



Research Article

Study of Ethnobotanical Flora and Medicinal Plants of District Mandi Bahauddin

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Abstract | Medicinal plants serve as a natural source of herbal medicine employed in treating numerous diseases within local communities across various countries. They also constitute the raw ingredient for the pharmaceutical industry. This study was conducted during year 2020-2021 to gather the native indigenous knowledge about therapeutic uses of medicinal plants in Mandi Bahauddin, District Gujrat, Punjab, Pakistan. Ethnomedicinal information was collected using surveys and personal interviews with local inhabitants, involving 30 males and 20 females across a wide range of age groups ranging from 25 to 80 years. The participants also included traditional practitioners of herbal medicines, known as 'tabibs' and 'hakims'. Household and market surveys were conducted in the rural areas of Mandi Bahauddin, Phalia and Malikwal for collection of socioeconomic and ethnic information of different plant species. Plant specimens underwent pressing, drying, and mounting onto herbarium sheets. The identification process was conducted for all gathered samples. In this research study, documentation was carried out for 50 plant species distributed across 27 families. These species arranged with scientific names, common names, family names, plant part used and ethnopharmacological applications. There were 20- herbs, 13- shrubs and 18 tree species documented on the basis of their importance and medicinal uses. Frequently utilized plant components included were fruits, leaves, roots, barks, seeds, and sometimes whole plant. There was a total of 50 plants out of which 20 plants were used through the preparation of decoction, 17 plants in the powder form and 10 plants used through infusion. 80% plants used to cure cough, asthma, fever, influenza, diabetes and liver diseases. 60% plants used to cure digestive diseases, diarrhea, cancer, inflammation, stomachache and dysentery. About 30% plants used to cure cardiovascular diseases and ulcers. The purpose of this study is to recognize wild plants gathered for medicinal purposes by the local residents of Mandi Bahauddin and to document the common names and therapeutic uses associated with these plants.

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Introduction

Herbal plants are the significant source of life-saving medicines for a large portion of the global population (Ginko *et al.*, 2023). Developing countries where modern health care is limited, medicinal plants provide a home remedy. Medicinal plants are more effective, safer and affordable, gaining popularity in rural and urban areas (Pandey and Tripathi, 2017). Ethno botany is coined with two terms “Ethno” the study of people and “botany” the study of plant. The concept of ethnobotany was initially introduced in the early 20th century by the botanist John William Hershberger. Ethnobotany is a discipline that deals with the interaction between people and plants (Hamilton *et al.*, 2003). Ethnologists aim to understand how individuals interact with the environment and obtain plant resources to meet their cultural and physical needs (Albuquerque *et al.*, 2011; Gaoue *et al.*, 2017). As a result, ethnographers have needed to formulate a theoretical framework which describes human behavior concerning the utilization of herbal resources (Gaoue *et al.*, 2017). Knowledge of indigenous traditional has played an important part in finding innovative products from plants groups. The World Health Organization (WHO) emphasizes the status of indigenous traditional herbal medicines because of the large quantity of rural individuals of underdeveloped nations still practice these drugs as a key line defense aimed at their well-being and health care (Organization, 2013).

Botanical surveys hold significant importance in our understanding and conservation of plant biodiversity. These surveys provide crucial data on the distribution, abundance, and ecological roles of plant species within specific regions. By documenting the diversity of plant life, botanical surveys contribute to the identification of rare and endangered species, aiding conservation efforts. Additionally, these surveys serve as valuable resources for scientific research, helping researchers explore the ecological relationships, medicinal properties, and economic potential of various plant species. Wild-harvested plant resources play a vital role in meeting the livelihood requirements, particularly for economically low communities living in remote regions. These individuals depend on such plants for sustenance, including food, fuelwood, medicinal purposes, and construction materials (Guo *et al.*, 2022).

District Mandi Bahauddin located in province Punjab (Pakistan). It is located at coordinates 32° 34'

60" N, 73° 30' 0" E. It is sketched by the southeast by the River Chenab and Jhelum River in the northwest which distinguishes it from districts Gujranwala and Gujarat and through Southwest district Sargodha. The region has a area of 2673 km² (Jamil *et al.*, 2022). Rasul Barrage is located on the Jhelum River and is used to regulate the water flow in the Jhelum River for the purpose of flood control and Irrigation. Sloping areas along Rasul Barrage contain a great deal of significant restorative plants that are utilized against various illnesses (Khan *et al.*, 2015). The region has a mild climate, hot summers and cold winters. Temperature can rise to 48 °C (118 °F) during the day in summers and the minimum temperature might fall below 37°F (3°C) in the winter. Average precipitation or rainfall of the region is 388 millimeters (15.3 in) (<https://mandibahauddin.punjab.gov.pk/climate>).

Different kinds of medicines obtained from herbal plants proved to be effectively utilized for the management of many sicknesses (Ozturk *et al.*, 2018). Globally, research has been conducted to validate the effectiveness of medicinal plants and discoveries from various studies have contributed to the development of herbal medicines. The annual market value of medicinal plant products worldwide surpasses \$100 billion Sofowora *et al.* (2013). Plants have long been used as a therapeutic aid in reducing various human diseases. Such plants, commonly known as herbs, are one of the most valuable tools in traditional medicine production and are used by industry to make new medicines (Shinwari, 2010). Pakistan is a huge country rich in diverse Ecological regions and climates. The flora is also very diverse and captivating. Approximately 6,000 angiosperm species have been documented from Pakistan to Kashmir (Ali, 2008). The ancient history of discovering and utilizing various medicinal plants is as old as the discovery and use of plants for sustenance. Medicinal plants play a crucial role in traditional healthcare systems, benefiting both animals and humans. Allopathic medicine incorporates extracts from medicinal plants into its treatments (Amjad *et al.*, 2020).

The land of Mandi Bahauddin is fertile and abundant with vegetation. Numerous medicinal plants grow naturally in this region throughout various seasons of the year (Farzaneh and Carvalho, 2015). Owing to the lack of modern communication, along with factors like poverty, illiteracy, and limited access to contemporary healthcare facilities, a significant portion of the population still relies on traditional

herbal medicines for addressing common ailments in their daily lives (Nisar *et al.*, 2011). Extensive understanding regarding the utilization of plants against various diseases is observed in areas where plant use is more common (Khan *et al.*, 2016).

Plant-based medicines are gaining particularly respectable status today. Knowledge of ethnic groups or traditional indigenous drug has played an important part in finding new products from plant mediators. The World Health Organization (WHO) also emphasizes this point (Newsom, 2008). About 85% of all primary health care medications derived from medicinal plants worldwide. Pakistan has exceptional biodiversity, which includes nine main ecological zones. Because of the alkaline climate, Pakistan is rich in medicinal herbs, which are dispersed over a vast area and cure patients with different diseases like diabetes type II (Liu *et al.*, 2004). Around 6,000 wild plants species are present in the country, of which 400-600 are considered medicinally important (Azaizeh *et al.*, 2003).

Whole plants and their various parts are employed medicinally to treat conditions such as bronchial issues, asthma, rheumatism, diabetes, paralysis, toothache, anthelmintic, antiallergic and snake bite etc. The solution used mainly for specific detail conditions, such as TB, melanoma, rheumatism or diabetes issues under intensive research (Gilani, 2005).

These traditional healthcare drugs have less side effects and can be gained from nature easily. Unfortunately, due to the transformation in the traditional culture, the old knowledge of the medicinal plants of the societies is rapidly vanishing from the face of the world. (Hussain *et al.*, 2018).

People use about 90% of the medicinal species that are native to the area. It is an indication of the vast store of plant medicinal knowledge that is present for worldwide use if it is not lost before it is documented or taped (Baqar, 1989). Traditional medical knowledge of plants, both oral and in written form, are needed to be acknowledged (Ali, 2008).

