



## RESEARCH PAPER

## OPEN ACCESS

## Ethnobotanical survey of medicinal plants used as a remedy in District Malakand, KP, Pakistan

Rohul Amin<sup>1</sup>, Abd Ullah<sup>2</sup>, Imtiaz Ahmad<sup>3</sup>, Yu-Jie Fu<sup>\*1</sup>

<sup>1</sup>School of Forestry, Department Forest Manager, Beijing Forestry University, China

<sup>2</sup>School of Life Sciences, Northeast Normal University, Changchun, Jilin, China

<sup>3</sup>Department of Botany, Bacha Khan University, Charsadda, Khyber Pakhtunkhwa, Pakistan

Article published on July 27, 2018

**Key words:** Ethnobotanical studies, Ailments, Use value, Malakand, Pakistan

### Abstract

Ethnobotanical studies are helpful in assessing the the therapeutic uses of the plants that are used for different healing purposes. The present work was conducted to explore the ethnomedicinal uses of indigenous plants of various localities of District Malakand KP, Pakistan. A total of 46 plant species were identified belonging to 49 families. The reported plant species were well known for various human illnesses in the localities. Family Lamiaceae was the leading family comprises 6 species (10.52%) followed by family Solanaceae, Moraceae, and Euphorbiaceae each with 4 species (7.02%). The natives use herb (45.61%), shrubs (22.81%) and trees (31.58%) for different healing purposes. They use leaves (23.61%), whole plant (19.44%), fruit (18.06%), seed (9.72%), latex (6.94%), shoot (6.94%), bark (5.56%), gum (4.17%), plant oil (1.39%) and root (1.39%) of the reported medicinally important plants. The major and important ailments of the localities were diabetes, wound healing stomach problems, blood and skin disorders and constipation. *Mentha arvensis* L. has the highest Use Value (0.42) whereas the highest Relative frequency citations has been reported for *Cannabis sativa* L. (0.32). The present study shown that the local people use the indigenous flora for different human ailments. Although further phytochemical and pharmacological justifications of the reported plant species are highly recommended.

\*Corresponding Author: Yu-Jie Fu ✉ [yujie\\_fu@163.com](mailto:yujie_fu@163.com)

## Introduction

Ethnobotany is the relationship between plants and human society that reflect all types of interactions between people and plants. In broader sense these interactions gyrate among people, plants and uses which explore how the people of a particular culture and region identify new plants that can be used as food, shelter, medicine, clothing, and religious purposes (Hamilton, 2002). From the early time human population were dependent on plants and were trying to identify nutritionally and medicinally important plants for the better survival in harsh environmental conditions. Today Plant-based traditional medicine plays a key role in the development of new drugs (Wright, 2005). Pakistan has a rich medicinal plants history having more than 600 plants being used traditionally for medication purposes (Hamayun *et al.*, 2006). In the developing countries it has been noticed that medicinally important plants are real substitute for the treatment of human and animal illnesses (Feo, 1992). It is often a single easily reached and affordable remedy for a particular disease.

The global market for herbal medicines based on traditional knowledge has reached up to 60 billion US dollars (Breevort, 1998). Human use plants for different purposes like medicine, food, shelter and other purposes that increases with passage of time (Ali *et al.*, 2003). Wild plants contain organic and inorganic molecules (Kris-Etherton *et al.*, 2002) which are the vital source of antioxidants, fiber, vitamins and minerals as well as for economic background of poor locals. Medicinally important plants play an important role in healthcare system that can be used for a number of physiological disorders (Erasto *et al.*, 2005) such as cancer, cardiovascular, diabetes and inflammatory diseases (Shad *et al.*, 2013). More than 50,000 plant species are used for the medicinal purposes in the rural population. In the developing countries about 80% population depend on traditional medicine (Bhat *et al.*, 2013). Medicinal plants are very popular in the rural areas because of low cost, no side effect and high treating potentials.

