RESEARCH ARTICLE

Health Care Application of Phytodiversity in Saharanpur, Uttar Pradesh

Yogendra Kumar

DOI: 10.18811/ijpen.v10i04.17

Abstract

Human is always dependent on plants for their basic necessities and good health. There are several ancient records of the utilization of medicinal plants to treat various ailments. Considering the fact the present investigation was conducted in rural parts of the Saharanpur district of western Uttar Pradesh to document floristic diversity being used for managing diseases. The survey documented 61 dicotyledonous plants belonging to Polypetalae that were ethnomedicinally important based on the personal interviews conducted with the local population and communities. The plant specimens were collected in all the seasons, identified and their herbarium was prepared. The plants mainly belonged to the family Fabaceae, Malvaceae and Cucurbitaceae. People mostly used leaves as well as seeds, roots, fruits, flowers, and stems as sources of medicine. Rich plant diversity is an asset to the region however, lack of awareness, overexploitation, grazing, habitat destruction, and improper harvesting are some serious issues responsible for the rapid decline of medicinal plant resources. It is need of the time to promote sustainable utilization to conserve valuable medicinal flora in the study area.

Keywords: Biodiversity, herbal drugs, overexploitation, polypetalous, secondary metabolites

Highlights:

- A total of 61 dicotyledonous plants belonging to Polypetalae have been documented.
- Fabaceae, Malvaceae and Cucurbitaceae were the most represented families.
- The genera which have contributed a large number of species included *Sida* and *Zizyphus.*
- Leaves were reported as the most commonly used plant part, followed by seeds, roots, fruits, flowers and stems.
- A decoction was the most common form for the preparation of medicine, followed by paste, extract and infusion.
- Ethnomedicinal knowledge is still alive with older people in rural parts of the area and is utilized for treating their health ailments.
- Some species are facing the danger of extinction, therefore, suitable conservation strategies are required to save valuable medicinal flora of the district.

International Journal of Plant and Environment (2024); **ISSN:** 2454-1117 (Print), 2455-202X (Online)

Introduction

Plants are fundamental sources of food, fodder, clothing, shelter and medicines for humans. Various plants are rich in many active ingredients and secondary metabolites that are capable in treating diseases and health problems (Yadav *et al.*, 2014; Prakash *et al.*, 2021). Plants are used as medicines across the globe by different communities (Basati *et al.*, 2022; Feng *et al.*, 2021). Ethnobotany is a multidisciplinary science that deals interaction of plants and people, especially the tribal communities and rural people who depend on plants for medicines (Chandra *et al.*, 2013; Kumar *et al.*, 2021). The relationship between human and plants is not only confined to their use as food, shelter and clothing but also in their several religious ceremonies and health issues. However, our knowledge of plants for medicinal values is limited to a small fraction of plants (10%) identified for their medicinal value among a total of about 2.5 lakhs flowering plants found in the world, whereas the rest, 90%, still to be explored (Ojha *et al.*, 2020; Rai *et al.*, 2000).

Worldwide, nearly 2.1 lakh plant species have been documented (WHO 2002). The importance of ethnobotany has increased dramatically in the recent past. People's interest in herbal medicines has increased in many populations of the world due to their better efficacy with negligible side effects. Thus exploration of ethnomedicinal knowledge of the tribal people can help in the formulation of safer and cheaper herbal drugs (Manna and Mishra, 2018).

In the Indian Ayurvedic medicine system many plants are traditionally used for curing diseases. The country is the land of one of the eight major centers of origin of domesticated plants (Siva 2007) and it is among the world's twelve mega-diverse countries. The Indian subcontinent occupies just about 2.4% of the total land area of the world but supports about 8% of the total global biodiversity and 15000 species of flowering plants. The economic utility of only 9000 plant species are known and about 5000 species are endemic to this land (Jain and Sastry, 1984).

The unique geography of the Saharanpur district supports rich plant diversity of medicinal importance that has been used locally for treating different ailments (Dhiman *et al.*, 2006;

Department of Botany, Government Degree College Nanauta, Saharanpur-247452, U.P., India

***Corresponding author:** Yogendra Kumar, Department of Botany, Government Degree College Nanauta, Saharanpur-247452, U.P., India, Email: ykpanchal4ever@gmail.com

How to cite this article: Kumar, Y. (2024). Health Care Application of Phytodiversity in Saharanpur, Uttar Pradesh. International Journal of Plant and Environment. 10(4), 165-172.

