



Exploring medicinal plants and their nutraceutical attributes from northern areas of Pakistan

Ikram Ullah^a, Shahid Ullah Khan^{b*}, Ayaz Khan^c, Rehana Bibi^c, Abdullah^c, Rahat Ullah^c, Zahid Irfan Marwat^d, Hameed Gul^b, Attaullah mian^e, Hafsa Begum^e, Fei Chen^f, Mushtaq Ahmad, Muhammad Sirab Khan^h, Izhar Ullah^e

- a. College of Resources and Environmental Sciences, Southwest University, Beibei, Chongqing, 400715, China
- b. College of Agronomy and Biotechnology, Southwest University, Beibei, Chongqing, 400715, China
- c. Department of Botany, Govt Ghazi Umara Khan Degree College, Samarbagh, Dir Lower
- d. Department of Biochemistry, Nowshera Medical College, Nowshera
- e. Department of Botany, University of Malakand, Chakdara, Dir (Lower)-18800, Khyber Pakhtunkhwa, Pakistan
- f. Tropical Agriculture and Forestry, Hainan University, Sanya 572025 China
- g. School of Pharmaceutical Sciences, Zhengzhou University, 100 Kexue Avenue, Zhengzhou, Henan, 450001, PR China
- h. Department of Botany, University of Science and Technology Bannu, Khyber Pakhtunkhwa, Pakistan

Abstract: This study focused on collecting 50 different species of medicinal plants from the northern areas of Pakistan. The present research furthers our understanding of the flora in Tehsil Munda District Dir Lower, Khyber Pakhtunkhwa (KPK) province of Pakistan through the comprehensive collection and subsequent analysis. During field expeditions, herbarium specimen collection, and consultation with local healers, the project unveils the rich diversity of medicinal plants in the research region. By highlighting the plant's botanical attributes, geographical distribution, and reporting the medicinal uses of concerned species, such as kidney disease, liver disease, chest disease, respiratory disease, diabetes, heart diseases, headache, skin diseases, and arthritis, swellings, stomach diseases. It has been concluded from the study that the area is densely covered with highly valued medicinally important flora due to climatic conditions, water, and good soil fertility, respectively.

Keywords: Medicinal plants, herbarium, specimen, distribution

1. Introduction

Ethnobotany is the study of the relationship between humans and plants, with special attention to traditional tribal cultures. According to a survey by the World Health Organization, due to poverty and limited access to modern medicine, between 65 and 80 percent of the world's population in underdeveloped countries receives their primary health care from plants ([Awoyemi et al., 2012](#)).

Around 6,000 higher plant species, roughly 6,000 species of vascular plants, approximately 6,000 types of higher plants, an estimated 6,000 plant species found in Pakistan, 12% are used to treat diseases, specifically those affecting humans and animals, for which herbal medicines are widely used. As a result, some plant species are thought to be specific to a particular disease, but plants can sometimes be used for a variety of purposes, with women using them most frequently, followed by children, as the main collectors of medicines ([Ali et al., 2014](#); [Shinwari, 2010](#)).

Plants that contain active biochemical constituents and have some response in the curing of disorders in living organisms are known as medicinal plants. In Pakistan, 80% of the people belong to rural areas and still depend upon herbal medicines. Herbal medicines occupy a distinct position from the primitive period to the present

[Received] 10 Oct 2023; Accepted 11 Dec 2023; Published (online) 20 Dec 2023]

Finesse Publishing stays neutral about jurisdictional claims published maps.



Attribution 4.0 International (CC BY 4.0)

Corresponding email: shahidbiochem@wmc.edu.pk (Shahid Ullah Khan)

DOI: [10.61363/p5vp2r98](https://doi.org/10.61363/p5vp2r98)

day. The ethno-medicinal history of Plants is as old as man himself, and these medicines can be obtained easily from nature and have fewer side effects ([Quazi et al., 2013](#)).

A few studies have been carried out in many areas of Pakistan, such as the Malakand Division, concern to Ethno medicinal. Still, it is not specifically from Tehsil Munda District Dir Lower. Our research supplements the data on ethnobotanically significant species in the Swat district. Likewise, [Shinwari \(2010\)](#) detailed the importance of medicinal plant species in Shinaki Bar and Valleys, Northern Territory of Pakistan.

There is a variety of flora in Dir lower (Tehsil Munda), which is medicinally very important, such as bryophytes, pteridophytes, gymnosperms, and angiosperms. The bryophytes (Marchantia, Pelliaepiphylla, Riccia, Funaria, and Poltricumcommne) are rich in number and present in shady places. The Pteridophytes (Adiantum, Asplenium dulce, and Selaginella, etc.) are found. The gymnosperms (Pinus Deodar etc.) are found in the mountain area.

The present work was conducted in District Dir Lower, Tehsil Munda. This Tehsil is renowned for gathering medicinal plants to address diverse ailments such as cough and fever. The literature review indicates that there is no prior documentation or reporting of the traditional applications of indigenous plants in this region. The current study is expressly crafted to spotlight the medicinal properties of plants found in Tehsil Munda Dir Lower, preserve this knowledge, and raise awareness regarding the preservation and recording of traditional uses of the local flora in Tehsil Munda District Dir Lower, Khyber Pakhtunkhwa (KPK) province of Pakistan.