Medicinal plants have important chemical components known as secondary metabolites. The most important secondary metabolites are alkaloids, essential oils, flavonoids, glycosides and vitamins. These secondary metabolites are common to specific plants and not occur in every plants just like primary metabolites. To use a plant as remedy for a particular ailment, it is important to be aware of the list of secondary metabolites present in that plant species. (Desideri *et al.*, 2010). As these secondary metabolites reflects the therapeutic values of medicinally important plants due to their antimicrobial properties (Harborne *et al.*, 1973; Heinrich *et al.*, 1998; Edeoga *et al.*, 2005; Desideri *et al.*, 2010; Gupta and Malan 2011). The villagers have experience about the manufacturing of herbal medicine for the treatment of various diseases. They collect parts of medicinally important during reproductive or vegetative stage (Nadeem *et al.*, 2013) which are then used as therapy for different disorders. Forest and rangeland are the major source of medicinal plants in Pakistan. There are 50,000 register folk experts of medicinal plants (Hakims) in Pakistan (William and Zahoor, 1999). The ethnobotanical survey was carried out in District Swat and District Chitral which shown that the local used plants for medicinal purposes (Mohammad *et al.*, 2013; Hadi *et al.*, 2013). The present work was aimed for exploring the ethnomedicinal uses of the local flora of various localities of District Malakand KP, Pakistan.

## Materials and methods

### Study area

The present ethnobotanical study was conducted out to explore the local flora and their traditional therapeutic values of the four localities of the District Malakand, KP, Pakistan (34° 35' North latitude and 71° 57' East longitude). Theses localities are Hazar Nao forest, village Kot, Mongai, and Khanori.

### Data collection and documentation

Various field trips were arranged to the selected localities in spring and summer during 2014-15 to document the medicinal uses of the local flora. The

plants were collated and interviewed for their local name, parts used, traditional knowledge, preparation method and medicinal value from the local informants. All the collected plants were photographed using a digital camera, pressed, dried and preserved on the standard size of herbarium sheets which were preserved in the department of Botany, Bacha Khan University Charsadda, KP, Pakistan. The information was collected by filling a semi-structure questionnaire (Hassan *et al.*, 2017a; Hassan *et al.*, 2017b). A total of 50 informants including local Hakims, male and female with different age classes were interviewed.

The plants were identified through flora of Pakistan (Nasir and Ali, 1970-1995; Ali and Qaisar, 1993-2015).

*Statistical analysis*

The collected ethnomedicinal data was analyzed for Use Value (UV=  $\sum U_i / N$ ) and Relative Frequency Citation (RFC = FC/ N) using SPSS version 16. (Savikin *et al.*, 2013).

**Results and discussion**

In the present study, a total of 57 plants belonging to 39 families were recorded. The reported plant species are tabulated in Table 1 along with their family names, local names, Use Valve, Relative frequency Citation and traditional uses.

