

Ethnobotanical appraisal of plants of Takkar Wildlife Sanctuary and surrounding areas, District Khairpur, Sindh Pakistan

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Abstract- Takkar Wildlife Sanctuary is home to diverse flora and fauna. The residents of this wildlife have their culture, lifestyle, beliefs, and traditions, and have used native plants in a variety of ways over many generations. In order to preserve the ethnobotanical information of native populations of the area, an ethnobotanical study was conducted to document the herbal medicinal plants. The field study used questionnaires to interview local informants, aged 50 to 65, who were familiar with the common use of herbal medicinal plants. The data were collected based on plant medicinal uses, local names, botanical names, and plant families and a use-value (UV) of each medicinal plant species were calculated. A total of twenty-two medicinally valuable plant species from sixteen families were identified which have been used to treat a wide range of disorders. Fabaceae was the most common plant family in ethnomedicine with four species, followed by Apocynaceae, Asteraceae, and Zygophyllaceae (two species each). As a result of the ethnobotanical experience, leaves (35%) were the most readily used plant part, followed by whole plant parts and roots (16%), fruit, flowers, and seeds (9% each), bark (4%), branches, and latex (2%). Mode of preparation were

infusions (35%), powder (20%), decoctions (9%), tea (6%), ash, smoke, wrap, and gum (3% each). In applications of these plants as medicine, oral (81%) intake was the dominant route of administration. On the use value index, *Salvadora oleoides* (1.55), *Prosopis juliflora* (1.45), *Calotropis procera* (1.41), *Capparis decidua* (1.36), *Aerva javanica* (1.32), *Acacia nilotica* (1.27), *Leptadenia pyrotechnica* (1.23), and *Ziziphus nummularia* (1.18) were recorded the most useful in medicines purposes. While the rest of the species had a use value of less than 1.5. This research was carried out to document important ethnobotanical plant species in a study area that has not been previously reported (to our knowledge). Ethnobotanical knowledge is only available to elders of the villages and health practitioners. This traditional knowledge is declining due to a lack of interest from younger generations. There are several threats to these medicinal plant species, including overgrazing, uprooting, erosion, population growth, mining, deforestation, and climate change.

Keywords- Ethnobotany, Medicinal plants, use value, Takkar Wildlife Sanctuary, Khairpur

I. INTRODUCTION

Plants have played a significant role in human wellbeing for thousands of years due to a large number of ecosystem services they offer, such as serving as a source of medicine, timber, fuel, and food, to maintain life on earth (Ijaz *et al.*, 2016; Ullah *et al.*, 2020). A wide variety of medicinal plants contribute to the preservation of human health around the globe and particularly in tropical regions. The rich source of traditional knowledge is commonly documented from remote areas (Abbas *et al.*, 2016). The Local communities of arid and mountainous regions generally rely primarily on traditional plants for different purposes such as domestic animal feed, human nutritional and vitamin supplements, components in utilitarian devices, indicator of seasonal change, and ingredients of various medications. A large number of cultural aspects associated with plant species such as folk tales, rituals, and taboos, are also studied in ethnobotanical research (Qureshi and Ashraf 2007; Qasim and Ansari, 2014). Some medicinal plant species have a similar origin to edible plants, which makes it difficult to distinguish them from edible plants. It has been found that a large number of herbal medicinal plants can be used as

salads or vegetables as well as colouring, flavouring, and spicing agents (Qasim and Ansari, 2014).

A wide range of flora exists in Pakistan due to diverse climatic conditions; a large portion of the country is rich in medicinal herbs (Begum *et al.*, 2014). Local communities from various geographical regions use a variety of ethnobotanical plants extracted from the wild, many of which have been used by them for centuries (Abbasi *et al.*, 2013). Many medicinal plants have been studied for their medicinal characteristic and appropriate use of those plants in the community have been studied. However many more species remain to be discovered. Even though about 84% of people in the country rely on herbal supplements to maintain their health; plant science is a virgin field in Pakistan from a scientific standpoint (Ghimire *et al.*, 2015). As a result, there is a dearth of traditional information about valuable plants. There are many reports about the use of ethnobotanical plant species from the different areas of Pakistan (Ibrar *et al.*, 2007; Sher and Hussain, 2009; Ahmed *et al.*, 2013; Noman *et al.*, 2013; Shaheen *et al.*, 2014; Rahman *et al.*, 2017; Umair *et al.*, 2017; Shuaib *et al.*, 2019). these medicinal plants species have been used to cure various ailments such as respiratory disorders,

gastrointestinal ailments, rheumatic disorders, digestive disorders, skin, and oral infections and hepatic diseases (Baloch *et al.*, 2017; Ijaz *et al.*, 2016; Umair and Abbasi, 2017). More than 6000 plant species have been recorded in Pakistan but ethnobotanical information of only 600 plant species has been documented so far (Shinwari, 2014).

Medicinal plants in Pakistan are under threat from several factors. They include indigenous communities and a lack of understanding on the part of the government of the region in which they thrive. Residents are unaware of any research work undertaken to conserve medicinal plants, as well as any threats to medicinal plants and any recommendations made by officials and specialists (Nishteswar, 2014). The younger generation is least interested in gaining this important knowledge. This knowledge is diminishing over time. The preservation of indigenous plant knowledge and the protection of the environment is vital.