Submitted: 13/09/2024 **Accepted:** 09/01/2025 **Published:** 20/01/2025

Nagiyan *et al.*, 2003; Prachi *et al.*, 2009). The phytodiversity of Uttar Pradesh has been analyzed by many workers in the past (Sharma 1991; Khanna *et al.*, 1996; Kumar, 1998; Maliya, 2004; Singh and Singh, 2007; Tomar, 2009). Although some basic ethnobotanical work has been carried out in the district by few workers but the present study is perhaps the first attempt focussing on ethnomedicinal aspects of polypetalae group with a large number of plant species. The major objective of the present investigation was the documentation of traditional ethnobotanical knowledge regarding medicinal plant resources in the area, which reported 61 ethnomedicinally important dicotyledonous plant species belonging to Polypetalae and compared it with previously available literature (Chopra *et al.*, 1956; Jain 1991; Khare 2007; Kirtikar and Basu 1935).

Materials and Methods

Study site description

The present investigation is based on the periodic field visits and surveys conducted in the rural areas of Saharanpur district (Fig. 1). This North-Western district (latitude 29° 34′ and 30° 34′ N, longitude 77° 7′ and 87° 12′ E) of Uttar Pradesh have mean elevation 291 masl which is surrounded Haryana (Karnal and Yamunanagar districts) in the west, Himachal Pradesh in northwest (Sirmour district), Uttarakhand in north (district Dehradun in north and Haridwar in the east). It touches the boundary of the Shamli and Muzaffarnagar districts in the south. The district has five tehsils, namely Behat, Deoband, Nakur, Rampur Maniharan and Saharanpur. Shivalik Hill forms the northern boundary of the study site and the land below it is known as the Bhabar, followed by the Terai region in the south, whereas the western part of the district is Khadar, having clay-rich soil. River Yamuna and its tributaries, namely Hindon, Panvdhoi, Krishna and Dhamola are, flow in the region, so characteristic soil is of alluvial nature. The region represents a tropical climate with rainfall of about 100 mm and an average annual temperature near 23.2°C.

Floristic and Ethnobotanical Survey

During the field survey, personal interviews and group discussions were conducted with the local traditional healers, experienced old people and villagers of different age groups.