Considering the significance of medicinal plants, this study was documented and compiled with the help of indigenous ethnobotanical knowledge and information gathered from Ethnomedicinal Tabibs (traditional practitioners of herbal medicines) about the native species of District Mandi Bahaudin, Pakistan.

Objectives

- To explore local flora and vegetation of district Mandi Bahaudin
- To find out the medicinal importance of various plants
- To conserve the ethnobotanical data for future researches.
- Proper documentation of indigenous knowledge about medicinal plants

Materials and Methods

This study was conducted in the year 2021-2022 at a critical stage, because of the pandemic. It was an order from the government to follow all the rules and Standard Operating Procedures. Ethno Botanical Survey was conducted in the form of questionnaires filled by interviewing local persons and medication plant experts (Hakims). Plant samples were also collected during the survey.

Study area

Recent study of medicinal plants was limited to valuable vegetation of Mandi Bahaudin. It is divided into three tehsils (In Pakistan, a "tehsil" refers to an administrative subdivision within a district) i.e., Mandi Bahaudin, Phalia and Malikwal as shown in Table 1. The data about medicinal plants were collected with the help of personally managed questionnaires in arbitrarily selected 8 villages of tehsil Phalia of district Mandi Bahaudin. Those 8 villages were carefully chosen on the basis of its characteristics features like agriculture, and ethnobotanical importance.

Table 1: Tehsils of District Mandi Bahaudin.

S.No	Tehsil	Area	Population
1	Mandi Bahaudin	2,673	1.5 million
2	Phalia	52,855	553,416
3	Malikwal	371,869	371,869

*Tehsil refers to administrative subdivision within a district.

Field work

Seven field visits were made to the study area between 2021 and 2022 and collected data from survey participants using carefully arranged questionnaires.

Ages of respondents

The ethnomedicinal data collected with the help of surveys and detailed personal interviews of local people including 30 men and 20 women. As shown in Figure 1.

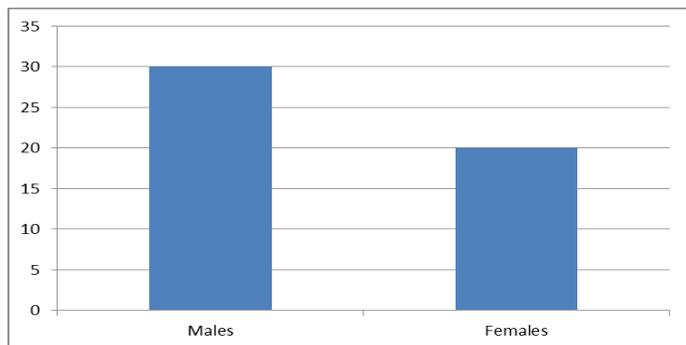


Figure 1: Total Number of respondents. The data presented in this figure is based on a survey conducted between 2021 and 2022.

Ages of female respondents

Out of total 20 female respondents 6 women were of age group between 25 to 30, 4 were of age ranging between 35 to 38, 4 were of age ranging between 50 to 55 and females with age of 60 to 70 years were 6. As shown in Figure 2.

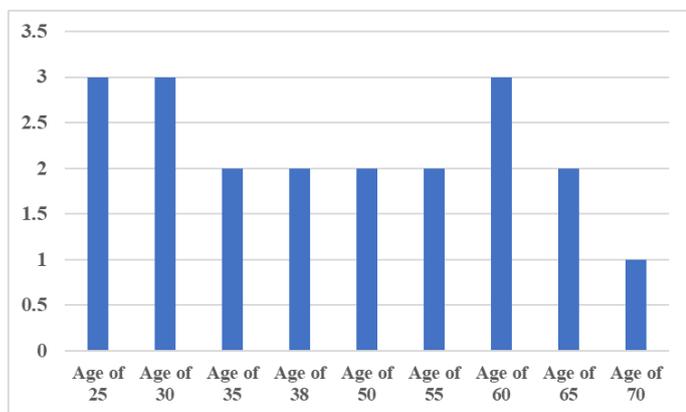


Figure 2: Ages of female respondents. The age data for female respondents was sourced from household and market surveys. The age range considered in this figure is 25 to 70. The figure is based on a sample size of 20 female respondents. Ages were self-reported by the participants, and no specific age groups were excluded from the analysis.

Ages of male respondents

Including 30 men of different age group between 30, 38, 55, 65 to 80 years. As shown in Figure 3.

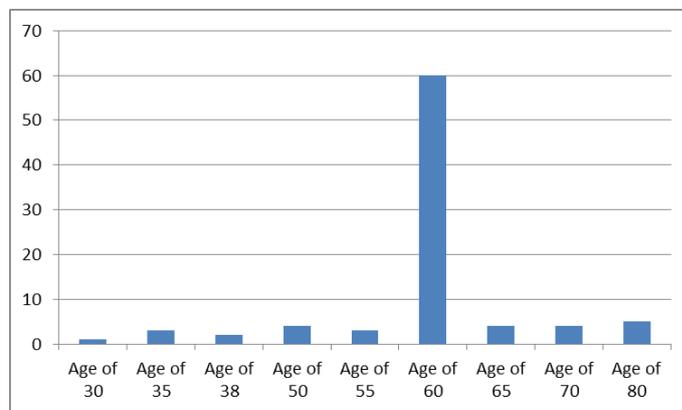


Figure 3: Ages of male respondents. The age data for male respondents was sourced from household and market surveys. The age range considered in this figure is 30 to 80. The figure is based on a sample size of 30 male respondents. Ages were self-reported by the participants, and no specific age groups were excluded from the analysis.

Household survey

Household survey was directed in the countryside areas of Mandi Bahauddin, Phalia and Malikwal for collection of socioeconomic and ethnic information from 50 households.

Market survey

Rural roadside bazaars (where herbal products available) are vital sources of information. Conducted interviews and surveys of pharmaceutical plant dealers and gathered information regarding customers basic data, socio economic status of the people, uses and the cultural features of the native plants for formulating questionnaires.

Key informant interviews

Data collected on various parts by enquiring questions like: Do you possess knowledge regarding the medicinal plants found in your region? If so, kindly provide their names and elucidate their significant medicinal applications. What are the methods of utilization and their corresponding medicinal applications? Additionally, which specific plant parts are employed for medicinal use? The questioners were asked queries in local language Punjabi and national language Urdu so that local people of the area can

communicate easily because most of them are uneducated and incapable to understand and speak English language [Table 2](#).

Table 2: Selected key informants.

Types of respondents	Frequency
Medicinal plants experts	5
Hakims	6
Pansaries	5
Herbal medicinal manufacturers	4
Common people	30
Total	50

Plant sampling

Gathering, documentation and conservation of samples occurred from study area and alphabetically arranged through their exact nomenclature, family, botanical and common name; habitat, used plant parts, and therapeutic uses.

Herbarium identification

Plant samples were dried, pressed and mounted on the botanical specimen sheets. All gathered specimens were recognized. After proper documentation, samples were submitted to the herbarium of the Department of Botany, University of Lahore (UOL), Punjab, Pakistan for future references.

Results and Discussion

A collective of 50 plant species from 27 plant families were gathered, these plants were arranged with scientific, family and common names; part used and ethnomedicinal uses. A total of 50 plants studied, 20 plants are used as decoction (*Eucalyptus camaldulensis*, *Zizyphus jujuba*, *Portulaca oleracea*, *Cannabis sativa*, *Bombax ceiba*, *Capsicum frutescens*, *Solanum nigrum* and *Trachyspermum ammi*), 18 plants are used as powdered form (*Capsicum annum*, *Albizia lebbeck*, *Psidium guajava*, *Ficus religiosa* and *Dalbergia sissoo*) and 12 plants are used for infusion (*Melia azedarach*, *Ricinus communis*, *Pongamia pinnata*, *Coriandrum sativum*, *Acacia nilotica* and *Ocimum basilium*) ([Figure 5](#)). There were 20- herbs, 13- shrubs and 18 tree species documented on the basis of their importance and medicinal uses as shown in [Figure 6](#). The study area is mainly characterized by angiosperms. All the plant species examined in this study area belong to the angiosperm category. No other major plant groups were identified in the area under consideration for ethnobotanical purposes.