This field is well known around the world and a lot of research has been undertaken in different parts of the world (Abdela and Sultan, 2018; Cheikhoussef *et al.*, 2011; Sharma and Kumar, 2011; Borgohain *et al.*, 2017; Tsioutsiou *et al.*, 2019; Chinsebu and Hedimbi, 2010). The literature review showed that no study has been conducted on the medicinal plants of the Takkar Wildlife Sanctuary. Therefore, this research was designed to investigate the common use of medicinal plants by rural populations in the Takkar Wildlife Sanctuary area to cure various diseases.

II. MATERIALS AND METHODS

Socioeconomic and ethnographic background of the study area

The Takkar Wildlife Sanctuary is located in the southern part of Sindh Province (27°21'03" N, 68°52'50" E) Pakistan (Figure 1). The total area is 43 thousand hectares in the Khairpur District. Takkar's habitat is important for ecological and biological processes to maintain the sustainability of life. Due to its huge conservation value, Takkar Wildlife Sanctuary has been registered under the IUCN habitat category-IV. A range of anthropogenic activities has severely affected the Takkar Wildlife Sanctuary such as a cutting of a large number of trees for fodder, fuel, coal, timber, construction of huts, mining activities and overgrazing. These activities pose a serious threat to the Wildlife Sanctuary's biodiversity. The study area is characterized by steep and gentle slopes, sandy hills, sandy soil with a mixture of clay and loose stones, and moderately calcareous. Winter temperatures can drop as low as 7°C, while the summer temperature can rise as high as 45°C (PMD, 2021). The socioeconomic status of indigenous communities is varied and largely poor in the study area. Most of their income came from agriculture, and some had small trades and businesses. There are many farmers in the area, while others work in stone mining. For better socioeconomic conditions, locals tend to keep domestic animals at home. People living in rural hilly areas, however, have limited access to allopathic medications. Therefore, locals use traditional herbal remedies rather than medical drugs. Their herbal remedies prepared by Hakim (a herbalist) or traditional healers are deeply influenced by religious and cultural traditions. It was only the hakims (herbalists) and

elders of the communities in the study area who knew well about herbal medications.

Ethnobotanical study

The ethnobotanical study was conducted by interviewing plant collectors, local informants, and local healers (Hakims). Who are knowledgeable with medicinal plant uses, including medicinal, veterinary, vegetables, fruits, fodder, fuel, and other uses. A questionnaire was used for interviewing people to gain information about the importance of ethnobotanical plants. Twenty-two (22) people aged between 50-65 years were interviewed. Of them, twelve were local healers or traditional herbal practitioners, known as Hakims (herbalists). Interviews were conducted according to prepared questions in English and interpreted when necessary into common languages. The knowledge about medicinal plants such as common names, methods of disease treatment, dosage, and application methods was noted. The unidentified plant species were brought to the Herbarium of Shah Abdul Latif University, Khairpur for correct taxonomic identification. As per standard protocol, the specimen of the plant was processed to prepare Herbarium sheets (Bridson, and Forman 1992). The species were identified with the help of the flora of Pakistan, taxonomic literature, and online databases (Bhandari 1987; Batanouny 1987; Missouri Botanical Garden 2020; Qureshi, 2012). Herbarium sheets have been submitted to the University's Herbarium, the Centre for Biodiversity and Conservation at Shah Abdul Latif University, Khairpur for future reference and record-keeping.

Use value (UV) of medicinal plants

All reported applications of a plant species provided by informants were estimated by using the use value (UV). It was calculated by using the following formula

$$UV = \{UI/N\}$$

The total number of plant species used by each inhabitant was represented by UI, while the total number of inhabitants were represented by N.

III. RESULTS

Taxonomic diversity of ethnobotanical plants

We recorded twenty-two medicinal plant species namely; *Acacia nilotica*, *Aerva javanica* var. *javanica*, *Calotropis procera*, *Capparis decidua*, *Cassia italic*, *Cistanche tubulosa*, *Citrullus colocynthis*, *Corchorus depressus*, *Cymbopogon jwarancusa*, *Fagonia indica*, *Heliotropium europaeum*, *Indigofera oblongifolia*, *Launaea procumbens*, *Leptadenia pyrotechnica*, *Mukia maderaspatana*, *Prosopis juliflora*, *Salvadora oleoides*,



Figure 1 Map showing the study area, Takkar Wildlife Sanctuary, District Khairpur, Sindh, Pakistan

Tamarix aphylla, *Tephrosia uniflora*, *Tribulus terrestris*, *Zaleya pentandra* and *Ziziphus nummularia* belonging to sixteen plant families, which were utilized to cure a variety of human ailments (Table 1). The majority of examined medicinal plant species belonged to Fabaceae with four species such as *Acacia nilotica*, *Indigofera oblongifolia* and *Prosopis juliflora* followed by Apocynaceae with two species (*Calotropis procera* and *Leptadenia pyrotechnica*), Asteraceae with two species (*Mukia maderaspatana* and *Launaea procumbens*), and Zygophyllaceae (*Fagonia indica* and *Tribulus terrestris*) (Table. 1) whereas the rest of the families such as Amaranthaceae, Capparidaceae, Caesalpiniaceae, Orobanchaceae, Cucurbitaceae, Malvaceae, Poaceae, Boraginaceae, Solvadroaceae, Tamaracaceae, Aizoaceae and Rhamnaceae were represented by single species each (Figure. 2).