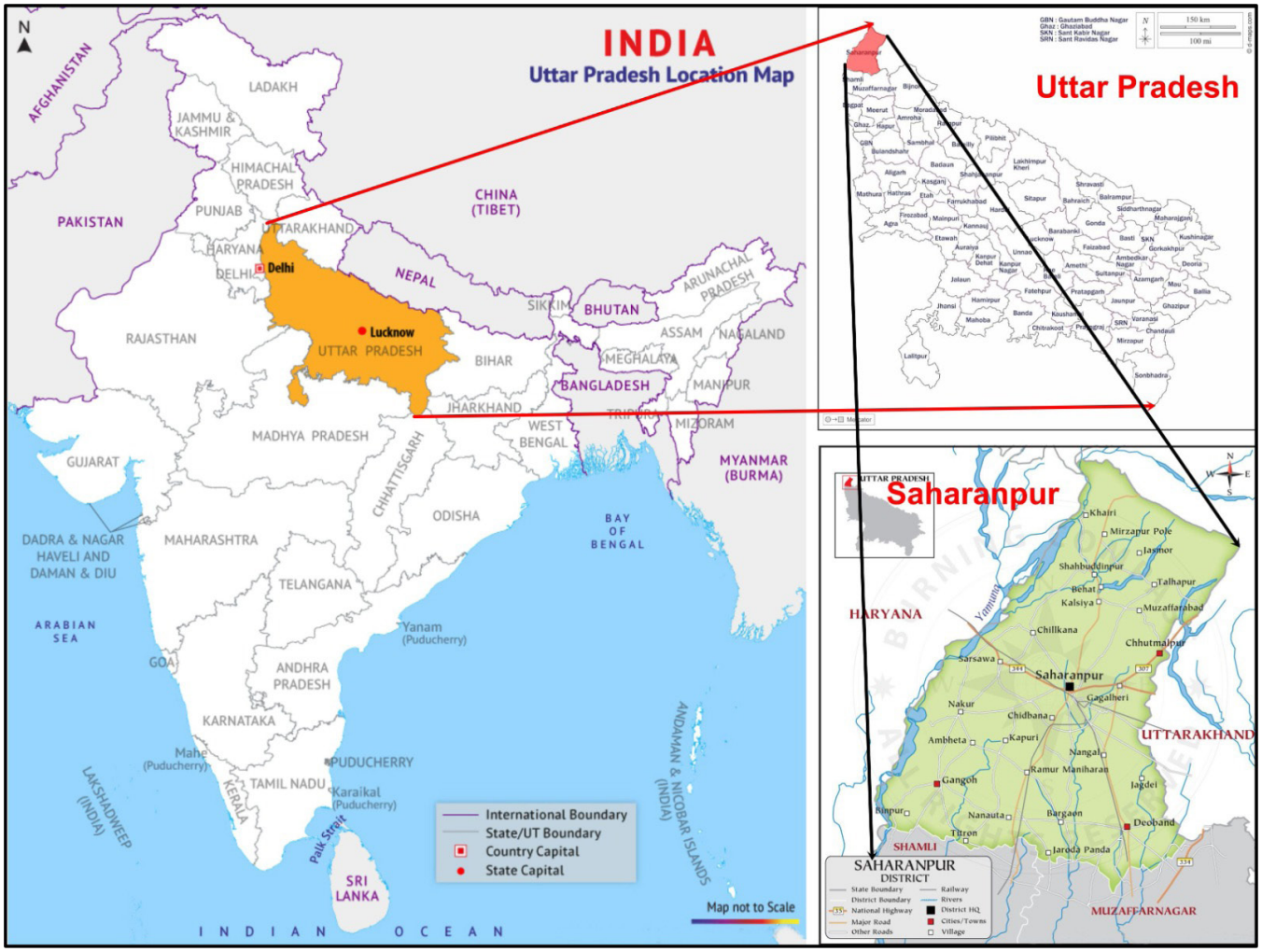

Fig.1: Map of the Study Area (Saharanpur District of Uttar Pradesh)

Table 1: List of plant species documented from Saharanpur district with ethnomedicinal uses.

Botanical name	*Common name*	*Family*	*Medicinal uses*	*Parts used*
Ranunculus sceleratus L. YK33	Jal Dhania	Ranunculaceae	Stem juice is useful in treating asthma, pneumonia and rheumatism. Leaf extract is given in eczema and ringworm. Seeds are used in the treatment of stomach pain and kidney problems.	Stem, leaf, seed
Tinospora cordifolia (Willd.) Miers. YK51	Giloy, Guduchi	Menispermaceae	Leaf decoction is useful in treating gout. Fruit is found effective in the treatment of rheumatism and jaundice. Polyurea and skin diseases can be treated with dried stems. Stem extract is useful in urinary problems, fever and general debility.	Stem, leaf, fruit
Argemone mexicana L. YK94	Peeli Kateli	Papaveraceae	Seed oil is useful in cutaneous infections. Snake bites could be treated with seeds. Latex is applied in jaundice and eye infections.	Seed, latex
Fumaria indica (Haussk.) Sabnis YK03	Pit Papra	Fumariaceae	Plant decoction is used to purify blood. It is also used as an anthelmentic.	Whole plant
Lepidium didymus L. YK150	Jungli Halo	Brassicaceae	Plant extract is useful in the treatment of rheumatism and bone disorders.	Whole plant
Lepidium sativum L. YK142	Halo	Brassicaceae	Used for the treatment of asthma and bleeding piles. Roots are used in the treatment of syphilis.	Root
Capparis decidua (Forsk.) Edgew. YK52	Kair	Capparidaceae	Scorpion bite could be treated with root paste. Flowers and buds are useful in gastric problems. Bark of the root is used for the treatment of gout, dropsy and rheumatism.	Flower, root
*Cleome gynandra*L. YK141	Jakhiya	Capparidaceae	Seed decoction is useful in typhoid and epilepsy. Leaves are effective in headache and rheumatism. Paste of leaves can be given to prevent pus formation in boils.	Leaf, seed
Cleome viscosa L. YK90	Hulhul	Capparidaceae	Painful joints can be treated with a poultice made up of seeds. Carminative and anthelmintic properties are reported in seeds.	Seed
Spergula arvensis L. YK34	Muchmuchia	Caryophyllaceae	Seeds have been proven effective in the treatment of pulmonary tuberculosis.	Seed
Stellaria media (L.) Vill. YK93	Godal, Chickweed	Caryophyllaceae	Plant paste is applied to treat cuts and wounds. It also helps in treating constipation. Healing of broken bones can be done with a mixture of plant paste and Plaster of Paris.	Whole plant
Tamarix dioica Roxb. ex Roth YK97	Jhau	Tamaricaceae	A decoction is used for the treatment of enlarged spleen.	Whole plant
Abutilon indicum (L.) Sweet YK01	Kanghi	Malvaceae	Leaf extract is useful for removing kidney stones. Bleeding piles could be treated with leaves. Roots are found effective in the treatment of dental problems.	Leaf, root
Malva parviflora L. YK129	Golio	Malvaceae	Leaf decoction is used as a nerve tonic. Seeds are used to cure coughs and ulcers.	Leaf, seed
Malvastrum coromandelianum (L.) Garcke. YK138	Bariara	Malvaceae	Roots are useful in intestinal hemorrhage dysentery.	Root
Sida acuta (Burm. f.) Bross. YK35	Bal	Malvaceae	Boiled leaf extract is effective in elephantiasis. Roots are employed to treat urinary problems and nervous disorders.	Leaf, root
Sida cordata (Burm. f.) Boiss. YK137	Baharbuta, Adia bel	Malvaceae	Fruit decoction is used in sexual debility. Crushed leaves are used for the healing of cuts. Root decoction is effective in gonorrhea and leucorrhoea.	Leaf, root, fruit
Sida cordifolia L. YK105	Kharenti	Malvaceae	Leucorrhoea and frequent micturition could be treated with root powder when given with milk. Root infusion is useful in treating urinary problems.	Root