2. Materials and Methods

2.1. Plant collection

Multiple plant collection expeditions were organized during the spring of 2023 to gather medicinal plants from various sites in Tehsil Munda. Field trips were scheduled based on the flowering or fruiting seasons of the plants. Whole plant specimens of herbs and shrubs were collected, while fruiting or flowering shoots of shrubs and trees were collected systematically, including details such as local name, habitat, locality, date of collection, flower color, etc.

The collected plants underwent a standardized process, and they were pressed, dried, and mounted on standard herbarium sheets at Ghazi Umara Khan Degree College, Samarbagh, Dir Lower. The collection procedure involved the use of tools and equipment such as News halves, Press straps (webbing straps), Field notebook, digger and clippers, Hand lens, collection bottles, mercuric chloride, collection bags, waxed paper Envelopes, cardboard, insecticides, and repellents, maps, camera, color charts, hand pruner, rope, pencil, cutter, GPS, field presser, driers (blotters), tags, and Ethanol.

The gathered specimens underwent identification processes utilizing both the Flora of Pakistan and the expertise of local taxonomists. Interviews were conducted with individuals of various age groups, with a particular emphasis on engaging the elderly community, and a structured questionnaire was employed for this purpose. The plant specimens collected were subjected to a series of steps, including pressing, drying, poisoning, mounting, and subsequent identification. This integrated approach ensures a comprehensive understanding of the collected plants, involving both botanical analysis and insights from local communities, especially the elderly, who often possess valuable traditional knowledge about plant uses.

2.2. Data analysis and questionnaire

The data acquired from questionnaires and semi-structured interviews were organized and tabulated using MS Excel from MS Office 2016. The plants were systematically categorized into their respective families, and information regarding their uses is documented in columns alongside them. This methodical organization in a spreadsheet format allows for a clear and structured presentation of the data, facilitating further analysis and interpretation of the relationships between plant families and their various uses.



3. Results and discussion

Table 1. List of collected medicinal plants: Botanical name, local name, and family name.

Species Name	Family	Local Name	Parts Use	Medicinal value	Reference
Calotropis procera	Apocynaceae	Spammy	Leaves, Flowers	tonic, anthelmintic, and expectorant	(Quazi et al., 2013)
Ricinus communis L.	Euphorbiaceae	Aranda	Leaves, seeds, and roots.	abdominal disorder, arthritis, muscle aches, chronic headache, expulsion of the placenta, menstrual cramps,	(Rana et al., 2012)
Datura innoxia mill L.	Solanaceae	Baturra	Flower and seeds	teeth infection, epilepsy, headache, Skin diseases, Heart diseases, arthritis, swellings, stomach.	(Fatima et al., 2015)
Zizypus sativa L.	Rhamnaceae	Makhani	Fruits and leaves	Enhancing muscular strength and maintaining a healthy weight are regarded as measures to prevent liver diseases and mitigate the risk of stress ulcers, fatigue, inflame national asthma	(Shah et al., 1989)
Brassica Campestris L.	Brassicaceae	Sharsham	seed, leaves	Diuretic, night blindness, headache, hair growth, and for muscular pain in the body	(Nawaz et al., 2018)
F. indica Hauskn	Fumariaceae	Shatara	Whole plant	skin disorder, body coolant, blood purification, Vomiting, influenza, diarrhea, fever, and liver complaints.	(Nasir et al., 2017)

Juglans Regia L.	Juglandaceae	Ghooz	Bark, fruit, and leaves	teeth cleaning, leaves used for intestinal infections, Asthma, skin disorder, diabetes, stomach aches.	(Taha & Al-wadaan, 2011)
Artemisia Maritime L.	Asteraceae	Tarka	Whole plant	Alleviate pain and inflammation, address digestive issues, combat intestinal worms, treat skin infections, and gallbladder disease.	(Petrovska, 2012)
Brassica Rape	Brassicaceae	Tepar	Roots	headaches, chest complaints, edemas, gonorrhoea, syphilis, and rabies, inflammation of the gall bladder, gallstones.	(Saeidnia & Gohari, 2012)
Vicia sativa L.	Fabaceae	Marghyhpa	Whole plant	skin infections, asthma, bronchitis, urinary disease, Plasters on broken bones, toothache.	(Salehi et al., 2021)
Sisymbrium irio	Brassicaceae	Jenjarl	Seed	treatment of asthma and treats coughs and chest congestion, and Reduces swelling and cleans wounds.	(Hailu et al., 2019)
Papaver rhoeas	Papaveraceae	Soorgullay	Flowers	inflammation, respiratory problems, diarrhea, cough, sleep Disorder and pain.	(Grauso et al., 2021)
Citrus medica	Rutaceae	Turangy	Leaves, flowers, seeds, fruits,	used for asthma, arthritis, headache, stomachache, intestinal disturbance,	(Panara et al., 2012)