Health problems of the communities in the study area

Our study showed that the local communities of Takkar Wildlife Sanctuary were suffering from various health problems; the most common being respiratory disorders, cough, cold, flu and fever, gastrointestinal (GIT) disorders, urinary disorders, stomach disorders, gums disorders, skin diseases, blood pressure, joint pain, ringworm, measles, bones fractured and labour pain .

Plant parts used for herbal medications

The local people used the plants in different ways mostly based on their local traditions. In the preparation of herbal medications, leaves were the most frequently used plant parts, followed by whole plant parts and root, fruit, seed and flower (9% each), bark (4%), branches, and latex (2% each). In the case of the preparation of remedial herbs, though, the use of leaves and the whole plant was predominant (Figure. 3).

Therapeutic and ethnobotanical use

Out of the twenty-two medical plant species studied, 57 percent were utilized for therapeutic reasons, followed by fodder (23 %), timber (15 %), and food (5 %). Different population sections were discovered to use different plant portions of the same species for diverse reasons at the same time, resulting in highly overlapping categories (Figure. 4).

Methods of preparing traditional recipes

Most plant species (35%) are recorded as being used as infusions. There are also plants used as a powder (20%), extract (18%), decoctions (9%), tea (6%) as well as ash, smoke, wrap, and gum (3% each) (Figure. 5). Multi-plant formulations were created by traditional practitioners and semiprofessional herbalists. A powder of many plants or their parts was taken orally with water or other indigents or in Phakki formula in many pathogenic conditions. In some cases, adverse drug reactions have resulted from overdosage and malpractice.

Method of administration

As per ancient belief that human illnesses are caused by an abnormality in the body's internal structure, a large portion of medication preparations are consumed orally (81%) and 19% to be used as an external application such as knee pain, bone fractures, skin infection, wounds, swellings body parts and pain management (Table. 1). While some plant species are used as chewing sticks namely *Capparis decidua*, *Citrullus colocynthis*, and *Salvadora oleoides*.

Table 1 Ethnomedicinal information and use value (UV) of the plant species recorded at Takkar Wildlife Sanctuary, Khairpur Sindh

S.No.	Family	Species	Local name	English name	Use Value	Plant Parts in use								Application			Recipes							Diseases											
						Leaf	Bran	Root	Flow	Fruit	Seed	Bark	Latex	Whol	Oral	Topic	Infusi	Deco	Powd	Tea	Gum	Extra	Ash		Smok	Wrap									
1	Aizoaceae	<i>Zaleya pentandra</i> (L.) Jeffrey.	Waho	Spiny fruit	0.59									✓	✓																				kidney stone, Cough, flue
2	Amaranthaceae	<i>Aerva javanica</i> (Burm.f.) Juss. ex.	Booh	Desert cotton	1.32	✓		✓						✓	✓	✓		✓																Headache and Skin diseases	
3	Apocynaceae	<i>Calotropis procera</i> (Aiton)W.T., Aiton	AK	Swallow-wart	1.41	✓			✓			✓	✓	✓	✓	✓		✓													✓		Dysentery, Asthma, cough, Snakebite		
4	Apocynaceae	<i>Leptadenia pyrotechnica</i> (Forsk.) Decne.	Khip	Broom bush	1.23	✓								✓		✓																	Ringworm		
5	Asteraceae	<i>Launaea procumbens</i> (Roxb) Ramayya & Rajagopal.	Bhattar	Dandelion	0.55	✓		✓							✓	✓	✓						✓										Hepatitis, Flue, Ringworm, Skin infection		
6	Asteraceae	<i>Mukia maderaspatana</i> (L.) M. Roem.		Madars Pea pumpkin	0.68			✓							✓		✓	✓															Toothache, cough		
7	Boraginaceae	<i>Heliotropium europaeum</i> L.	Kharsan	Turnsole	0.95	✓										✓	✓																Skin infections		
8	Caeslpinaceae	<i>Cassia italica</i> (Mill.) Spreng.	Ghora wal	Senegal senna	0.82				✓		✓				✓				✓	✓													Constipation, Hemorrhoids, labor pain		
9	Capparidaceae	<i>Capparis decidua</i> (Forssk.) Edgew.	Kirar	Capper	1.32	✓										✓	✓																Cough, Asthma, Fractured bones		
10	Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) Schrad.	Trooh	Bitter cucumber	0.82			✓		✓	✓				✓		✓																Constipation, Blood pressure, Toothache		
11	Fabaceae	<i>Acacia nilotica</i> (L) Delile	Sindhi babur	Arabic tree	1.27	✓	✓			✓				✓	✓				✓			✓											Diarrhea, Diabetes mellitus, Constipation		
12	Fabaceae	<i>Indigofera oblongifolia</i> Forssk.	Jhill	Nilam	0.68	✓										✓								✓									Skin infection		
13	Fabaceae	<i>Prosopis juliflora</i> (Sw.) DC	Devi	Mesquet	1.45	✓			✓				✓	✓	✓																		Asthma		
14	Fabaceae	<i>Tephrosia uniflora</i> Pers.	Andhari	Wild Indigo	1.05			✓							✓	✓									✓								Toothache, diarrhea		
15	Malvaceae	<i>Corchorus depressus</i> Stocks.	Mundheri	Mountain Jute	0.77	✓									✓	✓																	Jaundice, Heatstroke, Pile cure, Stomach		
16	Orobanchaceae	<i>Cistanche tubulosa</i> (Schrenk) Hook.f.		Desert hyacinth	0.95									✓	✓				✓														Diarrhea		
17	Poaceae	<i>Cymbopogon jwarancusa</i> (Jones) Schult.	Katan	Common scented grass	0.73	✓			✓						✓										✓								Flue, Fever		
18	Rhamnaceae	<i>Ziziphus nummularia</i> (Burm.f.) Wt. & A.	Jhangli Ber	Ziziphus/ Jujube	1.18	✓				✓					✓	✓	✓								✓								Joints pain, Blood purifier, Antidandruff		
19	Solvadroaceae	<i>Salvadora oleoides</i> Decne.	Jar/Peroon	Salvadora	1.55	✓		✓		✓	✓				✓	✓	✓								✓							Constipation, Pyorrhea, Athlete's foot			
20	Tamaracaceae	<i>Tamarix aphylla</i> (L.) Karst.	Lano	Tamarix	1.09	✓										✓			✓											✓		Typhoid fever, Cough, Measles			
21	Zygophyllaceae	<i>Fagonia indica</i> Burm f.	Dhamaaho	Prickly clover	0.68	✓								✓	✓	✓	✓		✓														Asthma, Inflammation in the urinary bladder,		
22	Zygophyllaceae	<i>Tribulus terrestris</i>	Bakhro/Bhurt	Calthrop	0.77			✓			✓				✓			✓	✓											✓			Jaundice, Heatstroke, Urinary disorders,		