Sida ovata Forsk. YK54	Bal	Malvaceae	Root decoction is given in sexual debility. Crushed seeds when given with jaggery are effective in lumbago.	Root, seed
Sida rhombifolia L. YK107	Sahadevi	Malvaceae	The root powder is useful in skin troubles and tuberculosis. Fever and burning micturition could be treated with root decoction.	Root
Urena lobata L. YK02	Bachita	Malvaceae	Stem and root decoction is useful in flatulence.	Root, stem
Bombax ceiba L. YK49	Semal, Simbhal	Bombacaceae	Root is useful in the treatment of dysentery and gonorrhea. Miscarriage could be prevented when flowers are used as gulkand.	Root, flower
Corchorus capsularis L. YK130	Kharenti	Tiliaceae	Leaves infusion is used in fever, cystitis and gonorrhea. Fruit decoction is given in stomach trouble.	Leaf, fruit
Triumfetta rhomboidea Jacq. YK40	Jhinjhira	Tiliaceae	Roots and leaves are used for treatment of ulcer and diarrhea, respectively. Flowers and leaves are used to treat leprosy. Fruit infusion is used to facilitate easy parturition.	Leaf, fruit
Tribulus terrestris L. YK41	Gokhru	Zygophyllaceae	Raw leaves could be used to treat stone problems. Decoction of fruit is effective in treating impotency. A mixture made up of root and fruit is used for the treatment of urinary problems and leucorrhoea.	Leaf, root, fruit
Oxalis corniculata L. YK07	Khatti- Booti	Oxalidaceae	The leaves contain good amount of vitamin C, hence could be used in Scurvy. Leaf juice is used as an antidote against Datura poisoning. Leaf extract is also useful in piles and anemia.	Leaf
Aegle marmelos (L.) Correa. YK55	Bel Pattar	Rutaceae	Leaf extract is useful in fever, jaundice, diabetes and asthma. Scorpion bite is treated with root paste. Ripe fruit juice could be used to treat gastrointestinal problems.	Leaf, root, fruit
Murraya koenigii (L.) Spreng. YK99	Kari-Patta, Mithi Neem	Rutaceae	Leaf infusion is effective for the treatment of fever, diarrhea and dysentery. Kidney-related troubles could be treated with root extract. Leaves, roots and bark are used for making tonics.	Leaf, root, bark
*Azadirachta indica*A. Juss. YK151	Neem	Meliaceae	Root decoction is given to treat jaundice and malaria. Boiled leaf extract is useful in treating skin ailments. Wound healing property is reported in bark paste.	Leaf, root, bark
Ziziphus jujuba Lamk. YK04	Ber	Rhamnaceae	Fruits are used to protect the liver and prevent ulcer formation. Fruits are useful in nausea, vomiting and stomach pain during pregnancy. The bark is used in ulcers and wounds. Leaves paste is helpful to prevent hair fall. Skin problems and coughs could be treated with the help of seeds.	Whole plant
Ziziphus nummularia (Burm. f.) Wt. &Arn. YK154	Jhad Beri	Rhamnaceae	Root decoction is recommended in fever. The stem bark is used for treating diarrhea. Root bark is used for the treatment of gout and rheumatism.	Root, stem, bark
Ziziphus oenoplia (L.) Mill. YK37	Bamolan	Rhamnaceae	Fruit juice is used as a tonic for the stomach. Roots are used in hyperacidity and ascariasis.	Root, fruit
Cardiospermum halicacabum L. YK136	Kapal- Phori	Sapindaceae	The herb is used in hair oils to prevent dandruff. The juice of the plant is useful in ear pain. Roots are laxative, and used for rheumatism and nervous disorders.	Whole plant
Moringa oleifera Lam. YK102	Sehjan	Moringaceae	Conjunctivitis could be treated when leaf extract mixed with honey is dropped into eyes. Bronchitis and asthma could be treated with root decoction.	Leaf, root
Butea monosperma (Lam.) Taub. YK38	Dhak, Palash,Tesu, Kesu	Fabaceae	Fresh leaf extract is effective in burning urination. Decoction of bark is useful in diarrhea and dysentery. Rheumatic pain could be treated with leaf paste when applied externally.	Leaf, bark
Clitoria ternatea L. YK134	Aprajita	Fabaceae	Nursing mothers use roasted seeds as a tonic. Root powder is used to prevent miscarriage. Snake bite could be treated with root paste.	Root, seed
Indigofera tinctoria L. YK155	Neel	Fabaceae	Leaf extract is a good medicine for treating epilepsy and nervous disorders. Urinary complaints and jaundice could be treated with roots. Root decoction is given in snake bite.	Leaf, root

