



# An Ethnobotanical Survey of Pakistani Medicinal Plants and Their Future in Pharmaceuticals Development

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## Abstract

**Background:** Pakistan's ethnobotanical landscape is rich in medicinal plants, deeply rooted in the traditional knowledge systems of indigenous tribes. This study aims to thoroughly document and analyze these plants, investigating their traditional usage, phytochemical composition, pharmacological properties, and applications in modern pharmaceuticals. **Methods:** The research involved meticulous cataloging of various medicinal plants and their customary applications using a combination of fieldwork and literature review. Fieldwork was conducted across different ecological niches, from the lush plains of Punjab to the northern highland ranges, to document the diversity and significance of medicinal flora. **Results:** The study uncovered the incredible diversity and significance of Pakistan's medicinal flora, revealing heirloom plant cures passed down through generations. Unique plant species with potential medicinal applications were identified in every ecological niche. Phytochemical studies revealed a wealth of bioactive compounds, including alkaloids, flavonoids, terpenoids, and polyphenols, exhibiting various pharmacological activities such as antibacterial, anti-inflammatory,

anticancer, and antioxidant properties. **Conclusion:** This research underscores the importance of preserving and respecting indigenous knowledge systems, highlighting the intricate connections between culture, environment, and traditional healing practices. The documented pharmacological activities of these medicinal plants provide insights into their potential as sources of new drug leads. Emphasizing conservation and sustainable use, the study highlights the significance of preserving medicinal plants for future generations. Pakistani medicinal plants offer exciting opportunities for pharmaceutical research and development, necessitating collaboration among ethnobotanists, pharmacologists, environmentalists, and local communities. Integrating traditional knowledge with contemporary research, these plants have the potential to advance the pharmaceutical industry and address global health challenges.

**Keywords:** Ethnobotany, Medicinal Plants, Traditional Medicine, Pakistan, Pharmacological Research

## Introduction

Ethnobotany is the systematic study of human-plant interactions (Dubey and Sao, 2018). The term 'ethnobotany' was first created by US botanist John Harshberger in 1896, but its history dates back far earlier (Awan et al., 2013). According to Mahmood et al. (2011), ethnobotany is essential to understanding the interplay between biodiversity, traditional systems, and society. A "medicinal plant" is a plant that has some curative qualities for beneficial

**Significance** | This review enriches our understanding of Pakistan's traditional healing practices and underscores the critical role of medicinal plants in advancing pharmaceutical innovation and promoting human well-being.

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Editor Muhammad Asif, And accepted by the Editorial Board Jan 15, 2024 (received for review Nov 11, 2023)

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## Please cite this article:

Amina Razzaq, Huma Ameen et al., (2024), An Ethnobotanical Survey of Pakistani Medicinal Plants And Their Future In Pharmaceuticals Development, Australian Herbal Insight. 7(1). 1-12. 20049

pharmacological effects on the human or animal body (Ahmad et al., 2010; Ullah et al., 2013). Ethnobotanical surveys provide insights on indigenous tribes' traditional use of medicinal plants (Verpoorte et al., 2015). Surveys have emphasized the use of herbal products in drug development, as they account for 50% of all medications worldwide (Verpoorte, 2000; Stefkov et al., 2011).

These studies also emphasize the biodiversity of medicinal flora protection (Leonti, 2011). Over 4.5 billion people in the poor world rely on medicinal plants as a key source of healthcare (Mussarat et al., 2014). Khalil et al. (2013) predict that about 35,000-75,000 medicinal plants can help fill gaps in the healthcare system. Many studies on the use of medicinal plants by various indigenous tribes have been carried out all over the world (Jamila and Mostafa, 2014). Many ethnomedical research have been gradually transformed into health and fitness initiatives (Balick, 1996). Ethnobotanical research on medicinal plant consumption have received significant interest from scholarly groups (Tripathi et al., 2017). The rising cost of synthetic pharmaceuticals for personal health care and the search for new plant-derived drugs are the causes for the growing interest in medicinal plant documentation and their use as re-emerging health support (Hoareau & DaSilva, 2000).