				Digestive disorder.	
Pisum sativum	Fabaceae	Matar	seeds	diabetes, heart diseases, and blood and peas have been used for Arthritis is also used for the stomach.	(Zilani et al., 2017)
Rumex dentatus	Polygonaceae	Shalkhay	whole	diabetes, diarrhea, skin, liver, and gallbladder Disorder, kidney stone, cough, stomach aches.	(Nisa et al., 2013)
Fragaria vesca	Rosaceae	Strawberry	Roots, leaves, fruit	increase blood level, diabetes, and kidney disease Issues, stomach, liver, gastrointestinal diseases.	(Liberal et al., 2014)
Spinacia oleracea	Amaranthaceae	Palak	Leaves	used to treat stomach and intestinal problems, fatigue, inflame the nation's lungs, Treatment of urinary infection.	(Gutierrez et al., 2019)
Verbascum thapsus	Scrophulariaceae	Khardag	flower, Leaves	Antiseptic, painkiller, for wound healing. Flowers and leaves are used for Pulmonary infection.	(Olmstead et al., 2001)
Calendula arvensis	Asteraceae	Ziargully	Flowers	wounds healing, inflammation, skin cancer, infections, varicose veins, treating fevers, and chronic infection	(Abudunia et al., 2017)

Rhaphanus sativa	Brassicaceae	Moli	leaves, seeds, roots	stomach disorders, urinary infections, anti-fever, treatment of asthma, and chest complaints, digestive, diuretic, and carminative	(Abdou et al., 1972)
Moringa oleifera	Moringaceae	Suhanjna	Whole plant	skin infection, swelling, anemia, asthma, diarrhea, heart Problems, digestive disorders, headaches, fever, joint pains, and wound healing.	(Anwar et al., 2007)
Psidium guajava	Rosaceae	Amrood	Leaf and fruit	Gastrointestinal health, discomfort, diabetes management, and wound recovery.	(Gutiérrez et al., 2008)
Artemisia scorpaenid	Asteraceae	Juky	Whole plant	liver diseases and inflammatory conditions, as well as for Infection, fever, pain, cancer, and diabetes.	(Herman & Swelankomo, 2011)
Colocasia esculents	Araceae	Kachalo	Leaves, stem, and tuber.	asthma, arthritis, diarrhea Neurological disorders, skin disorders, and antimicrobial agents.	(Prajapati et al., 2011)
Cydonia oblonga	Rosaceae	Boye	Leaves and fruits	digestive disorders, stomach, and intestinal pain, as well as diarrhea, Cough, urinary tract, cancer, diabetes.	(Al-Snafi, 2016)



Acacia modesta wall.	Mimosaceae	Palosa	Leaves, flower	wound healing, cough, venereal disease, bacterial infection, Stomach pain.	(Napar et al., 2012)
Lonicera japonica L.	Caprifoliaceae	Rambal chambel	Steam and flower	For arthritis, mumps, and hepatitis, flowers and buds are used as antibacterial, anti-inflammatory, and antispasmodic.	(Kawai et al., 1988)
Ocimum dentiform	Lamiaceae	Kashmalay	Leaves and roots	asthma, diarrhea, fever, arthritis, eye diseases, gastric ailments, etc.	(Aggarwal & Mali, 2015)
Berberis lyceum	Berberidaceae	Kwary	Root stem-bark.	Yellowing of the skin (jaundice), diabetes, eye infections, fractured bones, internal injuries, diarrhea, and stomachache.	(Ahmed et al., 2017)
Tagetes minuta	Asteraceae	Dambarguly	leaves, flowers, steam	respiratory inflammations, stomach problems, intestinal, Diseases, breathing problems, and ear.	(Wanzala et al., 2016)
Solanum melongena	Solanaceae	Bengon	fruits	diabetes, cholera, bronchitis, Dysentery, Otitis, toothache, skin infection, and asthma.	(Das & Barua, 2013)
Helianthus annuus	Asteraceae	Sunflower	leaf seeds and flowers	heart disease, bronchial, pulmonary infection, high fever, widely used for colds and coughs.	(Guo et al., 2017)

Malus pumila	Rosaceae	Mantra	Fruits, flowers	reduce the risk of some cancers, cardiovascular disease, and asthma, Diabetes reduces cholesterol.	(Patocka et al., 2020)
Zanthoxylum armatum.	Rutaceae	Dambara	Fruits, seeds, and steam bark.	cure of various diseases such as toothache, asthma, gum Bleeding, fever, dyspepsia, and tonics.	(Paul et al., 2018)
Silybum marianum	Asteraceae	Ghana	Seeds fruits.	liver, gallbladder disorder, neuroprotective, Skin protective.	(Porwal et al., 2019)
Prunus amygdalus	Rosaceae	Badam	seeds	headache, heart weakness, diarrhea, peptic ulcer, Bladder, breast, mouth, spleen, and internal kidney stones.	(Singh et al., 2022)
Rosa indica	Rosaceae	Gulab	Flowers, leaves, root bark	diarrhea, asthma, heart disease, and high Blood pressure, nervous stress, and tension.	(Rasheed et al., 2015)
Nigella sativa	Ranunculaceae	Kalonji	seed	antibacterial, liver tonic, digestive, and diarrheal, analgesic, and Antihypertensive.	(Gilani et al., 2004)
Daphne mucronate	Thymelaeaceae	Marraghony	roots and leaves	Treat toothache, ulcer, rheumatism, and as a purgative and abortive agent.	(Lutfullah et al., 2019)