Pongamia pinnata (L.) Pierre. YK207	Karanj	Fabaceae	Powder of bark is useful for treating diabetes. Bark decoction is utilized for curing 'Beri-beri'. Seed oil possesses antiseptic properties and is highly effective in treating skin diseases.	Bark, seed
Tephrosia purpurea (L.) Pers. YK10	Sharpunkhada	Fabaceae	Bleeding piles, dyspepsia and diarrhea could be treated with root decoction. Roots and seeds have insecticidal properties. Seed oil is useful in the treatment of skin disorders. Bronchitis could be cured with the decoction of pods.	Root, fruit, seed
Bauhinia variegata L. YK169	Kachnar	Fabaceae	Flowers are utilized for the treatment of diarrhea, dysentery, and piles. Roots decoction is applied to prevent obesity.	Root, flower
Cassia fistula L. YK208	Amaltas	Fabaceae	The paste made from rind of pod is applied to the vagina for easy delivery. Leaf paste is applied to cure ringworm, eczema, rheumatism and swelling. Leaves and pods are used as bug repellent.	Leaf, fruit
Senna occidentalis L. YK173	Chakwad, Kasaundhi	Fabaceae	Decoction made up of stem, leaf and seed is used as a purgative. Eczema and other skin disorders could be treated with leaf paste.	Whole plant
Delonix regia (Hook.) Raf. YK08	Gul-Mohar	Fabaceae	The seeds are useful as blood purifiers. Bark decoction is used in diarrhea and fever.	Seed, bark
Albizzia lebbeck L. YK09	Siris	Fabaceae	A Paste of flowers is applied on boils and swelling. Stem bark paste is applied against poisonous insect bites.	Stem, flower
Mimosa pudica L. YK24	Lajwanti, Chhui-Mui	Fabaceae	Powder of the whole plant is useful in treating asthma. Fistula and piles could be treated with plant paste. Root decoction is effective in the treatment of urinary disorders. Glandular swelling could be cured with leaf juice.	Whole plant
Pithecellobium dulce Roxb. YK160	Jangal Jalebi	Fabaceae	Leaf paste is applied for promoting hair growth. Pulp of pods mixed with sugar is eaten for treatment of jaundice.	Leaf, fruit
Terminalia arjuna (Roxb. *ex* DC.) Wt. &Arn. YK161	Arjun	Combretaceae	The bark is widely used as a good heart tonic. Leaf decoction is used to treat diabetes. Fruit is also useful in lowering of high blood pressure. Dental disorders could be cured when twigs are used as tooth brush.	Whole plant
Syzygium cumini L. YK172	Jamun	Myrtaceae	Seeds are regarded as wonderful medicine for the treatment of diabetes. Bark and crushed seed decoction is useful in diabetes.	Bark, seed
Lawsonia inermis L. YK164	Mehandi	Lythraceae	Burns could be cured with the paste of leaves. Leaf paste is also applied to check the burning sensation. Gargle with leaf decoction is good medicine for curing gum diseases.	Leaf
Punica granatum L. YK171	Anaar	Puicaceae	Seeds are given as medicine in morning sickness, diarrhea and vomiting. The fruit rind is chewed in stomatitis and diarrhea. Miscarriage could be prevented with the decoction of bark.	Bark, fruit, seed
Citrullus colocynthis (L.) Schrad. YK25	Tumba	Cucurbitaceae	Fruits are purgative. Snake bite could be treated with seed oil. The root is useful in cough, jaundice and rheumatism.	Root, fruit, seed
Coccinia grandis(L.) Voigt. YK170	Kanduri	Cucurbitaceae	Root paste is applied in snake bite. Flowers are used to treat itching and jaundice. Stem and leaf decoction help in the treatment of bronchitis.	Whole plant
Cucumis melo L. YK165	Kachra	Cucurbitaceae	Fruit pulp is used in treating chronic eczema. Kidney stones could be removed with seed powder.	Fruit, seed
Cucumis sativus L. YK61	Kheera	Cucurbitaceae	Fruits are eaten in burning micturition and calculi. Seeds act as diuretic, tonic and refrigerant.	Fruit, seed
Momordica dioica Roxb. ex Willd. YK178	Jungli Karela	Cucurbitaceae	Roasted roots are useful in treating piles and urinary disorders. Root paste is effective for scorpion stings. Leaf extract is useful in earache.	Leaf, root
Momordica balsamina L. YK184	Desi Karela	Cucurbitaceae	Leaf juice is effective in snake bites. Burns could be treated with fruit pulp. Fruit juice is used for proper digestion and to reduce excessive fat.	Fruit, leaf