Therefore, the focus of the study is specifically on angiosperms, providing comprehensive details on their ethnobotanical significance within the given region ([Khadim et al., 2023](#)). This study specifies that people living in the area of Mandi Bahauddin have immense information about uses of plant present in their areas. This study is significant for preserving the data of therapeutic plants utilized by local people of Mandi Bahauddin for the management of different diseases.

Number of plants according to disease cured

Out of a total of 50 plants documented, 12 plants were used for digestive problems like *Lactuca sativa* (lettuce), *Allium cepa* (onion), *Syzygium cumini* (jamun), *Citrus limonum* (lemon), *Citrus sinensis* (orange), *Ocimum basilicum* (basil), and *Carica papaya* (papaya). Plants used for cough, asthma, liver, and fever like *Ocimum basilicum* (basil), *Solanum nigrum* (black nightshade), *Trachyspermum ammi* (ajwain), *Syzygium cumini* (jamun), *Eucalyptus camaldulensis* (eucalyptus), *Convolvulus arvensis*, *Raphanus sativus* (radish), *Achyranthes aspera* (apamarga), *Arundo donax* (giant reed), *Allium sativum* (garlic), and *Catharanthus roseus* (periwinkle). Seven plants were used for diarrhea and dysentery like *Syzygium cumini* (jamun), *Abutilon indicum* (Indian mallow), *Coriandrum sativum* (coriander), *Murraya koenigii* (curry leaf), *Mangifera indica* (mango), *Psidium guajava* (guava), and *Nerium oleander* (oleander). Seven plants were used in cancer, inflammation, and ulcer like *Dalbergia sissoo* (Sheesham), *Vernonia scinerescens* (ironweed), *Abutilon indicum*, *Capsicum frutescens* (chili pepper), *Bombax ceiba* (cotton tree), *Jasminum sambac* (jasmine), *Linum usitatissimum* (flaxseed), and *Murraya koenigii* (curry leaf). 13 plants used for influenza, diabetes and heart diseases like *Dalbergia sissoo*, *Eucalyptus camaldulensis*, *Syzygium cumini*, *Aloe vera*, *Verbena officinalis*, *Bombax ceiba*, *Carthamus roseus*, *Cinnamomum zeylanicum*, *Allium sativum*, *Carthamus tinctorius*, *Trigonella foenum graecum*, *Ocimum tenuiflorum* and *Cannabis sativa* as shown in [Figure 4](#). In present study *Ocimum basilicum* (L.) is traditionally used as treatment of dysentery, bleeding piles, their sauce helps indigestion, diabetes, liver, nervous, cardiovascular disorders and pimples on face. This result was in accordance with the findings of ([Opalchenova and Obreshkova, 2003](#); [Tsai et al., 2011](#)).

According to my search *Melia azedarach* (L.) is traditionally used for rheumatic pain, Skin diseases, piles, anemia, emphysema, inflammation of gums,

pyrexia and hepatic disorder. This result was in accordance with the findings of (Ahmed *et al.*, 2008; Husain *et al.*, 2008; Sharma and Paul, 2013).

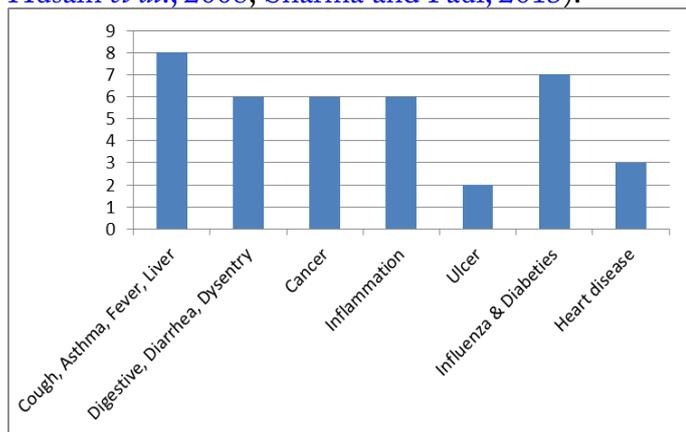


Figure 4: Number of Plants according to diseases cured. The data on plants and diseases cured is sourced from ethnobotanical surveys. Plants were classified based on their properties for treating specific diseases.

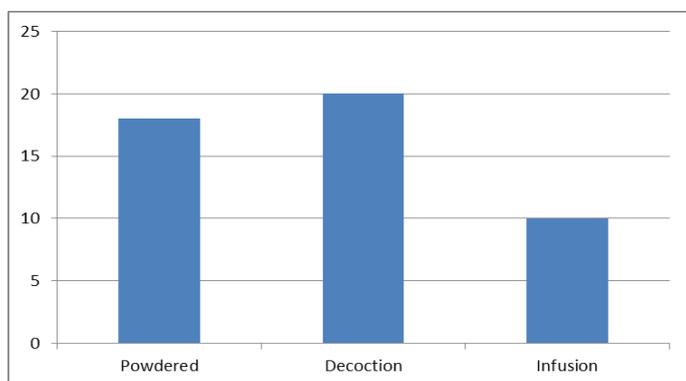


Figure 5: Administration form of plants. The data on administration forms of plants is sourced from questionnaires and ethnobotanical surveys. Plants were categorized based on Preparation Methods of Herbal Remedies.

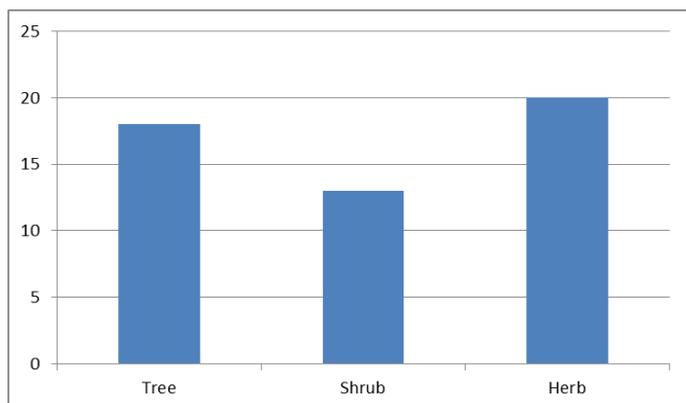


Figure 6: Status of plants. The data on the status of plants is sourced from questionnaires and ethnobotanical surveys. Plants were categorized based on which part of plant is used.

In current examination *Eucalyptus camaldulensis* is traditionally used as decoction, its leaves (Joshanda) used for influenza. Gum is used medicinally to treat diarrhea and heal wounds. This finding is in consonance

with (del Moral and Muller, 1970; Sofowora, 1993; Al-Zubairi *et al.* 2017; Sabo and Knezevic, 2019).

In the present investigation, traditional use involves the utilization of *Syzygium cumini* (L.) leaves for treating dysentery used for curing stomach, liver, heart and brain diseases. These outcomes are in accordance with previous research of (Chaudhuri, 1990; Ayyanar and Subash-Babu, 2012; Hidayah *et al.*, 2021). Cumini also used as an antidiabetic plant, lowering blood glucose levels (Helmstädter, 2008).

The findings about *Phoenix dactylifera* (L.) showed that their leaves have traditionally been used as mouth wash, fruit used for treatment of constipation, boost nervous system, shake of fruit is highly energetic used for sore throat, colds and bronchial asthma; ass states by (Chao and Krueger, 2007; Baliga *et al.*, 2011). The date palm has many remedial benefits such as cold, temperature, sore throat, alimentary stoppage, emphysema, abdominal troubles and diabetes.

In that study *Zizyphus jujuba* (L.) is traditionally used for the treatment of blood deficiency disease, hepatic problems, intestinal, pyrexia, diarrhea, urinary tract disorders, skin issues, low blood glucose level and obesity. As pointed by (Erenmemisoglu *et al.*, 2011; Arab *et al.*, 2021).