Pakistan has a rich climate and flora, including many therapeutic plants (Gilani et al., 2010). Approximately 1572 genera and 6000 wild plant species make up Pakistan's vast floral variety (Ahmad et al., 2014). Approximately 60,000 traditional health practitioners in rural and isolated locations employ medicinal plant species in home treatments for various ailments. It is estimated that individuals gather about 600 medicinal plants as non-timber forest products (NTFP) (Adnan et al., 2014). According to Ahmad et al. (2013), the most widely used traditional medical system in Pakistan is based on medicinal plants, such as "Greco-Islamic medicines" and "Yunani Dawakhana." The practice of using herbal medicines to treat a variety of illnesses and infections is known as "Tibb-e-Nabwi," and it is popular in Pakistan. It is based on the usage of natural products and herbs that the Prophet Muhammad (PBUH) recommended for treating a variety of illnesses (Khalil et al., 2014). Over the past few years, research on medicinal plants and their traditional uses has become more and more popular in many parts of Pakistan (Kayani et al., 2014).

In Punjab, indigenous medicines have been widely used. However, Talagang, Punjab, is not an exception when it comes to the inadequate documentation of this ethnobotanical knowledge (Sardar et al., 2015). This is the first ethnobotanical assessment of Talagang, making it a pioneering study. Talagang boasts a distinct topography with an abundance of therapeutic plant species. Both men and women in their senior years who live in rural areas are well-versed in ethnomedical techniques and favor using medicinal plants to treat a variety of illnesses. Some Talagang urban communities are gradually losing their ethnobotanical expertise due to the widespread and extensive use of modern health

services. In light of all these concerns, it was thought appropriate to record the locals of Talagang's traditional knowledge regarding the usage of medicinal herbs. In order to assess the level of traditional knowledge and describe the current state of ethnobotanical knowledge among various age groups, the current study set out to investigate and document ethnomedicine using quantitative indices such as relative frequency of citation (RFC), fidelity level (FL), use value (UV), frequency citation (FC), and informant consensus factor (ICF).

### Plants as drugs

Around the world, several plant species are employed as medicine for human health. Alkaloids and terpenoids are examples of active chemicals found in certain plant species. These substances have been tried and proven to work well as antibacterial, anti-infection, and sweeteners. For example, alkaloids and histamine found in *Alstoniaboonei* bark can be used to treat fever, vertigo, and elevated blood pressure. For a very long time, people have utilized the fiery flavors of garlic (*Allium sativum*) and ginger (*Zingiber officinale*) to preserve human health. The claim that medicinal plants have a significant impact on long-term human health is not hyperbole. Humanity has been using plants as a source of medicines for thousands of years. Most of the active components of plants used in medicine were created with the development of synthetic organic chemistry.

### Herbs Uses in Pakistani Medicines

#### Neem (*Azadirachta indica*)

*Azadirachta indica* is also referred to as the margosa tree or Indian neem. Since ancient times, it has been widely utilized in homoeopathic, unani, and ayurvedic treatment. In Sanskrit, "good health" is expressed as "Nimba" (Sitaswi et al., 2018), which can be evolved into "Neem". The tree is also known as "Sarvaroga nivarini" which means cure all maladies. Neem is referred to as "Arishta" in Ayurveda, which means "reliever of sickness." The tree is still recognized as a "village pharmacy" or "Divine tree" due to its medicinal properties in India (Amritalingam, 2011). More than 80% of people in underdeveloped nations are thought to be dependent on medicinal plants to treat a variety of illnesses or ailments (Rupani and Chavez, 2018).

### Traditional and modern Medicinal Uses

#### Ayurveda

Neem trees have been used in traditional Ayurvedic treatment in India from ancient times. Folk medicine has used neem bark, leaf extracts, and oil to treat a variety of conditions, such as leprosy, intestinal helminthiasis, constipation, etc. Additionally, it is essential for treating indolent ulcers, persistent syphilitic sores, and rheumatoid arthritis. It's well known that neem oil can treat a variety of skin issues. Together, bark, leaf, root, flower, and fruit can treat phthisis, biliary artery problems, skin ulcers, itching, and burning sensations (Saleem et al., 2018).

Young fruits and root bark are used as a tonic, alterative, and antiperiodic. Green twigs are used as toothbrushes to clean teeth and as a preventative measure for issues with the mouth and teeth. For treating snake bites and scorpion stings, one can utilize bark, gum, leaves, and seeds. The bark has various uses such as being a bitter tonic, astringent, periodic, pyretic, and preventing nausea and vomiting. Gum acts as a soothing tonic for coughs. Boils are treated with leaves as a poultice. Decoction of leaves applied topically to treat eczema and ulcers. Arid flowers are acidic. Seed oil has stimulant, anesthetic, and alterative properties for rheumatism and skin conditions. Berries have anthelmintic, emollient, and purgative properties.