Foeniculum vulgare	Apiaceae	Kaga	edible shoot, seed, and leaves	Acid reflux (heartburn), abdominal gas, bloating, diminished appetite, and colic in infants.	(Rather et al., 2016)
Ajuga bracteosa Wall	Lamiaceae	Goti	mostly root	Anti-inflammatory, antioxidant, rheumatism, and gout. Blood Purification of diabetes.	(Upadhyay et al., 2012)
Robinia pseudoacia	Fabaceae	Kikar	Flowers, bark, leaves	Antacid, antibacterial, purgative, and demagogic properties.	(Khan & Jan, 2019)
Dysphania botrys	Amaranthaceae	Kharawa	leave and branches	Diuretic, antispasmodic, carminative, and diarrheal properties. Also used for Cancer.	(Chen & Yang, 2018)
Ficus carica	Moraceae	Enzar	fruit, root, and leaves	Gastrointestinal issues (colic, indigestion, appetite loss, and diarrhea), respiratory concerns (sore throats, cough, and bronchial problems), inflammatory conditions, and cardiovascular disorders.	(Badgujar et al., 2014)
Olea ferruginea	Oleaceae	Khona	leaves and seeds	Gingival health, gonorrhea, pertussis (whooping cough), dermatological issues, musculoskeletal problems, and toothache.	(Mehmood & Murtaza, 2018)
Morus alba	Moraceae	Spen toot	Roots, Fruits,	Vertigo, sleeplessness, premature aging, atherosclerosis, issues with	(Devi et al., 2013)

			and Leaves	the liver and kidneys, and inflammatory conditions.	
Rumex status	Polygonaceae	Turkey	leave	Antioxidant, anti- nociceptive, anti-diarrheal, and cytotoxic potential.	(Ahmad et al., 2019)
Carthamus lanatus	Asteraceae	Kareza Ghana	leave	Rheumatism and paralysis, vitiligo and pigmentation issues, psoriasis, oral ulcers, excess phlegm, poisoning, numb extremities, and melancholic tendencies.	(Asgarpanah & Kazemivash, 2013)
Allium satsuma	Amaryllidaceae	Oga	whole plant	improve bone health and cholesterol leaves, also used to treat cough And blood pressure.	(Londhe et al., 2011)
Canna indica L.	Connaceae	Taspaboty	Leave and flower	Use as an antipyretic for tonsillitis and eye disease.	(Al-Snafi, 2015)

In this work, we collected 50 plants of angiosperm which is used for various medicinal purposes. These 50 angiosperm plants belong to 29 families. Out of these, 46 are the dicot family, and the remaining 04 belong to the monocot family, based on habit: 29 herbs, 11 shrubs, and 10 trees. The dominant family was Asteraceae which contains 7 species (*Calendula arvensis*, *Artemisia maritime L.*, *Artemisiascorparaia*, *Tagetes minuta*, *Helianthus annuus*, *Silybum marianum*, *Carthamus lanatus*), followed by the family Rosaceae which contains 6 species, Brasacaceae 4 species, Fabaceae, 3 species, Solanaceae, Rutaceae, polygonaceae, Amaranthaceous, and limeaceae have 2 species, and Euperbeaceae, Rhamnaceae, Fumaraceae, Juglandaceae, Papaveraceae, scrothulariaceae, morangiaceae, Araceae, Mimosaceae, Caprifoliaceae, berberidaceae, Ruanunculaceae, Melaceae, Apiaceae, Fabaceae, Moraceae, Amaryllidaceae, Cannaceae have 1 family and these medicinal plants we collected from the different village i.e. Hasham, Rasool Banda and Takooro. The utilization of these plant species for treating various health disorders is deeply rooted in ancient traditions, with knowledge being passed down orally and through practical experience from one generation to the next.

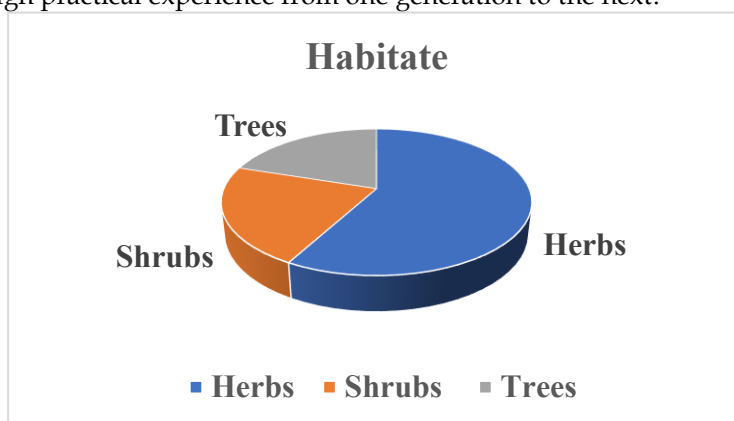


Fig 1. Habitat-wise distribution



A similar study was also carried out in the Swat Valley by [Hamayun \(2007\)](#), the exploration of medicinal plants present in the regional market aimed to uncover their traditional uses in the region. The study revealed that 51 species of medicinal plants, representing 32 different families, are prominently featured in the primary regional market of Madyan and Mingora. Some of these plants are even traded in national and international markets. The inhabitants of Swat rely on indigenous medicinal plants for treating various ailments, and they also engage in selling these plants in the local market as a means of earning a livelihood. Ethnomedicinal plants have found extensive applications in traditional medicine systems for addressing a variety of ailments. Approximately 80% of the populations in developing countries depend on medicinal plants for treating diseases, thereby playing a crucial role in sustaining and enhancing the well-being of their communities across generations ([Tuasha et al., 2018](#)).