Trichosanthes dioica Roxb. YK265	Parwal	Cucurbitaceae	Roots are useful for treating bronchitis. Leaf extract is effective in the enlargement of the liver and spleen.	Root, leaf
Opuntia dilleni (Ker Gawl.) Haw. YK62	Nagphani	Cactaceae	Pulp is used in ophthalmia. Fruits act as expectorant and spasmodic. Fruits are baked and given in whooping cough.	Leaf, fruit
Anethum graveolens L. YK108	Sowa	Apiaceae	Boils and wounds could be treated with leaf paste. Seeds are given to women to increase breast milk.	Leaf, seed
Centella asiatica L. YK110	Brahmi	Apiaceae	Powdered leaves are useful to improve memory. Leprosy could be treated with leaf decoction. Leaves are effective in overcoming stress, fatigue, and mental confusion.	Leaf
Trachyspermum ammi (L.) Sprague. YK109	Ajwain	Apiaceae	Roots are used as carminative and diuretic. Fruits are useful in flatulence, indigestion, colic and bronchitis.	Root, fruit

Fig.2: A. *Tinospora cordifolia* (Willd.) Miers.; B. *Urena lobata*L.; C. *Aegle marmelos* (L.) Correa.; D. *Murraya koenigii* (L.) Spreng.; E.*Azadirachta indica*A. Juss.; F. *Delonix regia* (Hook.) Raf.; G. *Lawsonia inermis* L.; H. *Punica granatum* L.; I. *Coccinia grandis*(L.) Voigt.; J. *Cleome viscosa*L.;K. *Albizzia lebbeck* L.; L. *Terminalia arjuna* (Roxb. *ex* DC.) Wt. & Arn.

The periodic field visits from August 2021 to June 2022 interviewed a total of 23 people of varying ages ranging from 35 to above 70 years for documenting the ethnomedicinal plants in the rural parts of the district. A total of 61 medicinal plants were suggested by people that belonged to 26 families of Polypetalae. The plants collected from different sites were identified using renowned floras and monographs (Duthie 1903-1929; Hooker 1872-1897; Kanjilal 1928; Kanjilal 1933). Collected plant specimens were mounted on standard-sized herbarium sheets after drying and pressing, and voucher specimens were prepared following standard procedure (Jain and Rao, 1977). The voucher specimens were deposited in the Botany Department, Banaras Hindu University, Varanasi. The currently accepted nomenclature of each species was confirmed using different databases such as The Plant list (http://www.theplantlist.org.), Tropicos (https://tropicos.org), Plants of the World Online (http://www.plantsoftheworldonline.org) and the World Flora Online (http://www.worldfloraonline.org). During plant species enumeration, Bentham and Hooker's system was followed in classification. The collected plant species belonging to Polypetalae were arranged according to family along with their scientific names, local names, parts used and ethnomedicinal importance (Table 1).

Results and Discussion

A survey was conducted in Saharanpur district to find out the uses of plants for treating health issues. This study documented phytodiversity and ethnomedicinal significance of angiospermic plants belonging to polypetalae, traditionally used by the local population of Saharanpur district in treating several dreadful diseases viz., tuberculosis, fever, gonorrhea, asthma, pneumonia, anemia, urinary tract infection, cough, respiratory problem, pimples, snake bite, diabetes, malaria, skin disease, wound, hair loss, and hypertension. From the present study site, 61 medicinally important plants were collected which belonged to 51 genera and 26 families of polypetalae.

Among the documented families, Fabaceae was the most dominating family, with twelve species. Malvaceae with nine species represented as the second largest family, followed by Cucurbitaceae with seven species, Apiaceae, Capparidaceae and Rhamnaceae with three species each. Brassicaceae, Caryophyllaceae, Rutaceae and Tiliaceae were represented by two species each. Families having single species in this region were Bombacaceae, Cactaceae, Combretaceae, Fumariaceae, Lythraceae, Meliaceae, Menispermaceae, Moringaceae, Myrtaceae, Oxalidaceae, Papaveraceae, Punicaceae, Ranunculaceae, Sapindaceae, Tamaricaceae and Zygophyllaceae. The genera that have contributed the large number of species included *Sida* (5 species), *Zizyphus* (3 species), while *Cleome, Cucumis, Lepidium and Momordica* were represented by two species each. The remaining 45 genera were monospecific. Some of the prominent medicinal plants from the study area are shown in Figure 2 (A-L).