According to my documented data *Phyllanthus emblica* (L.), *Citrus limon* (L.), *Ficus benghalensis* (L.) used for various diseases like, diabetes, cough, asthma, chest pain, leucorrhoea, inflammations, piles, digestive disorders, vomiting, ulcer, influenza, anemia, urinary infections, leprosy and heartburns. Similar aggregates have been reported by (Scartezzini and Speroni, 2000; Arias and Ramón-Laca, 2005; Mirunalini and Krishnaveni, 2010; Klimek-Szczykutowicz *et al.*, 2020; Murugesu *et al.*, 2021).

Portulaca oleracea (L.) and *Cucumis melo var.* has same valuable medicinal uses. Traditionally used for liver, kidney, jaundice, typhoid, skin infections, stomach problems, heart disease, ulcer and low blood pressure. These plants are also useful for the skin as they are used as natural moisturizer and cleanser. They are effective in cardiac and kidney dysfunctions, reducing blood pressure, treating ulcer and rheumatic fever (Kerje and Grum, 2000; Rao *et al.*, 2012; Zhou *et al.*, 2015; Barros *et al.*, 2017).

Current survey showed *Convolvulus arvensis* (L.) is

traditionally used in constipation, control dandruff, piles, skin wounds, spider bites, cough, flu, painful joints and inflammation. Comparative results have been reported by (Austin, 2007; Ansari et al., 2022; Saleem et al., 2022).

Local community reported that *Achyranthes aspera* (L.) is traditionally utilized for the management of asthma, cough, stomachache, dropsy, piles and skin eruption. It is also used for kidney problems, wound healing and curing ulcer. Similar concerns have been obtained by (Srivastav et al., 2011; Ganesh et al., 2021).

Some plants like *Solanum nigrum* (L.), *Brassica campestris* (L.), *Psidium guajava* (L.), *Lycopersicon esculentum* are used by different tribes in different diseases in different ways. Used to cure different ailments like, hepatitis, sore throat, stomach, fever, ulcer, asthma, lower cholesterol level, dysentery, diabetes, cardiac dysfunction, rheumatism, liver, pneumonia, analgesic, nervous weakness and stomach. This result was in accordance with the findings of (Kalloo, 1993; Wu and Lou, 2007; Díaz-de-Cerio et al., 2017; Hameed et al., 2017).

In present day analysis *Verbena officinalis* (L.) used against snake bites, anti-inflammatory, respiratory tract diseases, whooping cough, chest pain and wound healing. This result is in accordance with previous analysis in the literature (Calvo, 2006; Casanova et

al., 2008; Kou et al., 2013).

In recent academic studies, *Capsicum frutescens* (L.) is traditionally used against various conditions, including cancer, rheumatism, stiff joints, bronchitis, chest colds, cough, headache, heartache, stomachache, and even dog bites. Chili pepper is recognized for its therapeutic properties in addressing different ailments, such as, arthritis, cough, cold, cardiac dysfunction, gastric, microbes, and angina. Some authors have reported the obtained results (Omolo et al., 2014; Gurnani et al., 2016; Maji and Banerji, 2016).

According to the findings of my studies *Rosa indica* Lindl., *Coriandrum sativum* (L.), *Jasminum sambac* (L.), are used for the treatment of different diseases. Constipation, Liver, leucorrhoea, eye diseases, diarrhea, stomachic, nausea, jaundice, inflammation, skin diseases, breast tumor and ulcers. Comparable outcomes have been gotten by certain authors (Laribi et al., 2015; Mourya et al., 2017; Ahmad et al., 2018; Singh et al., 2023).

In the course of current study, we gathered ethnomedicinal data for 50 plant species. The details include their scientific name, botanical family, the utilized plant part and their respective ethnomedicinal applications. These details are presented below beginning with the family name and scientific name (as shown in Table 3).

Table 3: Ethnobotanical uses of different plants of District Mandi Bahauddin.

S. #	Scientific name	Family name	Local Name	Part used	Flowering Period	Disease treated	References
1.	<i>Allium cepa</i> L.	Amaryllidaceae	Piaz	Root, Leaves	June to July	Stop vomiting, Used for stomach and nervous weakness	Silambarasan and Ayyanar, 2015
2.	<i>Chenopodium album</i> L.	Amaranthaceae	Bathu	Seeds, Shoots	August to October	Seeds used for paralysis, rheumatic pain, facial paraplegia	Kaur and Arora, 2015
3.	<i>Spinacia oleracea</i> L.	Amaranthaceae	Palak	Shoot	June to September	Contains iron, used for treatment of anemia, overcome Iron deficiency	Desai, and Pandey, 2014
4.	<i>Albizia lebeck</i>	Fabaceae (Leguminosae)	Shireen	Leaves, Seed	April to June	Seeds used for piles, leaves used for improvement of sight	Verma et al., 2013
5.	<i>Cassia fistula</i> L.	Fabaceae (Leguminosae)	Amaltas	Fruit	November to July	Treatment of constipation, Decoction of it's fruit is given to infants to keep digestive tract in order.	Siddhuraju, 2002
6.	<i>Dalbergia sissoo</i> Roxb.	Fabaceae (Leguminosae)	Shisham	Leaves, Flowrs	April to May	Leaves ate used as anti diabetic, antioxidant anticancer, analgesic, Flowers were used for skin problems, immunity Booster	Asif and Kumar, 2009; Khare, 2008; Sehra and Sharma, 2018
7.	<i>Ocimum basilicum</i> L.	Lamiaceae (Labiatae)	Niazbo	Shoot	June to September	used as carminative, dysentery, bleeding piles, it's sauce helps indigestion	Opalchenova and Obreshkova, 2003; Tsai et al., 2011

Table continues on next page.....