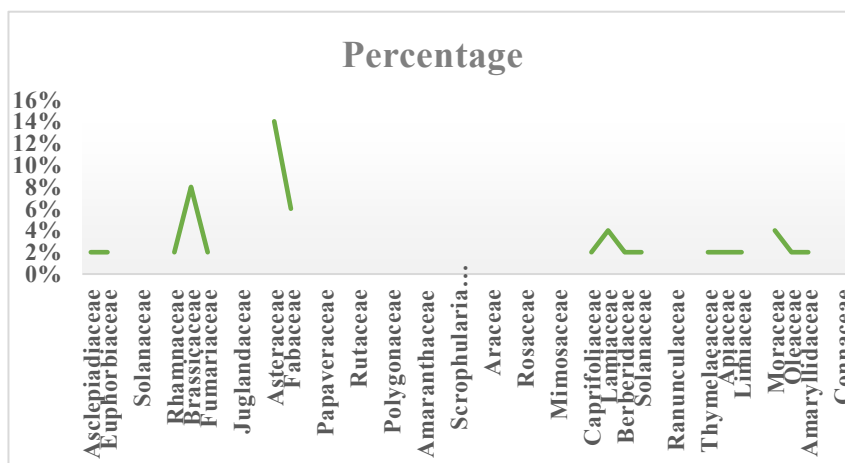


Fig 2. Representation based on the cotyledon

The information regarding the uses of these medicinal plants was gathered from local men, women, and herbalists in the area. Among these 50 plant species, *Nigella sativa* is used for the treatment of antibacterial, liver tonic, digestive, diarrheal, analgesic, and anti-hypertensive. *Daphne mucronate* is used for the treatment of toothache, ulcers, and rheumatism, and as a purgative. *Zizyphus jujube* is used in the treatment of respiratory diseases such as cough, asthma, and laryngitis, and gastrointestinal problems such as constipation, colitis, and liver disease. *Cana indica* is used for anti-piratic, tonsillitis, and eye disease. *Verbbasicum thapsus* is helpful in pulmonary disease, cold, and cough, as a stimulant and vermifuge. *Solanum nigrum* is employed for the treatment of skin inflammation and liver problems. *Ajuga bracteosa* is recorded to relieve abdominal pain, diarrhea, fever, and dysentery. *Citrus lemon* is used in the treatment of the common cold, flu, etc. [Ali et al. \(2018\)](#) reported that habitat fragmentation and the unwise use of these plants pose significant threats to their survival. When these plants lose their habitats, their utility in traditional recipes diminishes, and they may eventually be excluded from the ethnobotanical practices of the area. This situation could exert additional pressure on already inefficient government health facilities.

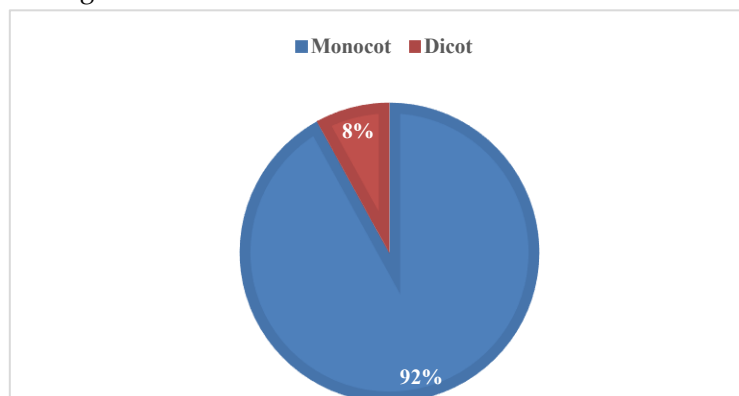


Fig 3. Representation of families

[Ahmad et al. \(2014\)](#) reported a total of 50 plant species from Chail Valley, representing 48 genera across 35 families. The majority were herbs (58%), followed by shrubs (28%), trees (12%), and climbers (2%). Leaves were the most frequently used plant part (33%), followed by roots (17%), fruits (14%), whole plants (12%), rhizomes (9%), stems (6%), barks (5%), and seeds (4%).

On the other hand, [Razzaq et al. \(2015\)](#) identified 25 medicinal plant species from 21 families in the same area. Among these, 19 were herbs, 3 were shrubs, 2 were climbers, and one was a tree. Some of the notable species included *Aconitum violaceum*, *Aconitum heterophyllum*, *Berberis vulgaris*, *Viola canescens*, *Valeriana jatamansii*, *Podophyllum emodi*, *Paeonia emodi*, *Geranium wallichianum*, *Polygonatum verticillatum*, and *Ajuga bracteosa*.