#### **Neem for Inflammation and Arthritis:**

Research has indicated that nimbidin, a compound present in neem, may have anti-inflammatory and anti-arthritic properties. Nimbidin may be able to prevent neutrophils and macrophages from inducing inflammation. Neem may help reduce inflammation as well as the pain and swelling that come with it. Additionally, it may be beneficial for rheumatoid arthritis, a condition marked by pain and inflammation in the muscles and joints as a result of auto-immune reactions. (Bhownik et al,2010).

#### **Neem for Infections:**

Neem may be able to treat dengue illness by inhibiting the dengue virus's development. It may prevent the coxsackie B virus from replicating, which is a family of viruses that can cause everything from upset stomachs to serious illnesses in people. Neem leaf has long been used to treat viral illnesses including smallpox and chickenpox. (Bhownik et al,2010). To support such statements, more research is necessary. Skin infections and bacterial infections: Recent research has concentrated on the antibacterial properties of neem in the mouth, particularly in relation to tooth cavities and gum disease. (Bhownik et al,2010). According to studies, neem may possess antifungal properties that could aid in the treatment of fungal infections such as ringworm, athlete's foot, and candida, which is also known as a yeast infection or organism that causes thrush. A fungal illness called thrush can affect the mouth, throat, or other areas of the body. (Bhownik et al,2010).

#### **Neem for Cancer:**

Neem's flavonoids and other constituents may prevent cancer from progressing. Increased levels of flavonoids may slow the progression of cancer, according to several studies. 4 Skin, breast, lung, oral, stomach, liver, colon, and prostate cancers are just a few of the human cancers that neem and its extracts may be able to combat. (Bhownik et al,2010). To demonstrate its potential use, however, a great deal more thorough research is needed.

#### **Neem for Liver:**

Neem may have some effect on liver protection, which may help to facilitate blood purification. By stabilizing serum marker enzyme levels and raising antioxidant levels, such as those found in natural carotenoids, vitamin E, and C, neem leaf may help lessen liver

damage brought on by toxins. These antioxidants may prevent damage and aid in the neutralization of free radicals. (Bhownik et al,2010)..

#### **Neem for Immunity:**

Neem's ability to stimulate the immune system may be its most significant potential usage. It may benefit lymphocytic and cell-mediated immune systems, particularly "Killer T" cells. These cells may release harmful compounds into other microorganisms, viruses, etc., thereby aiding in their demise (Bhownik et al,2010).

#### **Tulsi ( Ocimum sanctum )**

About 75 cm tall, *Ocimum sanctum* (Family Labiatae) is an erect, multibranched, robust, and scented plant. This little herb is grown all over India and is revered in Hindu homes and temples. This is usually referred to as India's Holy Basil in English, Tulsi in Sanskrit, Kala-Tulsi in Hindi, and Vishnu-Priya. This plant's leaves, seeds, and root have all been utilized in traditional Ayurvedic treatment. Tulsi has a very complex chemical makeup that includes a variety of nutrients and other biologically active substances. The way these ingredients are cultivated, stored, and timed all cause substantial variations. Since the nutritional and pharmacological qualities of the entire herb in its natural state as it has been traditionally used come from the synergistic combination of numerous active phytochemicals, individual compounds or extracts cannot adequately replicate the total effects of Tulsi. Standardization of Tulsi's active ingredients has proven to be extremely difficult thus far because of the plant's intrinsic botanical and biochemical complexity. Among the numerous discovered and extracted active components, ursolic acid and eugenol an essential oil are the most well-known (Sharma et al,2022 ). Traditionally, tulsi has been consumed in several ways, such as herbal teas (cold, hot, or dried), powdered leaves, tinctures made of alcohol, oil preparations (ghee), and formulations made of seeds, roots, and stems that can be used topically or systemically. Apart from different extracts, the isolated chemical is also injected in human clinical trials and animal investigations.

#### **Stress resilience:**

It has been discovered that the plant *Ocimum sanctum* possesses adaptogenic qualities after a series of tests on rats and mice ( Bhargava et al,1981). The ability to tolerate, adapt to difficult situations, and provide substantial stress protection is enhanced by basil leaves (adaptogenic). To reduce stress, even a healthy individual can chew 12 basil leaves twice a day.

#### **Common cold and fever:**

When cooked with tea, tender tulsi leaves serve as a preventive medication against dengue fever and malaria, two diseases that are often more common during the rainy season. It has been demonstrated that an Ayurvedic preparation containing *Piper nigrum*, *Curcuma longa*, and *Ocimum sanctum* exhibits antimalarial action against *Plasmodium vivax* and is particularly effective against *Plasmodium falciparum* ( Rajeshwar et al,1992). It

has been discovered that pretreatment reduces the clinical signs of malaria that these species cause. A diaphoretic for malarial fever is made from a decoction of Tulsi plant roots (Pavithra et al,2014).An essential ingredient in many Ayurvedic cough syrups and expectorants is tulsi. It aids in the mobilization of mucus in asthma and bronchitis. Chewing tulsileaves reduces symptoms similar to the flu and cold.