S. #	Scientific name	Family name	Local Name	Part used	Flowering Period	Disease treated	References
8.	<i>Melia azedarach</i> L.	Meliaceae	Dherk	Shoot	July to October	Leaves decoction used for hairs, and its paste applied on skin for many skin ailments	Husain <i>et al.</i> , 2008; Sharma and Paul, 2013
9.	<i>Eucalyptus camaldulensis</i>	Myrtaceae	Safeda	Whole plant	September to October	Decoction of it's leaves (joshanda) used for influenza	Sabo and Kn-ezevic, 2019
10.	<i>Syzygium cumini</i> (L.)	Myrtaceae	Jamun	Shoot	March to April	Leaves used for handling of dysentery in goats, fruit has antidiabetic properties and effective for live, brain, heart and stomach diseases.	Hidayah, Ridwanuloh, and Amal, 2021
11.	<i>Phoenix dactylifera</i> L.	Arecaceae (Palmae)	Khajoor	Fruit, leaves	February to March	Decoction (leaves) used as mouth wash, for treatment of constipation fruits are used, for energy their shake is best	Baliga <i>et al.</i> , 2011; Chao and Krueger, 2007
12.	<i>Zizyphus jujuba</i> L.	Rhamnaceae	Shaoo ber	Fruit, leaves	July to October	Edible part is fruit but over use of it's fruit is harmful for stomach and liver while its leaves are eaten by animals as fodder	Arab <i>et al.</i> , 2021; Erenmemisoglu <i>et al.</i> , 2011
13.	<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Amla	Fruit	March to April	Its fruits are rich source of Vitamin C. Their extract used as hair tonic, also used for curing pile and other digestive conditions	Murugesu <i>et al.</i> , 2021
14.	<i>Citrus limon</i> (L.) Burm.	Rutaceae	Nimboo, Lemon	Fruit	July to December	Toothpowder for teeth diseases and in infections	Klimek <i>et al.</i> , 2020
15.	<i>Ficus benghalensis</i> L.	Moraceae	Boher, Banyan	Adventitious roots and latex	November to January	Diseases like chronic flue, influenza and Gonorrhoea can be cured. Latex from aerial plant parts are mixed with honey to Control condition of hyperglycemia	Murugesu <i>et al.</i> , 2021
16.	<i>Portulaca oleracea</i> L.	Portulacaceae	Kulfa, Purslane	Whole plant	December to April	Refrigerants, used in cure liver, kidney, Jaundice, typhoid, iron deficiency and skin allergy. Seeds are demulcent, diuretic and wormifuge	Barros <i>et al.</i> , 2017, Zhou <i>et al.</i> , 2015, Kavitha <i>et al.</i> , 2012
17.	<i>Cucumis melo var. agrestis</i>	Cucurbitaceae	Chibbar, wild watermelon	Fruit and seed	March to September	Dried powdered plant used to treat skin infections, Wild Water Melon stomach problem	Kerje and Grum, 2000
18.	<i>Convolvulus arvensis</i> L.	Convolvulaceae	Vahri, Bind Weed	Whole Plant, Leaves	July to August	Constipation, control dandruff, piles, skin wounds, Roots are purgative	Ansari <i>et al.</i> , 2022; Austin, 2007; Saleem <i>et al.</i> , 2022
19.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Puth Kanda	Whole Plant	July to December	Decoction is used to cure asthma, cough, stomachache, piles, skin eruption and dropsy. It is also used for kidney problems and cough	Ganesh <i>et al.</i> , 2021; Srivastav <i>et al.</i> , 2011
20.	<i>Nerium indicum</i> Mill.	Apocynaceae	Kaner	Root, Seed	All the year round	Root is ground into powder and used for abortion, A decoction of the seed is used to treat syphilis.	Dey and Chaudhuri, 2014
21.	<i>Aloe vera</i> (L.) Burm.	Asphodelaceae (Xanthorrhoeaceae)	Kwargandal	Leaf	March to July	Rheumatism, body weakness and in the treatment of diabetics, sunburns, cosmetics	Benzidia <i>et al.</i> , 2019
22.	<i>Vernonia cinerescens</i>	Asteraceae (Compositae)	Simbla	Leaves, Rhizomes	July to September	Gastritis, Male sterility, constipation, internal ulcers, Urinary infections, and navel aches.	Calvo, 2006; Casanova <i>et al.</i> , 2008; Kou <i>et al.</i> , 2013

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S. #	Scientific name	Family name	Local Name	Part used	Flowering Period	Disease treated	References
23.	<i>Abutilon indicum</i> L.	Malvaceae	Peeli Buti, Kanski	Leaves and flowers	September to April	As a resolvent, analgesic, inflammations, diarrhea, bleeding piles and toothache	Patel and Rajput, 2013
24.	<i>Arundo donax</i> L.	Poaceae (Gramineae)	Neera	Leaf and stem	July to October	To treat dysfunctional cattle organs and to cure fever	Kumar <i>et al.</i> , 2021
25.	<i>Solanum nigrum</i> L.	Solanaceae	Kainch Mainch, Nightshade	Whole Plant	July to September	Used for the treatment of sore throat, hepatitis, abnormal and painful secretions from ears	Hameed <i>et al.</i> , 2017
26.	<i>Brassica campestris</i> L.	Brassicaceae (Cruciferae)	Sarsoon	Shoot	May to August	Brassica is used as cooking oil. Oil is also used for body massages and hair. Their leaves are rich source of vitamin C,	Wu and Lou, 2007
27.	<i>Psidium guajava</i> L.	Myrtaceae	Amrood	Fruit and Leaves	March to April	It is carminative and helps in digestion, cough, A decoction of the plant is antispasmodic, astringent, febrifuge and vulnerary	Díaz-de-Cerio <i>et al.</i> , 2017
28.	<i>Citrus limonum</i> -Risso in Ann.	Rutaceae	Meetha	Fruit and Leaves	July to December	Obesity, low blood pressure, liver and stomach, Rich in vitamin C, so it has potassium and calcium.	Al-Qudah <i>et al.</i> , 2018
29.	<i>Lycopersicon esculentum</i> Miller.	Solanaceae	Tamator	Fruit	June to September	Used for stomach, liver and nervous weakness, Tomato antioxidants include carotenoids such as β -carotene, a precursor of vitamin A	Kaloo, 1993; Mohamadi <i>et al.</i> , 2018
30.	<i>Verbena officinalis</i> L.	Verbenaceae	Podina	Shoot	July to September	Used against snake bites, anti-inflammatory, respiratory tract diseases, whooping cough, chest pain (angina)	Calvo, 2006; Casanova, <i>et al.</i> , 2008; Kou <i>et al.</i> , 2013
31.	<i>Capsicum frutescens</i> L.	Solanaceae	Lal mirch	Fruit	August to September	Used against dog bites, used for different types of cancer, rheumatoid arthritis, bronchitis, chest colds, stiff joints, Headache and heart arrhythmias	Gurnani <i>et al.</i> , 2016; Maji and Banerji, 2016; Omolo <i>et al.</i> , 2014
32.	<i>Citrus sinensis</i> L.	Rutaceae	Malta	Leaves and Fruit	February to March	Fruit peel is dried, then crushed and mixed into milk and Used as facial scrub, tonic for liver, heart and brain, Anti-Obesity	Viuda-Martos <i>et al.</i> , 2008
33.	<i>Rosa indica</i> Lindl.	Rosaceae	Gulab	Flower and Seed	May to June	Gulkand used for constipation, liver issues, leucorrhoea and stomach problems Juice of its flowers (arq-egulab) is also for eye problems.	Singh <i>et al.</i> , 2023
34.	<i>Trigonella foenum-graceum</i> L.	Fabaceae (Leguminosae)	Mathi	Shoot	June to August	Useful for liver, for weakness and edema of the legs	Das and Sharangi, 2021
35.	<i>Coriandrum sativum</i> L.	Apiaceae (Umbelliferae)	Dhania	Shoot	June to July	Laxative and effective for relief of anxiety, insomnia, convulsion, diarrhea gastritis and dyspepsia of many origins. It also has digestive stimulation antibilious properties and stomachic	Laribi <i>et al.</i> , 2015
36.	<i>Bombax ceiba</i> L.	Malvaceae	Simbel	Bark, Flower, Root	February to May	Effective against Snake bites, inflammation, dysentery, blood purification, treatment of genital organs, stimulant, gonorrhoea and bladder ulcer	Chaudhary and Khadabadi, 2012

Table continues on next page.....