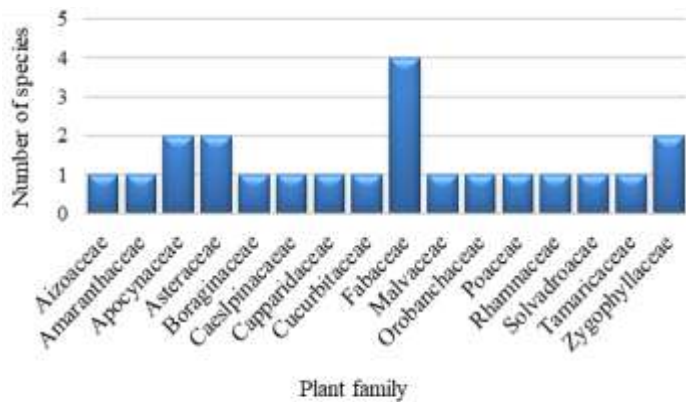


Figure 2 Species richness of Plant families identified at the Takkar Wildlife Sanctuary

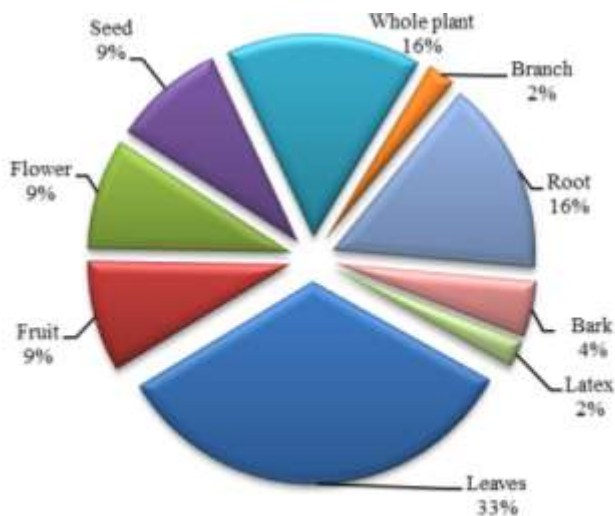


Figure 3 Plants parts percentage used to cure various ailments.

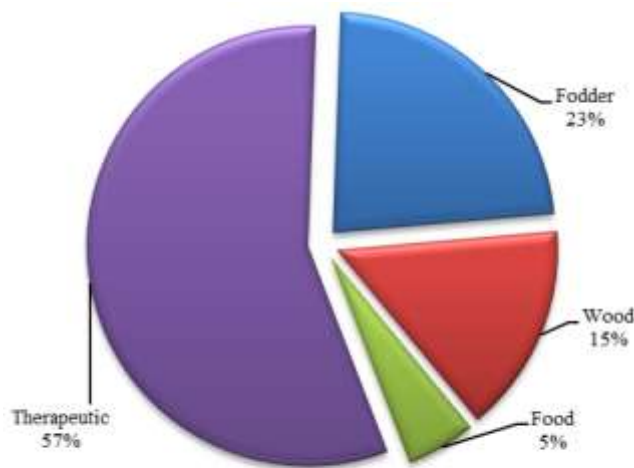


Figure. 4 Major plant used catogries from the study area.

Number of taxa used for treating the various ailment categories

There are approximately 16 different categories of ailments were reported from the number of taxa used for the curing of these ailment categories (Figure 6). In terms of the number of taxa treated for each ailment category, cough, fever, cold, and flu were among the most common (8), followed by Gastrointestinal (GIT) disorders (8), respiratory disorders (5), skin diseases and gums disorders (4 each), urinary disorders (3), heatstroke and ringworm (2 each) (Figure.6). It was observed from this study that many local people of the area work in the fields and thus are more susceptible to fevers, colds, and flu; therefore, they take more precautions in protecting themselves from such conditions.

