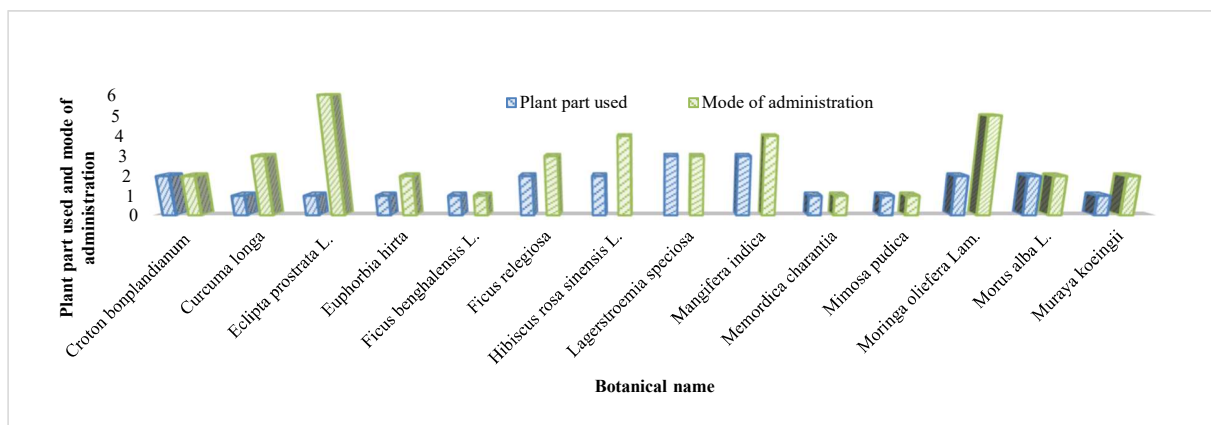


Figure 5: Ethno-medicinal plants and their mode of administration

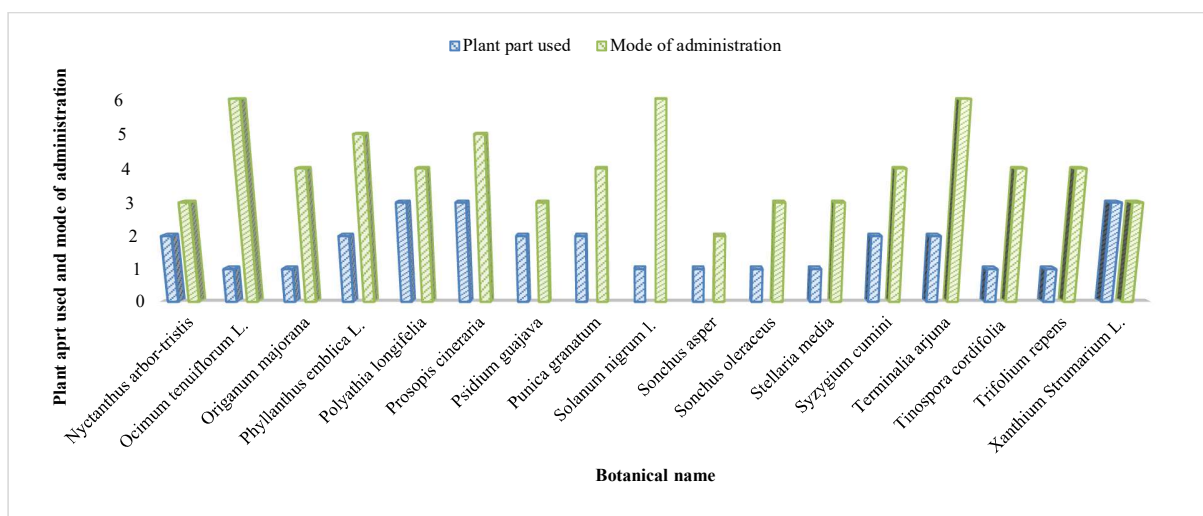


Figure 6: Ethno-medicinal plants and their mode of administration

(2022) investigated the variety of medicinally significant plants and identified 44 plant species across 25 families. Of them, twenty-four families are classified as angiosperms. Over 85 percent of plant species were used as vermifuges and anthelmintics, and to cure a wide range of ailments, including rheumatism, narcosis, dyspepsia, malaria, bronchitis, vomiting, oedema, backache, dysentery, eczema, purgative, typhoid, and rheumatism. Mirzaman *et al.* (2023) perform the ethnobotanical study at Muzaffarabad of Pakistan and reported 68 plant species belonging to 36 families were used by local inhabitants for various purposes and among them angiosperm were in leading number. Out of the total plant species found, most of them (about 57) were medically important. Ortiz-Mendoza *et al.* (2023) investigate the potential of the some plants of subfamily Nepetoideae (Lamiaceae) for the treatment of inflammatory diseases and reported that 308 species of selected subfamily were medically important and can be used for various inflammatory diseases.

Conclusion

There are 45 plant species in all that are known to be utilized for various ethnomedicinal purposes. These species are divided into 29 families. The parts usually employed for therapy were the stem, leaves, bark, and flowers. Their extracts and tonic are still utilized in many ayurvedic treatments; they can even be eaten and applied raw to wounds to

speed up healing. The majority of the plants had the ability to treat diabetes, and several also showed distinct pharmacological benefits and qualities such as antibacterial, antifungal, and anti-inflammatory. Every plant has the capacity to treat a wide range of illnesses, but because locals are unaware of the benefits of medicinal plants, it appears impossible for them to learn about them. It is important to promote awareness and research among locals and other inhabitants regarding the ethnomedicinal potential of adjacent plants. The residents of this area should take cooperative efforts for the rehabilitation of disappearing plants in order to maintain the growth of these priceless plant resources. Such ethnomedicinal plants need to be documented in order to be used in the future. The management and preservation of the wealth of medicinal plants in the Shamli region will benefit from this survey. Enhancing traditional knowledge about wild plants and documenting them is a crucial part of raising local awareness of the ethnomedicinal benefits of various plants, enabling people to embrace ayurveda and cultivate these kinds of plants on a large scale. Even the conservation of wild flora will benefit from this awareness. The locals employ this kind of research to treat a variety of illnesses naturally by utilizing various plant parts. The current study demonstrates the ethnomedicinal usefulness of many plant species components that are native to the region.

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Conflict of interest

The authors declare that they have no conflict of interest.

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