4. Conclusion

The research area, Tehsil Munda District Dir Lower, Khyber Pakhtunkhwa, Pakistan, is abundant in medicinal plants with the potential to treat various diseases, offering alternatives to conventional medicines. Extracting different chemicals from these local plants could contribute to addressing health issues in Pakistan and bolster the economy. Preserving indigenous knowledge related to medicinal plant collection and their proper administration is crucial, and it is recommended that this be undertaken collaboratively by various stakeholders, including the government, research organizations, and NGOs. This collaborative effort would ensure the effective documentation and conservation of valuable traditional knowledge for future generations.

CRedit authorship contribution statement

Conceptualization: Ikram Ullah and Shahid Ullah Khan; Methodology: Ayaz Khan and Rehana Bibi; Investigation and Data Collection: Rahat Ullah, Zahid Irfan, and Marwat; Formal Analysis: Hameed Gul, Attaullah Mian, and Hafsa Begum; Writing – Original Draft: Fei Chen and Mushtaq Ahmed; Writing – Review & Editing: Muhammad Sirab Khan and Izhar Ullah.

Funding

This work was not financially supported by any funding agency.

Declaration of competing interest

The authors declare no conflict of interest.

Acknowledgments

The author(s) acknowledge that they did not receive any financial support from any funding agency, whether public, private, or non-profit. The study was conducted independently without external funding.

References

- Abdou, I. A., Abou-Zeid, A. A., El-Sherbeeney, M. R., & Abou-El-Gheat, Z. H. (1972). Antimicrobial activities of *sativum*, *Allium cepa*, *Raphanus sativus*, *Capsicum frutescens*, *Eruca sativa*, *Allium kurrat* on bacteria. *Qualitas Plantarum et Materiae Vegetabiles*, 22, 29-35.
- Abudunia, A. M., Marmouzi, I., Faouzi, M. E. A., Ramli, Y., Taoufik, J., El Madani, N., & Ibrahim, A. (2017). Anticandidal, antibacterial, cytotoxic, and antioxidant activities of *Calendula arvensis* flowers. *Journal de Mycologie Médicale*, 27(1), 90-97.
- Aggarwal, A., & Mali, R. R. (2015). *Ocimum tenuiflorum* medicinal plant with versatile uses. *International Journal of Recent Advances in Science and Technology*, 2(2), 1-10.
- Ahmad, M., Sultana, S., Fazl-i-Hadi, S., Ben Hadda, T., Rashid, S., Zafar, M., & Yaseen, G. (2014). An ethnobotanical study of medicinal plants in the high mountainous region of Chail valley (District Swat-Pakistan). *Journal of Ethnobiology and Ethnomedicine*, 10.
- Ahmad, S., Ullah, F., Ayaz, M., Ahmad, A., Sadiq, A., & Mohani, S. N. U. H. (2019). Nutritional and medicinal aspects of *Rumex hastatus* D. Don along with in vitro anti-diabetic activity. *International Journal of Food Properties*, 22(1), 1733-1748.
- Ahmed, S., Shuaib, M., Ali, K., Ali, S., & Hussain, F. (2017). Evaluation of different parts of *Berberis lyceum* and their biological activities: a review. *Pure and Applied Biology*, 6(3), 897-907.
- Al-Snafi, A. E. (2015). Bioactive components and pharmacological effects of *Canna indica*-An Overview. *International Journal of Pharmacology and Toxicology*, 5(2), 71-75.
- Al-Snafi, A. E. (2016). The medical importance of *Cydonia oblonga*-A review. *IOSR Journal of Pharmacy*, 6(6), 87-99.