The use value of medicinal plants

There were eight (08) medicinal plant species documented as the most valuable from the study area. *Salvadora oleoides* (1.55), *Prosopis juliflora* (1.45), *Calotropis procera* (1.41), *Capparis decidua* (1.36), *Aerva javanica* (1.32) *Acacia nilotica* (1.27), *Leptadenia pyrotechnica* (1.23), *Ziziphus nummularia* with use-value (1.18), were observed most useful in medicines purposes. While the rest of the species have a use-value less than 1.5 (Table.1). The usage value indicates the relative importance of medicinal plant species used regions.

IV. DISCUSSION

The Takkar area's local communities have their own culture and values. Their traditional way of life, which includes the use of plants in their chores, connects people closer to the natural world. The medicinal herbs are employed as part of the community's cultural knowledge, which is passed down from generation to generation and constitutes a heritage. The study area is rich in diverse vegetation with twenty-two medicinal plant species. This region is also rich in traditional herbal knowledge and practice, with local people using plant species for various daily use for medicinal reasons, fodder, fuelwood, and food. This indicated that there exists a spectrum of traditional herbal knowledge among the local communities which could be scientifically used for human wellbeing.

In the study area, the majorities of the inhabitants were poor and live in rural areas where modern health care services are out of reach for them. As a result, these people depend on the medicinal plants that can be found in the vicinity. People use herbal preparations to cure minor health issues. The community is familiar with the healing properties of indigenous plants and made herbal medication at home following the recommendation of the elders. The reason for the local communities of area deep trust in plant-based medicines is the prevalence of herbalists, who are also experienced in the spirituality aspect of recovery. Mostly, traditional healers are often familiar with the belief in insufflation (prayers) that go along with administering herbal formulations (Nortje *et al.*, 2016; Kamsani *et al.*, 2020)

Our study reported that Fabaceae, Apocynaceae, Asteraceae, and Zygophyllaceae were the most represented families. The importance and acceptance of families are based on the existence of some phytochemicals that can be effective in conditions of pathological treatment. Furthermore, the use of any particular family may be attributed to its familiarity with locals and its predominance in the geographical region (Akhtar *et al.*, 2013; Khan *et al.*, 2021; Seleteng and Van, 2015). However, in most of the research studies in Pakistan (Bibi *et al.*, 2014; Kayani *et al.*, 2015) and throughout the world (Polat *et al.*, 2015) that Fabaceae and Asteraceae are commonly documented because they are distributed naturally in the study regions.

Our findings showed that the local communities of the study area have used the leaves most frequently for healing purposes. In comparison to other parts of the plant, leaves have more active phytochemicals (Aziz *et al.*, 2018; Khan *et al.*, 2021). As a result, they may have great potential in the treatment of various disorders. Moreover, leaves play an important role in the synthesis of primary molecules, which act as a basis for the synthesis of secondary metabolites, and they can be more easily collected than other parts, such as roots (Ghorbani, 2005). On the contrary, roots have been identified as the most important component utilized in the preparation of medicinal recipes in Traditional Chinese Medicine (Abdela and Sultan, 2018; Rahman *et al.*, 2017).

The infusion was the most common mode of utilization in the preparation of herbal medications. An infusion differs from a decoction in that the former is a liquid preparation that is made by pouring boiling water over a very finely chopped plant material. While the latter is boiled together with water from which the plant material was obtained (Husain *et al.*, 2008; Begum *et al.*, 2014). The active component of an ethnomedicine differs from plant species to species; for example, the leaf may be active for one species while the root may be active for another. Therefore, Phytopharmacological screening of all parts of the plant is essential to discover novel chemicals for contemporary allopathic medicines. Medication preparation and administration approaches used by local herbalists were recorded in this study. Traditionally, ethnomedicine is taken orally in combination with other ingredients. Some medications are bitter in the test so that to reduce the bitterness, these medications were taken in combination with some chemical ingredients such as additives, solvents to minimize toxic side effects including vomiting and diarrhoea, and increase drug efficacy (Khan *et al.*, 2014)

During the present study, the mode of administration and formulation of medication preparation mostly depends upon the type of healing conditions. Skin infections and traumas were treated with externally applied medication remedies, while oral administration is the only way to treat internal problems. Oral administration is also needed for certain skin diseases and traumas as a result, the majority of the medicines recommended by herbalist are taken orally.

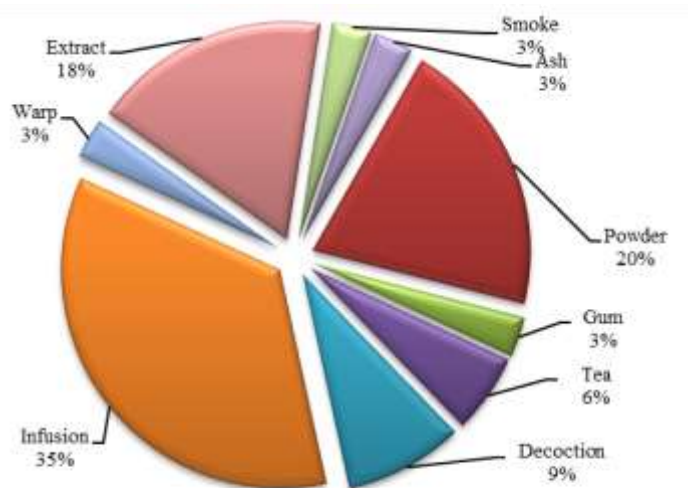


Figure 5 Method of utilization of medicinal plants for treating the wide range of disorder