#### **Antibiotic property**

*Ocimum sanctum* L. Essential oil has been shown to have antibacterial activity by inhibiting the growth of *E. Coli*, *B. Anthraci*, and *P. Aeruginosa* in vitro. Additionally, *ocimum sanctum* has antifungal action against *Aspergillus niger*, and a study indicated that an aqueous extract of the plant was beneficial for treating viral encephalitis in patients (Rajeshwar et al,1992). Tulsi leaf paste is in fact proved to be quite efficient in treating ring worm infections. Tulsi is useful in treating numerous major illnesses because of its strong inherent antibacterial, antiviral, and antifungal properties.

#### **Aloe Vera**

Aloe vera, a plant with a long history of therapeutic usage, plays an important role in Pakistani herbal medicine. Its various medicinal qualities have been thoroughly researched and described in scientific literature. Hamid Nasri and Mahmoud Rafieian-Kopaei's 2015 article, which was published in the *Avicenna Journal of Phytomedicine*, outlines the several pharmacological properties of aloe vera. The study states that the anti-inflammatory, antibacterial, and wound-healing properties of polysaccharides, glycoproteins, and anthraquinones found in aloe vera gel (Nasri & Rafieian-Kopaei, 2015).

It has well-established anti-inflammatory, antibacterial, and wound-healing properties. Aloe vera is frequently used to heal wounds, bruises, burns, and sunburns. In addition, it can be used to relieve psoriasis and eczema as well as acne. Aloe vera gel can be taken internally as a supplement or beverage, or it can be administered topically to the skin. Aloe vera is used topically, but it is also claimed to have internal health benefits, including improving immunological function, aiding with digestion, and reducing inflammation. Aloe vera is a naturally occurring plant that is safe to use for a number of applications. Extract is a tonic, anti-inflammatory, bactericidal, and tissue-regeneration-promoting agent that is utilized locally. In addition to organic acids, mineral salts (zinc, copper, and molybdenum), polysaccharides, amino acids, enzymes, saponins, resins, and substances including metal and vitamins, aloe Aloiin. It possesses potent immunomodulatory and restorative qualities ( Jędrzejko et al,2018). Aloe vera is applied topically to the facial tissues, where it functions as an anti-irritant and moisturizer to lessen nose chafing. Cosmetic businesses frequently include Aloe vera sap or its derivatives into makeup, tissues, moisturizers, soaps, sunscreens, incense, shaving creams, and shampoos ( Reynolds, 2014).

#### **Henna**

Henna, scientifically known as *Lawsonia inermis*, is an integral part of Pakistani culture, appearing in a variety of events and celebrations. Mehndi, or applying henna on the hands and feet, is a custom associated with weddings, Eid celebrations, and other important cultural events. It is a representation of beauty, happiness, and auspicious occasions (Ali et al., 2017). Pakistan's rich artistic legacy is reflected in the mehndi artwork, which features a variety of regional styles and patterns that highlight the cultural diversity of the nation.

In Pakistan, where it has been utilized for millennia in traditional medical procedures, henna offers therapeutic value in addition to its cultural significance. Henna's medicinal characteristics make it a popular treatment for a variety of skin conditions, including rashes, burns, and insect bites (Khan et al., 2018). Henna is useful for relaxing and repairing skin because of its cooling, anti-inflammatory, and antibacterial qualities, according to research. Henna paste is applied to afflicted regions to relieve pain and accelerate the healing process. Henna is also prized for its analgesic qualities, which provide relief from joint and headache discomfort. Henna paste is traditionally used to relieve pain and discomfort in the joints or temples that are afflicted (Ansari et al., 2019).

In Pakistan, henna is a traditional natural treatment that has been used for many aches and pains. It has been passed down through the years. Henna is used in Pakistan for hair care treatments in addition to topical uses. Henna's inherent coloring abilities are used to color and treat hair while enhancing its health and vibrancy. Applying henna paste to the hair gives it a deep, reddish-brown color and nourishes the hair follicles (Khan et al., 2018). This age-old method fortifies and shields hair from harm in addition to improving its beauty.