It is evident from the study that six species were used for skin disorders. The most used plants for this purpose are *Ranunculus sceleratus, Sida rhombifolia, Oxalis corniculata, Azadirachta indica, Pongamia pinnata* and *Lawsonia inermis.* A total of seven plants were employed for the treatment of gastrointestinal disorders. These include *Capparis decidua, Malvastrum coromandelianum, Bombax ceiba, Triumfetta rhomboidea, Aegle marmelos, Murraya koenigii* and *Ziziphus jujuba.* Similarly, 6 plants viz. *Ranunculus sceleratus, Abutilon indicum, Tribulus terrestris, Murraya koenigii, Cucumis melo* and *Cucumis sativus* have been proven effective for urinary or stone-related problems. Major plants used for respiratory disorders were *Ranunculus sceleratus, Spergula arvensis, Sida rhombifolia, Moringa oleifera, Tephrosia purpurea, Mimosa pudica* and *Coccinia grandis.*

Investigation showed that local people utilized different plants and their parts for efficient healing purposes. Among the plant parts, leaves were reported as the most frequently used plant part, followed by seeds, roots, fruits, flowers and stems. In preparation of herbal medicine, decoction was the most common form, followed by paste, extract of a single plant and infusion with other plant's extract. Traditional knowledge is an asset to civilization which has been transferred to the progeny based on their trials of many generations. The district is rich in plant diversity due to forming ecotone of hills and plains. In the past, the Company Garden was selected for the plant diversity during the English period.

Conclusion

Maximum plant species used for medicinal importance are wild and few of them are cultivated. These plants may serve as a source of some important medicine against some major diseases without showing any adverse effects. However, their scientific validation with the proper mode of action is necessary to develop them as a medicine for commercial use. The present research identified 61 plant species commonly used as sources of traditional remedies. The species identified are divided into 51 genera and 26 families of angiosperms belonging to polypetalae. The Fabaceae, Malvaceae and Cucurbitaceae were the most represented families. Due to ease of procurement and handling, people mainly used leaves for preparing therapeutic recipes from one plant (monospecific) and sometimes from many plants (multispecific).

In the present investigation, the most common form of preparation of herbal medicine was decoction, followed by paste, extract and infusion. It is evident from the result that traditional ethnobotanical knowledge is still alive with older people in rural parts of the area and utilized for treating their health ailments. So, this valuable knowledge must be documented to strengthen the development of new and safer medicines before they vanish. Some important plant species in this region are facing the danger of extinction due to over-exploitation, grazing, improper harvesting and habitat degradation. Therefore, suitable conservation strategies are required to save valuable medicinal flora of the district.

Acknowledgment

The author is grateful to the local people of Saharanpur district for their cooperation and sharing of their invaluable traditional ethnobotanical knowledge.

Conflict of interest

None

References

Basati, G., Abbaszadeh, S., Hasanvand, A., & Baharvand, P. (2022). Ethnobotanical Survey of Medicinal Plants used to Treat Cardiovascular Disorders in Ghasemloo Valley of Urmia City. *Cardiovascular & Hematological Agents in Medicinal Chemistry,* 20**,** 237-250.

Chandra, K., Nautiyal, B., & Nautiyal, M.C. (2013). Ethnobotanical Resources as Supplementary Foods and Less Known Wild Edible Fruits in District Rudraprayag, Uttarakhand, India. *Journal of Human Ecology,* 42, 259-271.

Chopra, R.N., Nyar, S.L., & Chopra, I.C. (1956). Glossary of Indian Medicinal Plants. Council of Scientific and Industrial Research, New Delhi.

Dhiman, A., Praveen, R., Khurana S., Kumar, S., & Bhargava, A.K. (2006). Antipyretic traditional herbal medicinal plants of District Saharanpur, U.P., India. *Plant Archieve, 6*(2), 707-710.

Duthie, J. F. (1903-1929). Flora of the Upper Gangetic Plains and of the Adjacent Siwalik and Sub- Himalayan Tracts. Government Press, Calcutta.

Feng, J., Huang, D., Yang, Y., Chen, J., Qiu, S., Lv, Z., Ma, X., Li, Y., Li, R., Xiao, Y., & Chen, W. (2021). Isatis indigotica: from (ethno) botany, biochemistry to synthetic biology. *Molecular Horticulture,* 1**:** 17.

Hooker, J.D. (1872-1897). The Flora of British India. Reprinted by Bishen Singh Mahendra Pal Singh, Dehradun.