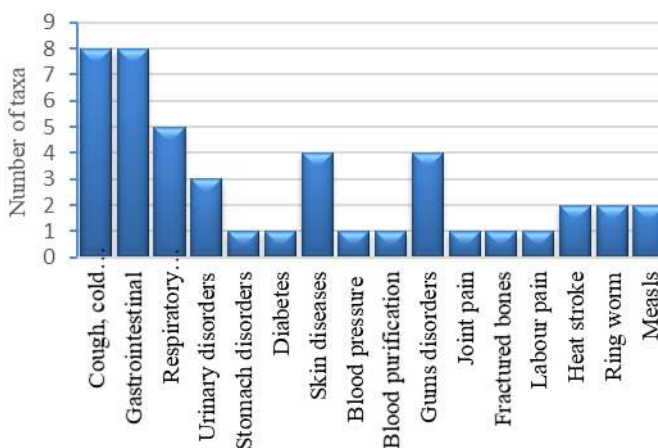


Figure 6 Number of taxa used for the treatment of various diseases

Most of the medicines were taken orally. When it came to oral herbal remedies, the powdered plants are generally consumed with mixed water or made into decoctions. Juices are rarely extracted from plants (Aziz *et al.*, 2018). On the other hand, these herbal medications are used in the form of grind herb and paste to cure various skin disorders. Various other studies have identified decoctions as a commonly used medicinal herb (Akhtar *et al.*, 2013). Herbal medicine has been documented for treating a wide range of ailments and disorders. In general, most treatments were centred around one herb because it was highly potent, tasty, and non-toxic. A mixture of two or more plants was sometimes used to make medicines to gain maximum therapeutic effects (Abbasi *et al.*, 2013).

The most common illnesses in the research area are gastrointestinal issues and respiratory disorders. Several factors might contribute to these illnesses in the study area, including high

air and water pollution, fuel-wood smoke within homes, and low food quality. In the study region as well as across the country, gastrointestinal diseases and respiratory infections, such as diarrhoea, cholera, cough, dysentery, as well as bronchitis and asthma, are the main concerns (Younis *et al.*, 2018). If not treated immediately, it has a high mortality rate.

The local communities of the Takkar area use local vegetation to fulfil their various daily needs, such as cutting down large numbers of trees in the area. Wood was used as a fuel source and was also sold in the local market as timber. They use native plants for various purposes including farming implements, roof thatching, mats and baskets, and religious purpose. As a result, Takkar's native tropical thorn forest, which includes; *Tamarix aphylla*, *Prosopis juliflora*, *Capparis decidua*, *Salvadora oleoides*, and *Ziziphus nummularia* are rapidly vanishing. Various studies have documented the depletion of valuable medicinal plant resources through deforestation, overgrazing, agricultural development, acculturation, ecological destruction, enhanced by population pressure and poverty (Hussain *et al.*, 2010).

V. CONCLUSION

Plant species are used in the region for the treatment of a wide array of diseases, including respiratory disorders, gastroenteritis, rheumatic disorders, digestive problems, skin and oral infections, and hepatitis, as well as for different other purposes such as fuel, wood, and fodder. Socioeconomic conditions, shifting lifestyles, and a lack of resources cause the local population to overexploit the medicinal flora. The study area has been threatened by mining activities, overgrazing and medicinal plant collection. As a result of such activities, the population of plant species like *Ziziphus nummularia*, *Capparis decidua*, *Acacia nilotica*, *Tamarix aphylla*, and *Salvadora oleoides*, have significantly declined. To protect these plant species, steps such as controlled grazing, reforestation, and rangeland management must be taken. Additionally, the need to preserve traditional knowledge is crucial to protecting local flora. Awareness among the local communities about the conservation and sustainable use of resources is also crucial.