Although the cultural significance and health advantages of henna are well established, more scientific study is required to fully understand its therapeutic potential. Some of the claims made about the therapeutic benefits of henna remain unsubstantiated despite its extensive use in traditional medicine. Consequently, more research is needed to confirm its safety and effectiveness for a range of medical issues.

#### **Giloy (*Tinospora cordifolia*)**

Giloy, also known as *Tinospora cordifolia*, is an indigenous plant that is deeply ingrained in traditional Pakistani healthcare practices and provides numerous medical benefits. Giloy, a Menispermaceae climbing shrub, is widely distributed throughout the Indian subcontinent, including Pakistan, and has been used for generations for its medicinal benefits (Pandey & Rout, 2014). Giloy is highly valued in Pakistani traditional medicine for its ability to treat a wide range of diseases while also enhancing overall health. It is frequently used as a Rasayana, or revitalizing plant, with the belief that it will increase vigor and lifespan (Nahata et al., 2013). The pharmacological properties of this herbaceous plant are attributed

to a variety of bioactive chemicals, including alkaloids, glycosides, steroids, and flavonoids (Jagetia & Baliga, 2014).

One of the most important applications of Giloy in Pakistani healthcare is its capacity to enhance immunity, which is critical in combating infectious diseases prevalent in the region. Due to its immunomodulatory qualities, it is a useful tool for treating illnesses like fever, gastrointestinal problems, and respiratory infections (Brijesh et al., 2014). Furthermore, Giloy's antioxidant and anti-inflammatory properties may help alleviate inflammatory disorders such as arthritis and inflammatory bowel illness (Sinha et al., 2011). With virus outbreaks, chronic illnesses, and environmental issues among Pakistan's health concerns, the introduction of Giloy into the healthcare system offers a chance to supplement traditional treatments with herbal ones. However, comprehensive scientific study, including clinical trials and pharmacological studies, is required to establish its efficacy, safety, and appropriateness.

#### **Ginger (*Zingiber officinale*)**

The therapeutic properties of ginger (*Zingiber officinale*) have led to its significant use in traditional Pakistani medicine. Its efficacy in treating a range of conditions, including digestive disorders including dyspepsia, nausea, and vomiting, has been documented (Majeed et al., 2019; Mozaffari-Khosravi et al., 2016). Ginger's carminative qualities facilitate digestion and ease gastrointestinal pain (Kumar et al., 2015). Furthermore, ginger has traditionally been used in Pakistan to relieve cold and flu symptoms as shown in Table 5. Its warming qualities are thought to aid in clearing sore throats and congestion (Ali et al., 2011; Marx et al., 2015). Ginger tea and concoctions containing ginger, honey, and other herbs have been utilized to improve immunological function (Shukla & Singh, 2007; Mozaffari-Khosravi et al., 2016). Ginger has also been used in traditional Pakistani medicine to alleviate inflammation and pain caused by illnesses like arthritis. Its anti-inflammatory qualities may help reduce joint discomfort and increase range of motion (Majeed et al., 2019; Marx et al., 2015). Localized discomfort and edema have been treated with topical medicines or ginger poultices (Kumar et al., 2015; Mozaffari-Khosravi et al., 2016).

Ginger has been used traditionally, and its methods of action have been clarified by modern pharmacological investigations carried out in Pakistan. Gingerol, shogaol, and zingerone are among the bioactive chemicals that have been found in research to provide ginger its therapeutic qualities (Majeed et al., 2019; Ali et al., 2011). Particularly gingerol has anti-inflammatory and antioxidant properties, which make it a useful medicinal ingredient (Shukla & Singh, 2007; Marx et al., 2015). Research has indicated that ginger's anti-inflammatory and prokinetic properties on the digestive tract may help manage gastrointestinal illnesses such functional dyspepsia and irritable bowel syndrome (Majeed et al., 2019; Mozaffari-Khosravi et al., 2016). Ginger has also demonstrated potential in easing the symptoms of motion sickness,

chemotherapy-induced nausea and vomiting, and pregnancy (Kumar et al., 2017).

#### **Black seed (*Nigella sativa*)**

*Nigella sativa*, the scientific name for black seed, is a plant native to South Asia, notably Pakistan, where it has long been used in traditional herbal medicines. Its medicinal effects have been described in ancient literature like as the Quran and Hadith, which both reference its restorative virtues. Black seed is highly valued in Pakistani traditional medicine for its ability to treat a variety of illnesses, such as skin concerns, gastrointestinal problems, and respiratory difficulties.