S. #	Scientific name	Family name	Local Name	Part used	Flowering Period	Disease treated	References
37.	<i>Carthamus roseus</i> L.	Asteraceae (Compositae)	Sada bahar	Root, shoot and leaves	May to October	Pain, headache, immunity, anti cancer, anti diabetic, skin infection and cardiovascular disease	Khademian <i>et al.</i> , 2019
38.	<i>Cynodon dactylon</i> L.	Poaceae (Gramineae)	Bermud	Whole plant a	March to September	Laxative, wounds problem, bronchial problem, kidney disorders, antidiabetic, syphilis	Ashokkumar <i>et al.</i> , 2013
39.	<i>Jasminum sambac</i> L.	Oleaceae	Motia	Flower	June to August	Removing intestinal worms, jaundice and venereal diseases, soaked flowers to wash the face, treatment of inflammation, fever and pain	Kalaiselvi <i>et al.</i> , 2011
40.	<i>Linum usitatissimum</i> Linaceae	Linaceae	Alsi	Seed	June to July	Inflammation, swellings, pneumonia, bronchitis, pleurisy, peritonitis and arthritis. Decoction of Alsi is very beneficial in throat irritation produced by severe cough.	Palla <i>et al.</i> , 2015
41.	<i>Foeniculum vulgare</i> Mill.	Apiaceae (Umbelliferae)	Sounf	Fruit	August to October	It is used for chronic dyspepsia, intestinal colic, vomiting and heart burn, flavour liquor, It has been used as a galactagogue improving the milk supply of a breast feeding mother	Badgujar <i>et al.</i> , 2014
42.	<i>Raphanus sativus</i> L.	Brassicaceae (Cruciferae)	Mooli	Under-ground parts	June to August	Used in the treatment of intestinal parasites, asthma, chest pain, treatment of gall stones	Sreelekshmi, 2015; Badar, 2012
43.	<i>Murraya koenugii</i> L.	Rutaceae	Curry pata	Flower, leaves, root	April to May	Dysentery, leprosy, asthma,itching, blood diseases, snake bites	Iyer and Devi, 2008
44.	<i>Tamarindus indica</i> L.	Fabaceae (Leguminosae)	Imli	Bark, stem, leaves	April to June	General body pain, jaundice, ulcer, sore, asthma, rashes, throat infection, stomach disorders, yellow fever	De Caluwé <i>et al.</i> , 2010
45.	<i>Punica granatum</i> L.	Lythraceae	Anar	Exocarp of fruit	June to September	Dysentery and menstrual irregularities, cancer, osteoarthritis, and diabetes, buds are used for bronchitis	Shaygannia <i>et al.</i> , 2016
46.	<i>Pongamia glabra</i> Vent.	Fabaceae (Leguminosae)	Sukvhai n	Twigs	February to June	Their Branches used for ailments like teeth infection, tumors, skin diseases, ulcers and piles	Rout <i>et al.</i> , 2009, Pavithra <i>et al.</i> , 2010
47.	<i>Carica papaya</i> L.	Caricaceae	Papeeta	Fruit and latex	Germination depending on the temperature July to August While the other from February to March	It is used for digestive problems, abortion, rashes and burns, used for treatment of malaria,	Desser <i>et al.</i> , 2001; Milind parle, 2011
48.	<i>Taraxacum officinale</i> (L.)	Asteraceae (Compositae)	Dandelion	Roots and leaves	April to May	Effective for Headaches, skin issues, constipation, eye complications, liver, fatigue and gaut.	Lis and Olas, 2019
49.	<i>Carthamus Oxycantha</i> (M.)	Asteraceae (Compositae)	Pohli	Seeds and Flowers	March to June	Effective for itching, Ulcers, measles, strengthening liver, pain relieving, diaphoretic and laxative	Mani <i>et al.</i> , 2023
50.	<i>Ricinus communis</i> (L.)	Euphorbiaceae	Harnoli	Leaves, Bark and Seeds	July to September	Laxative, help to induce Labour pain, relieve period pain and menstrual cramps.	Kumar, 2017; Rana <i>et al.</i> , 2012

Conclusions and Recommendations

Herbal medicines are well documented in traditional medicine. In the past few years, there has been an increasing inclination among researchers and practitioners to embrace a systematic approach when utilizing medicinal plants for therapeutic purposes. Rural communities in Mandi Bahauddin have great information about medicinal plants as presented in this study. This study is important to preserve the knowledge of the medicinal plants used by the people of Mandi Bahauddin. But the potency of these plants should be scientifically assessed. It was concluded that there are many useful plants in this area. These plants are of great significance among the local community and are used to cure many diseases.

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We author of paper hereby stated that research article entitled "Study of Ethnobotanical Flora and Medicinal Plants of District Mandi Bahauddin" is my own work and has not been submitted previously in any journal.

Novelty Statement

Mandi Bahauddin region has rich flora and very little literature is available about medicinal uses of plants. So, this study will provide valuable information of plant uses and their therapeutical properties.

Author's Contribution

Iqra Munir and Farrah Iftikhar: Performed the ethnobotanical survey to collect data.

Farrah Iftikhar and Roha Ramash wrote the first draft of the manuscripts,

Iqra Munir and Hira Fatima designed the experimentation.

Sunbal Khalil Chaudhary: Analyzed the data.

All authors read and approved the final manuscript.

Conflict of interest

The authors have declared no conflict of interest.

References

Ahmad, L., A.J. Semotiuk, Q.R. Liu, W. Rashid, P. Mazari, K. Rahim and S. Sadia. 2018. Anti-

hypertensive plants of rural Pakistan: Current use and future potential. *J. Complement. Med. Res.*, 7(2): 138-153. <https://doi.org/10.5455/jcmr.20171228035946>

Ahmed, M.F., M.A. Ahmed, H. Thayyil, K. Zameeruddin and M. Ibrahim. 2008. Antioxidative activity of *Melia azedarach* Linn leaf extract.

Albuquerque, U.P., M.A. Ramos and M.F. Medeiros. 2011. Experiences of ethnobotanists with publication: A first approach. *BioScience*, 61(9): 706-712. <https://doi.org/10.1525/bio.2011.61.9.9>

Ali, S., 2008. Significance of flora with special reference to Pakistan. *Pak. J. Bot.*, 40(3): 967-971.

Al-Zubairi, A.S., M.A. Al-Mamary and E. Al-Ghasani. 2017. The antibacterial, antifungal, and antioxidant activities of essential oil from different aromatic plants. *Glob. Adv. Res. J. Med. Med. Sci.*, 6(9): 224-233.

Amjad, M.S., U. Zahoor, R.W. Bussmann, M. Altaf, S.M.H. Gardazi and A.M. Abbasi. 2020. Ethnobotanical survey of the medicinal flora of Harigal, Azad Jammu and Kashmir, Pakistan. *J. Ethnobiol. Ethnomed.*, 16: 1-28. <https://doi.org/10.1186/s13002-020-00417-w>

Ansari, H., A.P. Ansari, I. Qayoom, B. Reshi, A. Haseeb, Z. Ahmed and N. Anwar. 2022. Saqmunia (*Convolvulus scammonia* L.), an important drug used in Unani system of medicine: A review. *J. Drug Delivery Ther.*, 12(5): 231-238. <https://doi.org/10.22270/jddt.v12i5.5681>

Arab, K., B. Ghanbarzadeh, A. Ayaseh and K. Jahanbin (2021). Extraction, purification, physicochemical properties and antioxidant activity of a new polysaccharide from *Ocimum album* L. seed. *Int. J. Biol. Macromol.*, 180: 643-653. <https://doi.org/10.1016/j.ijbiomac.2021.03.088>

Arias, B.A. and L. Ramón-Laca. 2005. Pharmacological properties of citrus and their ancient and medieval uses in the Mediterranean region. *J. Ethnopharmacol.*, 97(1): 89-95. <https://doi.org/10.1016/j.jep.2004.10.019>

Austin, D.F., 2007. *Merremiadissecta* (Convolvulaceae): Condiment, medicine, ornamental, and weed. A review. *Econ. Bot.*, 61(2): 109-120. [https://doi.org/10.1663/0013-0001\(2007\)61\[109:MDCCMO\]2.0.CO;2](https://doi.org/10.1663/0013-0001(2007)61[109:MDCCMO]2.0.CO;2)