VI. ACKNOWLEDGMENT

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VII. REFERENCES

- [1] F. Ijaz *et al.*, "Investigation of traditional medicinal floral knowledge of Sarban Hills, Abbottabad, KP, Pakistan," *J. Ethnopharmacol.*, vol. 179, pp. 208–233, 2016.
- [2] K. Ullah, G. M. Shah, J. Alam, and M. Hussain, "Ukrainian Journal of Ecology Ethnobotany of the Medicinal Plants Used by Indigenous Communities in the Mountain of Shishikoh Valley , Hindukush," *Ukr. J. Ecol.*, vol. 10, no. 2, pp. 92–105, 2020.
- [3] Z. Abbas, S. M. Khan, A. M. Abbasi, A. Pieroni, and Z. Ullah, "Ethnobotany of the Balti community , Tormik Ethnobotany of the Balti community , Tormik valley , Karakorum range , Baltistan , Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 12, no. 38, pp. 2–15, 2016.
- [4] R. A. Qureshi, S. A. Gilani, and M. Ashraf, "Ethnobotanical studies of selected medicinal plants of Sudhan gali and Ganga chotti hills, district bagh, Azad kashmir," *Pak. J. Bot.*, vol. 39, no. 7, pp. 2207–2215, 2007.
- [5] M. Qasim, Z. Abideen, and R. Ansari, "Traditional ethnobotanical uses of medicinal plants from coastal areas of Pakistan," *J. Coast. Life Med.*, vol. 2, no. 1, pp. 22–30, 2014.
- [6] S. Begum, N. M. AbdElIslam, M. Adnan, A. Tariq, A. Yasmin, and R. Hameed, "Ethnomedicines of highly utilized plants in the temperate Himalayan region," *Afr. J. Tradit. Complement. Altern. Med.*, vol. 11, no. 3, pp. 132–142, 2014.
- [7] A. M. Abbasi, M. A. Khan, M. H. Shah, M. M. Shah, A. Pervez, and M. Ahmad, "Ethnobotanical appraisal and cultural values of medicinally important wild edible vegetables of Lesser Himalayas-Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 9, no. 1, pp. 1–13, 2013.
- [8] K. Ghimire, B. Janmajoy, G. amit kumar, and D. Prasanna, "Phytochemical constituents and pharmacological Uses of medicinal plant *Achyranthes aspera*: a review," *World J. Pharm. Res.*, vol. 4, no. 1, pp. 470–480, 2015.
- [9] M. Ibrar, F. Hussain, and A. Sultan, "Ethnobotanical studies on plant resources of Ranyal Hills, District Shangla, Pakistan," *Pak. J. Bot.*, vol. 39, no. 2, pp. 329–337, 2007.
- [10] A. Ahmad *et al.*, "In-situ conservation of *Commiphora wightii* : an endangered medicinal shrub through integrated participatory approach in the Nagarparkar Hills of Tharparkar, Pakistan," *Univers. J. Agric. Res.*, vol. 1, no. 3, pp. 103–109, 2013.
- [11] A. Noman, I. Hussain, Q. Ali, M. A. Ashraf, and M. Z. Haider, "Ethnobotanical studies of potential wild medicinal plants of Ormara, Gawadar, Pakistan," *Emirates J. Food Agric.*, vol. 25, no. 10, pp. 751–759, 2013.
- [12] H. Shaheen, R. Qureshi, A. Akram, and M. Gulfranz, "Inventory of Medicinal Flora from Thal Desert, Punjab, Pakistan," *African J. Tradit. Complement. Altern. Med.*, vol. 11, no. 3, p. 282, Jul. 2014.
- [13] T. U. Rahman, M. A. Zeb, W. Liaqat, M. Sajid, S. Hussain, and M. I. Choudhary, "Phytochemistry and pharmacology of genus *Indigofera*: A review," *Rec. Nat. Prod.*, vol. 12, no. 1, pp. 1–13, 2018.
- [14] M. Umair, M. Altaf, and A. M. Abbasi, "An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan," *PLoS One*, vol. 12, no. 6, pp. 1–22, 2017.
- [15] M. Shuaib *et al.*, "Ethnobotanical and ecological assessment of plant resources at District Dir, Tehsil Timergara, Khyber Pakhtunkhwa, Pakistan," *Acta Ecol. Sin.*, vol. 39, no. 1, pp. 109–115, Feb. 2019.
- [16] A. H. Baloch, I. A. Baloch, Hanif-ur-Rehman, I. Ahmed, and S. Ahmed, "A study of poisonous plants of Balochistan, Pakistan," *Pure Appl. Biol.*, vol. 6, no. 3, pp. 989–1001, 2017.
- [17] Z. K. Shinwari, "Medicinal plants research in Pakistan," *J. Med. Plants Res.*, vol. 4, no. 3, pp. 161–176, 2014.