Thymoquinone is the most studied of the bioactive chemicals found in black seed, which is responsible for its medicinal efficacy. Black seed is a remarkable therapeutic plant because thymoquinone has strong anti-inflammatory, antibacterial, anticancer, and antioxidant qualities (Abd El-Ghany et al., 2020) as shown in Table 6. Together, these bioactive substances modify many bodily physiological processes, which enhances the therapeutic effects.

In Pakistan, respiratory conditions including bronchitis and asthma are common health issues, and black seed has long been used to treat their symptoms. According to studies, black seed has anti-inflammatory and bronchodilatory properties that enhance airway function and lessen respiratory tract inflammation (Nasir et al., 2020). Black seed's application in respiratory health is further supported by its antibacterial qualities, which may aid in the fight against respiratory infections.

In Pakistani herbal medicine, black seed is frequently used to treat digestive problems such as diarrhea, bloating, and indigestion. It is thought that its carminative and antispasmodic qualities would ease stomach discomforts and support healthy digestion (Al-Megrin, 2020). In addition, black seed's anti-inflammatory properties might lessen gastrointestinal tract irritation and relieve ailments like gastritis and inflammatory bowel disorders. Black seed is also used in Pakistani traditional medicine to treat skin conditions like acne, psoriasis, and eczema. It is useful in treating a variety of skin disorders due to its anti-inflammatory, antibacterial, and wound-healing qualities (Salem, 2020). *Nigella sativa* seeds are the source of black seed oil, which is frequently applied topically to relieve irritated skin, lessen inflammation, and encourage tissue regeneration.

Clinical investigations have shed light on black seed's medicinal potential (Table 7) Studies have indicated that it is effective in glycemic control in diabetics, suggesting its potential as an adjuvant therapy for metabolic disorders.

#### **Moringa (*Moringa oleifera*)**

*Moringa (Moringa oleifera)* is a plant with nutritional and therapeutic properties, particularly in Pakistani folk medicine. Scholarly investigations have emphasized its exceptional characteristics and customary application in multiple societies, including Pakistan. Moringa leaves are high in important nutrients



Figure1. Neem Plant

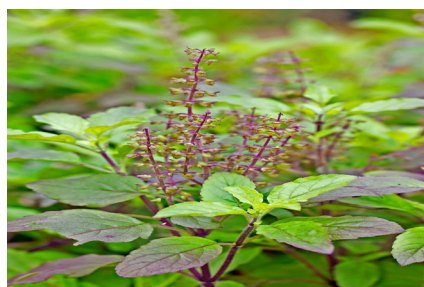


Figure 2. Tulsi Plant



Figure 3. Aloe Vera Uses

Table 1. Therapeutic properties of Aloe vera in Pakistani herbal medicine

| Therapeutic Properties    | Traditional Uses  | Modern Research Evidence  |
|---------------------------|---|---|
| Skin Disorders            | Soothes burns, wounds, eczema, and psoriasis.   | Anti-inflammatory and antimicrobial effects reduce inflammation and prevent infection |
| Digestive Health          | Aids digestion and alleviates gastrointestinal discomfort.                                  | Laxative effects attributed to compounds like aloin and anthraquinones                |
| Immune Support            | Boosts immunity due to its rich array of vitamins, minerals, and antioxidants.              | Antioxidant activity may contribute to immune-boosting effects                        |
| Wound Healing             | Accelerates healing of cuts, abrasions, and burns.  | Enhances wound healing and reduces risk of infection                                  |
| Anti-inflammatory Effects | Used to manage conditions like arthritis and gastritis.                                     | Demonstrated anti-inflammatory effects both topically and internally                  |
| Antioxidant Activity      | Neutralizes free radicals and reduces oxidative stress.                                     | Contains antioxidants like vitamins C and E, flavonoids, and polyphenols              |
| Gastrointestinal Health   | Alleviates symptoms of irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD). | Investigated for its potential role in managing gastrointestinal disorders            |



Figure 4. Henna Plant

Table 2. Cultural Significance of Henna in Pakistan

| Aspect                  | Discription  |
|-------------------------|--|
| Integral Ceremonial Use | Henna is an essential part of ceremonies like weddings, Eid festivities, and other celebrations in Pakistan.   |
| Symbolism               | It symbolizes beauty, joy, and auspicious occasions, serving as a form of adornment for the hands and feet with intricate designs known as mehndi.                       |
| Artistic Heritage       | The intricate designs created with henna reflect Pakistan’s rich artistic heritage, with diverse regional styles and motifs showcasing the country’s cultural diversity. |