- Ayyanar, M. and P. Subash-Babu. 2012. *Syzygium cumini* (L.) Skeels: A review of its phytochemical constituents and traditional uses. *Asian Pac. J. Trop. Biomed.*, 2(3): 240-246. [https://doi.org/10.1016/S2221-1691\(12\)60050-1](https://doi.org/10.1016/S2221-1691(12)60050-1)
- Azaizeh, H., S. Fulder, K. Khalil and O. Said. 2003. Ethnobotanical knowledge of local Arab practitioners in the Middle Eastern region. *Fitoterapia*, 74(1-2): 98-108. [https://doi.org/10.1016/S0367-326X\(02\)00285-X](https://doi.org/10.1016/S0367-326X(02)00285-X)
- Baliga, M.S., B.R.V. Baliga, S.M. Kandathil, H.P. Bhat and P.K.J.F.R.I. Vayalil. 2011. A review of the chemistry and pharmacology of the date fruits (*Phoenix dactylifera* L.). 44(7): 1812-1822. <https://doi.org/10.1016/j.foodres.2010.07.004>
- Baquar, S.R., 1989. Medicinal and poisonous plants of Pakistan. *Med. Poisonous Plants of Pakistan*.
- Barros, A.S.A., H.O. Carvalho, I.V.F. Dos Santos, T. Taglialegna, T.I. dos Santos Sampaio, J.L. Duarte, C.P. Fernandes and J.C.T. Carvalho. 2017. Study of the non-clinical healing activities of the extract and gel of *Portulaca pilosa* L. in skin wounds in wistar rats: A preliminary study. *Biomed. Pharmacother.*, 96: 182-190. <https://doi.org/10.1016/j.biopha.2017.09.142>
- Calvo, M., 2006. Anti-inflammatory and analgesic activity of the topical preparation of *Verbena officinalis* L. *J. Ethnopharmacol.*, 107(3): 380-382. <https://doi.org/10.1016/j.jep.2006.03.037>
- Casanova, E., J. García-Mina and M. Calvo. 2008. Antioxidant and antifungal activity of *Verbena officinalis* L. leaves. *Plant Foods Hum. Nutr.*, 63: 93-97. <https://doi.org/10.1007/s11130-008-0073-0>
- Chao, C.T. and R.R. Krueger. 2007. The date palm (*Phoenix dactylifera* L.): Overview of biology, uses, and cultivation. *J. Hort. Sci. Horts.* 42(5): 1077-1082. <https://doi.org/10.21273/HORTSCI.42.5.1077>
- Chaudhuri, K.N., 1990. Asia before Europe: Economy and Civilisation of the Indian Ocean from the Rise of Islam to 1750, CUP Archive.
- del Moral, R. and C.H. Muller. 1970. The allelopathic effects of *Eucalyptus camaldulensis*. *Am. Midland Natur.*, pp. 254-282. <https://doi.org/10.2307/2424020>
- Díaz-de-Cerio, E., V. Verardo, A.M. Gómez-Caravaca, A. Fernández-Gutiérrez and A. Segura-Carretero. 2017. Health effects of *Psidium guajava* L. leaves: An overview of the last decade. *Int. J. Mol. Sci.*, 18(4): 897. <https://doi.org/10.3390/ijms18040897>
- Erenmemisoglu, A., F. Kelestimur, A.H. Koker, H. Ustun, Y. Tekol and M. Ustdal. 2011. Hypoglycaemic effect of *Zizyphus jujuba* leaves. *J. Pharm. Pharmacol.*, 47(1): 72-74. <https://doi.org/10.1111/j.2042-7158.1995.tb05737.x>
- Farzaneh, V. and I.S. Carvalho. 2015. A review of the health benefit potentials of herbal plant infusions and their mechanism of actions. *Ind. Crops Prod.*, 65: 247-258. <https://doi.org/10.1016/j.indcrop.2014.10.057>
- Ganesh, S.S., P. Rao, D. Nandal and R. Kunkulol. 2021. A review on pharmacological and phytochemical constituent of *Achyranthes aspera* L. *Int. J. Pharmacogn.*, 8(8): 58-64.
- Gaoue, O.G., M.A. Coe, M. Bond, G. Hart, B.C. Seyler and H. McMillen. 2017. Theories and major hypotheses in ethnobotany. *Econ. Bot.*, 71: 269-287. <https://doi.org/10.1007/s12231-017-9389-8>
- Gilani, A.H., 2005. Trends in ethnopharmacology. *J. Ethnopharmacol.*, 100(1-2): 43-49. <https://doi.org/10.1016/j.jep.2005.06.001>
- Ginko, E., E.A. Demirović and B. Šarić-Kundalić. 2023. Ethnobotanical study of traditionally used plants in the municipality of Zavidovići, BiH. *J. Ethnopharmacol.*, 302: 115888. <https://doi.org/10.1016/j.jep.2022.115888>
- Guo, C.A., X.Y. Ding, Y.W. Addi, Y. Zhang, X.Q. Zhang, H.F. Zhuang and Y.H. Wang. 2022. An ethnobotany survey of wild plants used by the Tibetan people of the Yadong River Valley, Tibet, China. *J. Ethnobiol. Ethnomed.*, 18(1): 28. <https://doi.org/10.1186/s13002-022-00518-8>
- Gurnani, N., M. Gupta, D. Mehta and B.K. Mehta. 2016. Chemical composition, total phenolic and flavonoid contents, and in vitro antimicrobial and antioxidant activities of crude extracts from red chilli seeds (*Capsicum frutescens* L.). *J. Taibah Univ. Sci.*, 10(4): 462-470. <https://doi.org/10.1016/j.jtusci.2015.06.011>
- Hameed, I.H., M.R.C. Cotos and M.Y. Hadi. 2017. A review: *Solanum nigrum* L. antimicrobial, antioxidant properties, hepatoprotective effects and analysis of bioactive natural compounds. *Res. J. Pharm. Technol.*, 10(11): 4063-4068. <https://doi.org/10.5958/0974-360X.2017.00737.5>
- Hamilton, A., P. Shengji, J. Kessy, A.A. Khan, S. Lagos-Witte and Z.K. Shinwari. 2003. The purposes and teaching of applied ethnobotany,

Citeseer.

- Helmstädter, A., 2008. *Syzygium cumini* (L.) Skeels (Myrtaceae) against diabetes—125 years of research. *Die Pharmazie. An Int. J. Pharma. Sci.*, 63(2): 91-101.
- Hidayah, H., D. Ridwanuloh and S. Amal. 2021. Aktivitas farmakologi tumbuhan jamblang (*Syzygium cumini* L.): Literature review article. *Cerdika: J. Ilmiah Indonesia*, 1(5): 530-536.
- Husain, S.Z., R.N. Malik, M. Javaid and S. Bibi. 2008. Ethnobotanical properties and uses of medicinal plants of Morgah biodiversity park, Rawalpindi. *Pak. J. Bot.*, 40(5): 1897-1911.
- Hussain, W., L. Badshah, M. Ullah, M. Ali, A. Ali and F. Hussain. 2018. Quantitative study of medicinal plants used by the communities residing in Koh-e-Safaid Range, northern Pakistani-Afghan borders. *J. Ethnobiol. Ethnomed.*, 14(1): 1-18. <https://doi.org/10.1186/s13002-018-0229-4>
- Jamil, M.D., M. Waheed, S. Akhtar, N. Bangash, S.K. Chaudhari, M. Majeed, M. Hussain, K. Ali and D.A. Jones 2022. Invasive plants diversity, ecological status, and distribution pattern in relation to edaphic factors in different habitat types of district Mandi Bahauddin, Punjab, Pakistan. *Sustainability*, 14(20): 13312. <https://doi.org/10.3390/su142013312>
- Kaloo, G., 1993. Tomato: *Lycopersicon esculentum* Miller. Genetic improvement of vegetable crops: pp. 645-666. <https://doi.org/10.1016/B978-0-08-040826-2.50049-7>
- Kerje, T. and M. Grum. 2000. The origin of melon, *Cucumis melo*: A review of the literature. VII Eucarpia Meeting on Cucurbit Genetics and Breeding, pp. 510. <https://doi.org/10.17660/ActaHortic.2000.510.5>
- Khadim, S., K. Malik, R. Qureshi and S. Rehman. 2023. Ethnobotanical study of traditional therapeutic plants used by the indigenous communities: A case study from District Gujrat Punjab, Pakistan. *Ethnobot. Res. Appl.*, 26: 1-23. <https://doi.org/10.32859/era.26.2.1-23>
- Khan, A., S.H. Ghouri and A. Shah. 2015. Phytochemical analysis of potential medicinal plants located on mountainous area along Rasul Barrage, Mandi Bahauddin, Pakistan. *Science*, 34(4): 221-231. <https://doi.org/10.3923/std.2015.221.231>
- Khan, I., A. Abd-Ur-Rehman, S. Aslam and M. Mursalin. 2016. Importance of ethnomedicinal flora of Sarai Alamgir (boundary side of river Jhelum) District Gujrat, Punjab, Pakistan. *Med. Aromat. Plants*, 5(264): 2167-0412. <https://doi.org/10.4172/2167-0412.1000264>
- Klimek-Szczykutowicz, M., A. Szopa and H. Ekiert. 2020. Citrus limon (Lemon) phenomenon. A review of the chemistry, pharmacological properties, applications in the modern pharmaceutical, food, and cosmetics industries, and biotechnological studies. *Plants (Basel)*, 9(1). <https://doi.org/10.3390/plants9010119>
- Kou, W.Z., J. Yang, Q.H. Yang, Y. Wang, Z.F. Wang, S.L. Xu and J. Liu. 2013. Study on *in-vivo* anti-tumor activity of *Verbena officinalis* extract. *Afr. J. Trad. Complement. Altern. Med.*, 10(3): 512-517. <https://doi.org/10.4314/ajtcam.v10i3.19>
- Laribi, B., K. Kouki, M. M'Hamdi and T. Bettaieb. 2015. Coriander (*Coriandrum sativum* L.) and its bioactive constituents. *Fitoterapia*, 103: 9-26. <https://doi.org/10.1016/j.fitote.2015.03.012>
- Liu, X., J. Wei, F. Tan, S. Zhou, G. Würthwein and P. Rohdewald. 2004. Antidiabetic effect of Pycnogenol® French maritime pine bark extract in patients with diabetes type II. *Life Sci.*, 75(21): 2505-2513. <https://doi.org/10.1016/j.lfs.2003.10.043>
- Maji, A.K. and P. Banerji. 2016. Phytochemistry and gastrointestinal benefits of the medicinal spice, *Capsicum annum* L.(Chilli): A review. *J. Complement. Integr. Med.*, 13(2): 97-122. <https://doi.org/10.1515/jcim-2015-0037>
- Mirunalini, S. and M. Krishnaveni. 2010. Therapeutic potential of *Phyllanthus emblica* (amla): The ayurvedic wonder. *J. Basic Clin. Physiol. Pharmacol.*, 21(1): 93-105. <https://doi.org/10.1515/JBCPP.2010.21.1.93>
- Mourya, N.M.N., D.B.D. Bhopte and R.S.R. Sagar. 2017. A review on *Jasminum sambac*: A potential medicinal plant. *Int. J. Indig. Herbs Drugs*, pp. 13-16.
- Murugesu, S., J. Selamat and V. Perumal. 2021. Phytochemistry, pharmacological properties, and recent applications of *Ficus benghalensis* and *Ficus religiosa*. *Plants*, 10(12): 2749. <https://doi.org/10.3390/plants10122749>
- Newsom, L., 2008. Present status and new horizons (Understanding the Evolution of an Indigenous Ethnobotany). *Crossing the borders: New methods and techniques in the study of archaeological materials from the Caribbean:*