- [18] K. Nishteswar, "Depleting medicinal plant resources: A threat for survival of Ayurveda," *AYU (An Int. Q. J. Res. Ayurveda)*, vol. 35, no. 4, p. 349, 2014.
- [19] G. Abdela and M. Sultan, "Indigenous Knowledge, Major Threats and Conservation Practices of Medicinal Plants by Local Community in Heban Arsi District, Oromia, South Eastern Ethiopia," *Adv. Life Sci. Technol.*, vol. 68, no. 10, pp. 8–26, 2018.
- [20] K. C. Chinsebu and M. Hedimbi, "2010 Chinsebu and Hedimbi IJBMBR Ethnomedicinal plants and other natural products with anti-HIV active compounds and their putative modes of action," *Int. J. Biotechnol. Mol. Biol.*, vol. 1, no. 6, pp. 74–91, 2010.
- [21] A. Cheikhoussef, M. Shapi, K. Matengu, and H. M. Ashekele, "Ethnobotanical study of indigenous knowledge on medicinal plant use by traditional healers in Oshikoto region, Namibia," *J. Ethnobiol. Ethnomed.*, vol. 7, no. 10, pp. 1–11, 2011.
- [22] H. Sharma and A. Kumar, "Ethnobotanical studies on medicinal plants of Rajasthan (India): A review," vol. 5, no. 7, pp. 1107–1112, 2011.
- [23] B. Borgohain, J. Mahanta, R. Islam, D. Sapkota, S. Sarma, and M. Borah, "Effect of Feeding Garlic (*Allium sativum*) as Prebiotic on the Performance of Broiler Chicken," *Int. J. Livest. Res.*, vol. 7, no. 17, pp. 225–233, 2017.
- [24] E. E. Tsioutsiou, P. Giordani, E. Hanlidou, M. Biagi, V. De Feo, and L. Cornara, "Ethnobotanical Study of Medicinal Plants Used in Central Macedonia, Greece," vol. 2019, no. September 2017, pp. 1–22, 2019.
- [25] PMD, "Weather update: Pakistan Meteorological Department," *Pakistan Meteorological Department*, 2021. [Online]. Available: <https://www.pmd.gov.pk/>. [Accessed: 12-Oct-2021].
- [26] L. Bridson, D. and Forman, *The Herbarium hand book*. Kew: Royal Botanic Garden, 1992.
- [27] M. M. Bhandari, *Flora of Indian desert*. Jodhpur: Scientific publisher, 1987.
- [28] K. H. Batanouny, *Ecology and flora of Qatar*. Doha: Centre for Scientific and Applied Research, University of Qatar, 1987.
- [29] Missouri Botanical Garden, "Flora of Pakistan: Pakistan plant database," 2021. [Online]. Available: <http://www.tropicos.org/Project/Pakistan>. [Accessed: 15-Nov-2021].
- [30] R. Qureshi, *The flora of Nara Desert, Pakistan*. London: Nova Biomedical, 2012.
- [31] G. Nortje, B. Oladeji, O. Gureje, and S. Seedat, "Effectiveness of traditional healers in treating mental disorders: A systematic review," *The Lancet Psychiatry*. pp. 70-154., 2016.
- [32] K. Kamsani, F. M. Franco, and F. Slik, "A comparative account of the traditional healing practices of healers and non-healers in the Kiudang area of Brunei Darussalam," *J. Ethnopharmacol.*, vol. 28, no. 34, p. 256:112788., 2020.
- [33] N. Akhtar, A. Rashid, W. Murad, and E. Bergmeier, "Diversity and use of ethno-medicinal plants in the region of Swat, North Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 9, no. 1, pp. 1–13, 2013.
- [34] M. F. Khan *et al.*, "An ethnopharmacological survey and comparative analysis of plants from the Sudhnoti District, Azad Jammu and Kashmir, Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 17, no. 1, pp. 1–23, 2021.
- [35] L. Seleteng Kose, A. Moteeteetee, and S. Van Vuuren, "Ethnobotanical survey of medicinal plants used in the Maseru district of Lesotho," *J. Ethnopharmacol.*, vol. 170, pp. 184–200, 2015.
- [36] T. Bibi *et al.*, "Ethnobotany of medicinal plants in district Mastung of Balochistan province-Pakistan," *J. Ethnopharmacol.*, vol. 157, no. 18, pp. 79–89, 2014.
- [37] S. Kayani *et al.*, "Ethnobotany of medicinal plants among the communities of Alpine and Sub-alpine regions of Pakistan," *J. Ethnopharmacol.*, vol. 164, no. February, pp. 186–202, 2015.
- [38] R. Polat, U. Cakilcioglu, K. Kaltaliolu, M. D. Uluhan, and Z. Turkmen, "An ethnobotanical study on medicinal plants in Espiye and its surrounding (Giresun-Turkey)," *J. Ethnopharmacol.*, vol. 15, no. 2, pp. 1–11, 2015.
- [39] M. A. Aziz, M. Adnan, A. H. Khan, A. A. Shahat, M. S. Al-Said, and R. Ullah, "Traditional uses of medicinal plants practiced by the indigenous communities at Mohmand Agency, FATA, Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 14, no. 1, pp. 1–16, 2018.
- [40] A. Ghorbani, "Studies on pharmaceutical ethnobotany in the region of Turkmen Sahra, north of Iran (Part 1): General results," *J. Ethnopharmacol.*, vol. 102, no. 1, pp. 58–68, 2005.
- [41] S. Z. Husain, R. N. Malik, M. Javaid, and S. Bibi, "Ethnobotanical properties and uses of medicinal plants of Morgah Biodiversity Park, Rawalpindi," *Pak. J. Bot.*, vol. 40, no. 5, pp. 1897–1911, 2008.
- [42] A. Bano and M. A. and M. A. A., Mushtaq Ahmad, Taibi Ben Hadda, Abdul Saboor4, Shazia Sultana Muhammad Zafar Muhammad Pukhtoon Zada Khan, "Quantitative ethnomedicinal study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan," *J. Ethnobiol. Ethnomed.*, vol. 10, no. 43, pp. 1–17, 2014.
- [43] W. Younis, H. Asif, A. Sharif, H. Riaz, and I. A. Bukhari, "Traditional medicinal plants used for respiratory disorders in Pakistan: a review of the ethno - medicinal and pharmacological evidence," *Chin. Med.*, vol. 48, no. 4, pp. 2–29, 2018.
- [44] P. Nasoora and J. Harshberger, "Asian Pacific Journal of Tropical Biomedicine," *Asian Pac. J. Trop. Biomed.*, vol. 5, no. 3, pp. 234–241, 2015.
- [45] A. Hussain, M. A. Farooq, M. Ahmed, M. U. Zafar, and M. Akber, "Phytosociology and structure of Central Karakoram National Park (CKNP) of Northern areas of Pakistan," *world Appl. Sci. J.*, vol. 9, no. 1, pp. 1443–1449, 2010.

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