Table 3. Medicinal Uses of Henna in Pakistan

| Aspect          | Discription   |
|-----------------|---|
| Skin Conditions | Henna is used to soothe various skin ailments, including rashes, burns, and insect bites, due to its cooling, anti-inflammatory, and antiseptic properties. |
| Pain Relief     | Its analgesic properties provide relief from headaches and joint pain, making it a traditional remedy for alleviating discomfort                            |
| Hair Care       | Henna’s natural dye properties are utilized for coloring and conditioning hair, promoting hair health and vitality.   |

Table 4. Bioactive Compounds in Giloy

| Compound Type | Functionality                  |
|---------------|--------------------------------|
| Alkaloids     | Antioxidant, Anti-inflammatory |
| Glycosides    | Immunomodulatory               |
| Steroids      | Hepatoprotective               |
| Flavonoids    | Antimicrobial                  |



Figure 5. Giloy plant

**Table 5.** Uses of Ginger

| Traditional Uses:                                   | Pharmacological Effect                              |
|---|---|
| Digestive issues                                    | Antioxidant and anti-inflammatory properties        |
| Cold and flu symptoms                               | Management of gastrointestinal disorders            |
| Anti-inflammatory and pain relief (e.g., arthritis) | Reduction of pain and improvement in joint function |
|   | Antiemetic effects                                  |

**Table 6.** Therapeutic Properties of Black Seed

| Therapeutic Property | Description   |
|----------------------|---|
| Antioxidant          | Protects cells from oxidative damage and reduces inflammation                           |
| Anti-inflammatory    | Reduces inflammation in the body, alleviating symptoms of various health conditions     |
| Antimicrobial        | Exhibits activity against bacteria, viruses, and fungi, aiding in infection management  |
| Bronchodilatory      | Dilates airways and improves respiratory function, beneficial for asthma and bronchitis |
| Antispasmodic        | Relieves spasms in the gastrointestinal tract, easing digestive discomforts             |
| Wound Healing        | Promotes tissue regeneration and accelerates the healing process of wounds              |

**Table 7.** Clinical Applications of Black Seed

| Health Condition      | Clinical Application   |
|-----------------------|--|
| Diabetes              | Improves glycemic control and insulin sensitivity, potentially serving as an adjuvant therapy for diabetes |
| Respiratory Disorders | Alleviates symptoms of asthma, bronchitis, and coughs, improving respiratory function                      |
| Skin Conditions       | Manages eczema, psoriasis, acne, and other skin ailments, reducing inflammation and promoting healing      |
| Allergies             | Modulates immune response, potentially reducing symptoms of allergic reactions                             |
| Cancer                | Exhibits anticancer effects against various types of cancer cells, warranting further investigation        |



**Figure 6.** Ashwagandha



like calcium, potassium, iron, and vitamins A, C, and E, according to a study published in the journal *Food Chemistry* (Bhattacharya et al., 2018). These elements help it maintain its reputation as a beneficial nutritional supplement, particularly in areas where access to fresh vegetables is scarce. Moringa is frequently utilized in Pakistani traditional medicine due to its medicinal properties. Its anti-inflammatory, antioxidant, and antibacterial qualities are covered in a review that was published in the *Journal of Ethnopharmacology*. These qualities have been used to treat a variety of conditions, such as infections, skin problems, and digestive problems (Moyo et al., 2020). Moreover, studies that were published in the *International Journal of Molecular Sciences* indicate that moringa seed extract may have hypolipidemic and hypoglycemic properties, which would make it advantageous for the treatment of cardiovascular disease and diabetes (Mahajan & Kamal, 2021). Additionally, investigations on ethnobotany carried out in Pakistan have confirmed the relevance of moringa in traditional medical techniques. These studies demonstrate the cultural importance of moringa and how it has been widely used for many generations in traditional medicines (Qasim et al., 2019).

#### **Ashwagandha (*Withania somnifera*)**

In Pakistani traditional medicine, ashwagandha (Figure 6), or *Withania somnifera* in scientific parlance, is used as an adaptogenic herb. Once known as "Indian ginseng" or "winter cherry," this plant has long been an essential part of Ayurvedic therapy (Chandrasekhar et al., 2012). Its complex pharmacological profile and adaptogenic qualities have made it a valuable traditional medicine for a wide range of diseases in Pakistan. In Pakistani traditional medicine, ashwagandha, or *Withania somnifera* in scientific parlance, is used as an adaptogenic herb. Once known as "Indian ginseng" or "winter cherry," this plant has long been an essential part of Ayurvedic therapy (Chandrasekhar et al., 2012). Its complex pharmacological profile and adaptogenic qualities have made it a valuable traditional medicine for a wide range of diseases in Pakistan.