- Ali, K., Khan, N., Rahman, I. U., Khan, W., Ali, M., Uddin, N., & Nisar, M. (2018). The ethnobotanical domain of the Swat Valley, Pakistan. *Journal of Ethnobiology and Ethnomedicine*, 14.
- Ali, S., Gladieux, P., Rahman, H., Saqib, M. S., Fiaz, M., Ahmad, H., & de Vallavieille-Pope, C. (2014). Inferring the contribution of sexual reproduction, migration, and off-season survival to the temporal maintenance of microbial populations: A case study on the wheat fungal pathogen *Puccinia striiformis* f. sp. *tritici*. *Molecular Ecology*, 23(3), 603-617.
- Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). *Moringa oleifera*: a food plant with multiple medicinal uses. *Phytotherapy Research*, 21(1), 17-25.
- Asgarpanah, J., & Kazemivash, N. (2013). Phytochemistry, pharmacology, and medicinal properties of *Carthamus tinctorius* L. *Chinese Journal of Integrative Medicine*, 19, 153-159.
- Awoyemi, O. K., Abdulkarim, I. A., Ewa, E. E., & Aduloju, A. R. (2012). Ethnobotanical assessment of herbal plants in South-Western Nigeria. *Academic Research International*, 2(3), 50.
- Badgujar, S. B., Patel, V. V., Bandivdekar, A. H., & Mahajan, R. T. (2014). Traditional uses, phytochemistry and pharmacology of *Ficus carica*: A review. *Pharmaceutical Biology*, 52(11), 1487-1503.
- Chen, Y., & Yang, Z. (2018). Characterization of the complete plastome of *Dysphania botrys*, a candidate plant for cancer treatment. *Mitochondrial DNA Part B*, 3(2), 1214-1215.
- Das, M., & Barua, N. (2013). Pharmacological activities of *Solanum melongena* Linn. (Brinjal plant). *International Journal of Green Pharmacy*, 7(4).
- Devi, B., Sharma, N., Kumar, D., & Jeet, K. (2013). *Morus alba* Linn: A phytopharmacological review. *International Journal of Pharmacy and Pharmaceutical Sciences*, 5(2), 14-18.
- Fatima, H., Khan, K., Zia, M., Ur-Rehman, T., Mirza, B., & Haq, I.-u. (2015). Extraction optimization of medicinally important metabolites from *Datura innoxia* Mill.: an in vitro biological and phytochemical investigation. *BMC complementary and alternative medicine*, 15(1), 376.
- Gilani, A. U. H., Jabeen, Q., & Khan, M. A. U. (2004). A review of medicinal uses and pharmacological activities of *Nigella sativa*. *Pakistan Journal of Biological Sciences*, 7(4), 441-451.
- Grauso, L., de Falco, B., Motti, R., & Lanzotti, V. (2021). Corn poppy, *Papaver rhoeas* L.: A critical review of its botany, phytochemistry, and pharmacology. *Phytochemistry Reviews*, 20, 227-248.
- Guo, S., Ge, Y., & Na Jom, K. (2017). A review of phytochemistry, metabolite changes, and medicinal uses of the common sunflower seed and sprouts (*Helianthus annuus* L.). *Chemistry Central Journal*, 11, 1-10.
- Gutierrez, R. M., Velazquez, E. G., & Carrera, S. P. P. (2019). *Spinacia oleracea* Linn considered as one of the most perfect foods: A pharmacological and phytochemical review. *Mini Reviews in Medicinal Chemistry*, 19(20), 1666-1680.
- Gutiérrez, R. M. P., Mitchell, S., & Solis, R. V. (2008). *Psidium guajava*: A review of its traditional uses, phytochemistry and pharmacology. *Journal of Ethnopharmacology*, 117(1), 1-27.
- Hailu, T., Gupta, R. K., & Rani, A. (2019). *Sisymbrium irio* L.: A herb used in the Unani system of medicine for broad spectrum therapeutical applications.
- Hamayun, M. (2007). Traditional uses of some medicinal plants of Swat Valley, Pakistan. *Indian Journal of Traditional Knowledge*, 6(4), 636-641.
- Herman, P. P. J., & Swelankomo, N. (2011). Asteraceae. *Bothalia*, 41(1), 176-178.
- Kawai, H., Kuroyanagi, M., Umehara, K., Ueno, A., & Satake, M. (1988). Studies on the saponins of *Lonicera japonica* Thunb. *Chemical and Pharmaceutical Bulletin*, 36(12), 4769-4775.
- Khan, M. N., & Jan, A. (2019). Evaluation of pharmacognostic features and antimicrobial activities of *Dysphania botrys* L. *Sarhad Journal of Agriculture*, 35(4), 1234-1242.
- Liberal, J., Francisco, V., Costa, G., Figueirinha, A., Amaral, M. T., Marques, C., & Batista, M. T. (2014). Bioactivity of *Fragaria vesca* leaves through inflammation, proteasome, and autophagy modulation. *Journal of Ethnopharmacology*, 158, 113-122.
- Londhe, V. P., Gavasane, A. T., Nipate, S. S., Bandawane, D. D., & Chaudhari, P. D. (2011). Role of garlic (*Allium sativum*) in various diseases: An overview. *Angiogenesis*, 12, 129-134.
- Lutfullah, G., Shah, A., Ahmad, K., & Haider, J. (2019). Phytochemical screening, antioxidant and antibacterial properties of *Daphne mucronata*. *Journal of Traditional Chinese Medicine*, 39(6), 764.
- Mehmood, A., & Murtaza, G. (2018). Phenolic contents, antimicrobial and antioxidant activity of *Olea ferruginea* Royle (Oleaceae). *BMC complementary and alternative medicine*, 18(1), 1-6.