Jain, S.K. (1991). Dictionary of Indian folk medicine and Ethnobotany. Deep Publications, New Delhi.

Jain, S.K., & Rao, R.R. (1977). A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi, India.

Jain, S.K., & Sastry, A.R.K. (1984). Red Data Book of Indian Plants (Vol.1). Bot. Surv. India, Howrah.

Kanjilal, P.C. (1933). A Forest Flora for Pilibhit, Oudh, Gorakhpur and Bundelkhand. Superintendent Printing and Stationary, Allahabad.

Kanjilal, U.N. (1928). Forest Flora of the Chakrata, Dehradun and Saharanpur forest divisions, Uttar Pradesh, (3rd ed.), Manager of publications, Governmentof India Press, Delhi.

Khanna, K.K., Srivastava, P.K., & Mudgal, V. (1996). New medicinal uses of plants from Jalaun district, Uttar Pradesh. *Journal of Economic and Taxonomic Botany.Additional Series,* 12, 108-111.

Khare, C.P. (2007). Indian Medicinal Plants: An Illustrated Dictionary. Springer Verlag Berlin/ Heidelberg.

Kirtikar, K.R., & Basu, B.D. (1935). Indian Medicinal Plants. vols.1-4 (2nd ed.) Bishen Singh Mahendra Pal Singh, Dehradun and Periodical Experts, Delhi.

Kumar, D. (1998). Floristic Studies of District Muzaffarnagar. Ph.D. Thesis, C.C.S. University Meerut, U.P, India.

Kumar, M., Rawat, S., Nagar, B., Kumar, A., Pala, N.A., Bhat, J.A., Bussmann, R.W., Cabral-Pinto, M., & Kunwar, R. (2021). Implementation of the Use of Ethnomedicinal Plants for Curing Diseases in the Indian Himalayas and Its Role in Sustainability of Livelihoods and Socioeconomic Development. *International Journal of Environenvironmental Research and Public Health,* 18, 1509. doi:10.3390/ijerph18041509

Maliya, S.D. (2004). Some new or less known folk medicines of district Bahraich, Uttar Pradesh, India-II Ethno-botany *16*(1 & 2), 113-115.

Manna, S.S., & Mishra, SP. (2018). Ethnomedicinal survey of plants used by tribal in Lalgarh forest range, W.B., India. *The Journal of Phytopharmacology, 7*(2), 199-202.

Nagiyan, P., Dhiman, A., & Bhargava, A.K. (2003). Medicinal value of gum and raisins secreting plants of district Saharanpur. *Annals of Forestry, 11*(2), 245-248.

Ojha, S.N., Tiwari, D., Anand, A., & Sundriyal, R.C. (2020). Ethnomedicinal knowledge of a marginal hill community of Central Himalaya: diversity, usage pattern, and conservation concerns. *Journal of Ethnobiology and Ethnomedicine,* 16, 29. https://doi.org/10.1186/s13002-020-00381-5.

Prachi, Chauhan, N., Kumar, D., & Kasana, M.S. (2009). Medicinal plants of Muzaffarnagar district used in treatment of urinary tract and kidney stones. *Indian Journal of Traditional Knowledge, 8*(2), 191-195.

Prakash, S., Kumar, M., Kumari, N., Thakur, M., Rathour, S., Pundir, A., & Mekhemar, M. (2021). Plant-Based Antioxidant Extracts and Compounds in the Management of Oral Cancer. *Antioxidants, 10*(9), 1358.

Rai, L.K., Prasad, P., & Sharma, E. (2000). Conservation threats to some important medicinal plants of Sikkim Himalaya. *Biology and Conservation,* 93, 27-33.

Sharma, S.C. (1991). Traditional herbal medicines from Shahjahanpur district, Uttar Pradesh -1. *Vegetos,* 4, 76-80.

Singh, P.K., & Singh, R.H. (2007). Medicinal plants used by gond tribe of Dhudhi- district Sonebhadra, Uttar Pradesh. *Flora and Fauna, 13*(1), 50-54.

Siva, R. (2007). Status of natural dyes and dye-yielding plants in India. *Current Science, 92*(7), 916- 925.

Tomar, A. (2009). Folk medicinal uses of plant roots from Meerut district, Uttar Pradesh. *Indian Journal of Traditional knowledge, 8*(2), 298-301.

World Health Organization (2002). WHO Traditional Medicine Strategy. WHO, Geneva.

Yadav, S.S., Bhukal, R.K., Bhandoria, M.S., Gnie, S.A., Gulia, S.K., & Raghav, T.B.S. (2014). Ethnoveterinary medicinal plants of Tosham block of district Bhiwani (Haryana) India. *Journal of Applied Pharmaceutical Science, 4*(6), 40.