Furthermore, Ashwagandha is valued for its ability to promote mental health by lowering anxiety and increasing cognitive function (Choudhary et al. 2017). Its common application in improving memory, focus, and mental clarity is indicative of its historical function in fostering holistic wellness. In Pakistani traditional medicine, ashwagandha's immune-modulating qualities are also highly prized (Wankhede et al., 2020). The immune system is said to be strengthened, improving resistance to infections and illnesses. This is especially important in areas where access to contemporary healthcare may be restricted.

#### **Discussion**

Pakistan's traditional medical plant knowledge and practices provide important insights into the nation's medical systems and cultural legacy. This conversation examines the importance, obstacles, and future prospects of combining traditional care with

contemporary pharmaceutical development, building on existing research and intellectual discourse.

In Pakistan, traditional medicine is essential to providing the healthcare requirements of millions of people, especially in underprivileged and rural areas. Traditional medicinal herbs are extensively utilized throughout the nation, according to a 2013 research by Abbasi et al., and indigenous knowledge is a crucial resource for providing healthcare. Hussain et al. (2019) have emphasized the ecological and cultural value of traditional healing methods, highlighting the deep-rooted link between humans and environment shown in this dependence on medicinal plants.

Furthermore, traditional medicine provides an affordable and culturally appropriate healthcare alternative, particularly for ailments that contemporary medications might not be able to adequately treat. According to Qureshi et al. (2018), traditional healers frequently offer individualized treatment based on each patient's requirements and beliefs. Pakistan may foster cultural diversity in medical treatment techniques and improve healthcare access by recognizing and integrating traditional healing practices into contemporary healthcare systems.

Even while traditional knowledge about medicinal plants is abundant, there are still a number of issues that need to be resolved. The sustainability of medicinal plant resources is seriously threatened by habitat degradation, overharvesting, and biodiversity loss (Bano et al., 2014). Furthermore, the preservation and dissemination of indigenous healing traditions are threatened by the rising urbanization and globalization that is eroding traditional knowledge (Abbasi et al., 2010).

However, there are ways to overcome these obstacles and maximize the potential of traditional medicine. The recording, validation, and integration of traditional healing techniques into contemporary healthcare systems can be facilitated by cooperative efforts involving researchers, government organizations, pharmaceutical corporations, and traditional healers. For instance, a study by Khan et al. (2016) emphasizes the value of collaborations between scientists and traditional healers in confirming the effectiveness of medicinal herbs.

Pakistani traditional medicine's future depends on how well it integrates with contemporary pharmacological advancements. Through the integration of cutting-edge scientific research and the knowledge of traditional healers, scientists may fully harness the potential of medicinal plants to create new medications that meet unmet medical needs. Traditional medicine has a rich reservoir of bioactive chemicals with therapeutic potential, as noted by Mahmood et al. (2017). These molecules serve as important leads for drug development and discovery. Furthermore, actions to safeguard the rights and knowledge of indigenous populations should go hand in hand with initiatives to maintain and advance traditional healing methods. Fostering respect and cooperation between traditional and modern medical systems requires ensuring

equal access to healthcare resources and recognizing the role played by traditional healers.

#### Conclusion:

In conclusion, Pakistan's traditional medical plant knowledge and practices constitute both an important cultural legacy and a vital resource for healthcare. Despite obstacles such as habitat degradation and the loss of traditional knowledge, there are chances to combine traditional treatment and modern pharmacological research. Pakistan may record, validate, and incorporate traditional healing techniques into contemporary healthcare systems by working with researchers, traditional healers, and government institutions. Integration has the potential to improve access to healthcare, encourage cultural variety, support economic growth, and aid in the protection of wildlife.

Pakistani traditional medicine's future depends on how well it integrates with contemporary pharmacological advancements. Pakistan has the ability to harness the healing powers of its indigenous medicinal plants and create innovative pharmaceuticals to tackle modern health issues by merging scientific research with the knowledge of traditional healers. In essence, by identifying, maintaining, and incorporating ancient healing traditions into contemporary healthcare systems, Pakistan may use the therapeutic potential of its medicinal plants for the benefit of its people while also contributing to global health initiatives.

#### Author contributions

A.R., H.A., and R.A. contributed equally to this work. A.R. conceived the study and designed the experiment. H.A. conducted the data analysis and interpretation. R.A. provided critical revisions to the manuscript and assisted with data collection. All authors reviewed and approved the final version of the manuscript.

#### Acknowledgment

Author was grateful to their department.

#### Competing financial interests

The authors have no conflict of interest.

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