- Napar, A. A., Bux, H., Zia, M. A., Ahmad, M. Z., Iqbal, A., Roomi, S., & Shah, S. H. (2012). Antimicrobial and antioxidant activities of Mimosaceae plants; *Acacia modesta*, *Prosopis cineraria*, and *Prosopis juliflora*. *Journal of Medicinal Plants Research*, 6(15), 2962-2970.
- Nasir, B., Ahmad, M., Zahra, S. S., Fatima, H., & Ur-Rehman, T. (2017). Pharmacological evaluation of *Fumaria indica* (Hausskn.) Pugsley. *Pakistan Journal of Botany*, 49, 119-132.
- Nawaz, H., Shad, M. A., & Muzaffar, S. (2018). Phytochemical composition and antioxidant potential of *Brassica*. *Brassica Germplasm – Characterization, Breeding and Utilization*, 1, 7-26.
- Nisa, H., Kamili, A. N., Bandh, S. A., Lone, B. A., & Parray, J. A. (2013). Phytochemical screening and antimicrobial efficacy of *Rumex dentatus* L. *Asian Pacific Journal of Tropical Disease*, 3(6), 434-440.
- Olmstead, R. G., de Pamphilis, C. W., Wolfe, A. D., Young, N. D., Elisons, W. J., & Reeves, P. A. (2001). Disintegration of the Scrophulariaceae. *American Journal of Botany*, 88(2), 348-361.
- Panara, K., Joshi, K., & Nishteswar, K. (2012). A review on phytochemical and pharmacological properties of *Citrus medica* Linn. *Int J Pharm Biol Arch*, 3(6), 1292-1297.
- Patocka, J., Bhardwaj, K., Klimova, B., Nepovimova, E., Wu, Q., Landi, M., Kuca, K., Valis, M., & Wu, W. (2020). *Malus domestica*: A review on nutritional features, chemical composition, traditional and medicinal value. *Plants*, 9(11), 1408.
- Paul, A., Kumar, A., Singh, G., & Choudhary, A. (2018). Medicinal, pharmaceutical and pharmacological properties of *Zanthoxylum armatum*: A Review. *J Pharmacogn Phytochem*, 7(4), 892-900.
- Petrovska, B. (2012). Historical review of medicinal plants' usage. *Pharmacognosy reviews*, 6(11), 1.
- Porwal, O., Ameen, M. M., Anwer, E. T., Uthirapathy, S., Ahamad, J., & Tahsin, A. (2019). *Silybum marianum* (Milk Thistle): Review on Its chemistry, morphology, ethno medical uses, phytochemistry and pharmacological activities. *Journal of Drug Delivery and Therapeutics*, 9(5), 199-206.
- Prajapati, R., Kalariya, M., Umbarkar, R., Parmar, S., & Sheth, N. (2011). *Colocasia esculenta*: A potent indigenous plant. *International Journal of Nutrition, Pharmacology, Neurological Diseases*, 1(2), 90-96.
- Quazi, S., Mathur, K., Arora, S., & Wing, P. (2013). *Calotropis procera*: An overview of its phytochemistry and pharmacology. *Indian Journal of Drugs*, 1(2), 63-69.
- Rana, M., Dhamija, H., Prashar, B., & Sharma, S. (2012). *Ricinus communis* L. – a review. *International Journal of PharmTech Research*, 4(4), 1706-1711.
- Rasheed, H. M., Khan, T., Wahid, F., Khan, R., & Shah, A. J. (2015). Chemical composition and vasorelaxant and antispasmodic effects of essential oil from *Rosa indica* L. petals. *Evidence-Based Complementary and Alternative Medicine*, 2015(1), 279247.
- Rather, M. A., Dar, B. A., Sofi, S. N., Bhat, B. A., & Qurishi, M. A. (2016). *Foeniculum vulgare*: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. *Arabian journal of chemistry*, 9, S1574-S1583.
- Razzaq, A., Hadi, F., Rashid, A., Ibrar, M., & Ali, U. (2015). Exploration of medicinal plants and their conservation status at higher altitude of district Shangla, Khyber Pakhtunkhwa, Pakistan. *Am Eurasian J Agric Environ Sci*, 15, 328-331.
- Saeidnia, S., & Gohari, A. R. (2012). Importance of *Brassica napus* as a medicinal food plant. *J. Med. Plants Res*, 6, 2700-2703.
- Salehi, B., Abu-Reidah, I. M., Sharopov, F., Karazhan, N., Sharifi-Rad, J., Akram, M., Daniyal, M., Khan, F. S., Abbaass, W., & Zainab, R. (2021). *Vicia* plants—A comprehensive review on chemical composition and phytopharmacology. *Phytotherapy Research*, 35(2), 790-809.
- Shah, A. H., Ai-Bekairi, A. M., Qureshi, S., & Ageel, A. M. (1989). *Zizyphus sativa* fruits: Evaluation of some biological activities and toxicity. *Phytotherapy Research*, 3(6), 232-236.
- Shinwari, Z. K. (2010). Medicinal plants research in Pakistan. *J Med Plants Res*, 4(3), 161-176.
- Singh, D., Gohil, K. J., Rajput, R. T., & Sharma, V. (2022). Almond (*Prunus amygdalus* Batsch.): a latest review on pharmacology and medicinal uses. *Research Journal of Pharmacy and Technology*, 15(7), 3301-3308.
- Taha, N. A., & Al-wadaan, M. A. (2011). Utility and importance of walnut, *Juglans regia* Linn: A. *African journal of microbiology research*, 5(32), 5796-5805.
- Tuasha, N., Petros, B., & Asfaw, Z. (2018). Medicinal plants used by traditional healers to treat malignancies and other human ailments in Dalle District, Sidama Zone, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 14(1), 15.
- Upadhyay, S., Patel, V., Patel, A., Upadhyay, U., & Patel, N. (2012). AJUGA BRACTEOSA: A PROMISING HERB. *Pharma Science Monitor*, 3(4).



-
- Wanzala, W., Wagacha, J. M., Dossaji, S. F., & Gakuubi, M. M. (2016). Bioactive properties of *Tagetes minuta* L.(Asteraceae) essential oils: A review.
- Zilani, M. N. H., Sultana, T., Asabur Rahman, S., Anisuzzman, M., Islam, M. A., Shilpi, J. A., & Hossain, M. G. (2017). Chemical composition and pharmacological activities of *Pisum sativum*. *BMC complementary and alternative medicine*, 17(1), 171.