- pp. 173-194.
- Nisar, M.F., S. Ismail, M. Arshad, A. Majeed and M. Arfan. 2011. Ethnomedicinal flora of district mandi bahaudin, Pakistan. Middle-East J. Sci. Res., 9(2): 233-238.
- Omolo, M.A., Z.Z. Wong, A.K. Mergen, J.C. Hastings, N.C. Le, H.A. Reiland, K.A. Case and D.J. Baumler. 2014. Antimicrobial properties of chili peppers. J. Infect. Dis. Ther., 2(4): 2332-0877.1000145.
- Opalchenova, G. and D. Obreshkova. 2003. Comparative studies on the activity of basil. An essential oil from *Ocimum basilicum* L. against multidrug resistant clinical isolates of the genera *Staphylococcus*, *Enterococcus* and *Pseudomonas* by using different test methods. J. Microbiol. Methods, 54(1): 105-110. [https://doi.org/10.1016/S0167-7012\(03\)00012-5](https://doi.org/10.1016/S0167-7012(03)00012-5)
- Organization, W.H., 2013. WHO traditional medicine strategy: 2014-2023, World Health Organization.
- Ozturk, M., V. Altay, A. Latiff, S. Shareef, F. Shaheen and M.I. Choudhry. 2018. Potential medicinal plants used in the hypertension in Turkey, Pakistan, and Malaysia. Plant Hum. Health Ethnobot. Physiol., 1: 595-618. https://doi.org/10.1007/978-3-319-93997-1_16
- Pandey, A.K. and Y. Tripathi. 2017. Ethnobotany and its relevance in contemporary research. J. Med. Plants Stud. 5(3): 123-129.
- Rao, B.M., R. Kavitha, K. Subash and N.J. Rao. 2012. Evaluation of anti arthritic activity of pet-ether extract of portulaca oleracea (Linn.).
- Sabo, V. A. and P. Knezevic. 2019. Antimicrobial activity of Eucalyptus camaldulensis Dehn. plant extracts and essential oils: A review. Ind. Crops Prod., 132: 413-429. <https://doi.org/10.1016/j.indcrop.2019.02.051>
- Saleem, U., S. Khalid, S. Zaib, F. Anwar, M.F. Akhtar, L. Hussain, A. Saleem and B. Ahmad. 2022. Wound healing potential and in silico appraisal of *Convolvulus arvensis* L. methanolic extract. BioMed. Res. Int., 2022. <https://doi.org/10.1155/2022/1373160>
- Scartezzini, P. and E. Speroni. 2000. Review on some plants of Indian traditional medicine with antioxidant activity. J. Ethnopharmacol., 71(1-2): 23-43. [https://doi.org/10.1016/S0378-8741\(00\)00213-0](https://doi.org/10.1016/S0378-8741(00)00213-0)
- Sharma, D. and Y. Paul. 2013. Preliminary and pharmacological profile of *Melia azedarach* L.: An overview. J. Appl. Pharma. Sci., 3(12): 133-138.
- Shinwari, Z.K., 2010. Medicinal plants research in Pakistan. J. Med. Plants Res., 4(3): 161-176.
- Singh, K., Y.P. Sharma and S. Gairola. 2023. Distribution status and ethnomedicinal importance of genus *Rosa* L. (Rosaceae) in India. Ethnobot. Res. Appl., 25: 1-22. <https://doi.org/10.32859/era.25.51.1-22>
- Sofowora, A., 1993. Recent trends in research into African medicinal plants. J. Ethnopharmacol., 38(2-3): 197-208. [https://doi.org/10.1016/0378-8741\(93\)90017-Y](https://doi.org/10.1016/0378-8741(93)90017-Y)
- Sofowora, A., E. Ogunbodede and A. Onayade. 2013. The role and place of medicinal plants in the strategies for disease prevention. Afr. J. Trad. Complement. Altern. Med., 10(5): 210-229. <https://doi.org/10.4314/ajtcam.v10i5.2>
- Srivastav, S., P. Singh, G. Mishra, K. Jha and R. Khosa. 2011. *Achyranthes aspera*-An important medicinal plant: A review. J. Nat. Prod. Plant Resour., 1(1): 1-14.
- Tsai, K., B. Lin, D. Perng, J. Wei, Y. Yu and J.M. Cherng. 2011. Immunomodulatory effects of aqueous extract of *Ocimum basilicum* (Linn.) and some of its constituents on human immune cells. J. Med. Plants Res., 5(10): 1873-1883.
- Wu, Y.D. and Y.J. Lou. 2007. A steroid fraction of chloroform extract from bee pollen of *Brassica campestris* induces apoptosis in human prostate cancer PC-3 cells. Phytother. Res. Int. J. Dev. Pharmacol. Toxicol. Evaluat. Natl. Prod. Deriv., 21(11): 1087-1091. <https://doi.org/10.1002/ptr.2235>
- Zhou, Y.X., H.L. Xin, K. Rahman, S.J. Wang, C. Peng and H. Zhang. 2015. *Portulaca oleracea* L.: A review of phytochemistry and pharmacological effects. BioMed. Res. Int., 2015. <https://doi.org/10.1155/2015/925631>