**Table 1.** Important medicinal plant of Hazar Nao District Malakand, Kp, Pakistan.

Plant name	Family name	Local name	Habit	Part used	FC	RFC	$\sum U_i$	Use value	Traditional uses
<i>Acacia modesta</i> Wall.	Memosaceae	Palosa	T	Gum	10	0.2	13	0.26	Gum: Tonic, bone fracture, cough, jaundice, backache
<i>Acacia nilotica</i> L.	Memosaceae	Kikar	T	Gum	13	0.26	18	0.36	Gum: used in bandages for fractures and headache, diabetes
<i>Adiantum venustum</i> D. Don	Pteridaceae	Sumbal	S	Fronnd	2	0.04	6	0.12	Fronns: Emetic, cough, diabetes, diuretic
<i>Ailanthus altissima</i> Mill.	Simaroubaceae	Bakyanra	T	Bark	6	0.12	9	0.18	Dysentery, Vermifuge
<i>Ajugabracteosa</i> Wall.	Labiatae	Gotti	H	Whole plant	3	0.06	5	0.1	Diabetic, hepatic, throat infections
<i>Albezialebeck</i> L.	Mimosaceae	Srikh	T	Fruit, bark	4	0.08	6	0.12	Fruit used Diabetes Bark: skin burn
<i>Boerhavia procumbens</i> Banks ex Roxb.	Nyctaginaceae	Insutt	H	Whole plant	3	0.06	4	0.08	Hepatic, Wound healing
<i>Calotropis procera</i> (Ait.)	Asclpiadaceae	Spalmae	S	Latex, leaves	9	0.18	12	0.24	Latex: stomach-ache, snake and scorpion bite, analgesic Leaves: wound healing
<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	H	Shoot	16	0.32	19	0.38	Sedative, narcotic, analgesic Leaves: Hallucination, animal wound healing
<i>Carthamus tinctorius</i> L.	Asteraceae	Karezza	H	Seed	2	0.04	5	0.1	Stomach-ache and for controlling of urination
<i>Cassia fistula</i> L.	Caesalpinaceae	Landees	T	Fruit	10	0.2	11	0.22	Colic pain, constipation of child
<i>Chenopodium album</i> L.	Chenopodiaceae	Sarmai	H	Whole plant	1	0.02	2	0.04	Animal diarrhoea, laxative
<i>Citrullus colocynthis</i> L.	Cucurbitaceae	Kalkundai	H	Fruit, seed	4	0.08	6	0.12	Fruit: Diabetes Seed: Constipation
<i>Colebrookea oppositifolia</i> Smith	Labiatae	Badizai	S	Leaves	1	0.02	2	0.04	Wound healing
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Perwatai	H	Shoot	2	0.04	2	0.04	Plant used for skin disorder
<i>Coriandrum sativum</i> L.	Umbelliferae	Dhanya	H	Seed	7	0.14	9	0.18	Seed: Stomach disease, carminative
<i>Coronopus didymus</i> L.	Brassicaceae	Sakhaboti	H	Whole plant	5	0.1	7	0.14	Piles, blood purifier
<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Banosha	H	Whole plant	4	0.08	5	0.1	Hepatic, Skin disorder
<i>Dalbergia sissoo</i> Roxb.	Papilionaceae	Shawa	T	Bark	2	0.04	2	0.04	Abdominal pain, back-ache
<i>Datura stramonium</i> L.	Solanaceae	Balthura	H	Leaves	3	0.06	4	0.08	Piousness but fresh leaves warmed in oil are used for pus removing
<i>Dodonaea viscosa</i> L.	Sapindaceae	Ghwaraskay	S	Leaves	2	0.04	2	0.04	Leaves: Anthelmintic, wound healing
<i>Equisetum ramosissimum</i> Desf.	Equisetaceae	Bandakai	H	Whole plant	4	0.08	7	0.14	Pain killer, kidney stone and cleaning of teeth, urinary bladder inflammation
<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	Lachee	T	Seed, leaves	1	0.02	2	0.04	Seed: Cough Leaves: Anti-vomiting
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	Mandhano	H	Latex	5	0.1	6	0.12	Laxative Latex: piousness, causes irritation and swelling of the skin. It causes the death of animals when eaten in large amount
<i>Euphorbia prostrata</i> Ait., Hort.	Euphorbiaceae	Warming	H	Shoot	2	0.04	4	0.08	Itching, ring worm
<i>Ficus benghalensis</i> L.	Moraceae	Barh	T	Latex	2	0.04	3	0.06	Latex: Aphrodisiac, Spermatorrhoea, urinary disorder
<i>Ficus carica</i> L.	Moraceae	Inzar	T	Fruit, latex	11	0.22	15	0.3	Fruit: Piles, constipation, and stomach disease

Plant Name	Family	Local Name	Category	Part	Count	Value 1	Value 2	Value 3	Value 4	Uses
<i>Fumaria indica</i> L.	Fumaraceae	Paprha	H	Whole plant	5	0.1	7	0.14		Latex: To remove the thorn Blood purifier, Itching and diuretic
<i>Iris hookeriana</i> Foster	Iridaceae	Gandichar	H	Whole plant	3	0.06	5	0.1		Diabetes, blood purifier, and itching disease. Otherwise, the plant is pioussness
<i>Justicia adhatoda</i> L.	Acanthaceae	Baikerh	S	Leaves	6	0.12	10	0.2		Leaves: Rheumatism, expectorant, anthelmintic, diabetes, wound healing, snake bite
<i>Melia azadarach</i> L.	Meliaceae	Torashandai	T	Leaves, fruit	3	0.06	5	0.1		Fruit: Piles and diabetes Leaves: Wound healing
<i>Mentha arvensis</i> L.	Labiatae	Podina	H	Whole plant	12	0.24	21	0.42		Stomach-ache, gas problem. Refrigerant
<i>Mentha longifolia</i> L.	Labiatae	Venaly	H	Leaves	7	0.14	12	0.24		Stomach-ache and carminative. Refrigerant
<i>Mollotus philipensis</i> (Lam.) Muell.	Euphorbiaceae	Kambela	T	Seed	2	0.04	3	0.06		Hypothermic and hyperthermic (CHARMEKH) in animals
<i>Monothecha buxifolia</i> (Falc.) A. DC.	Sapotaceae	Gwargura	S	Fruit, leaves	9	0.18	13	0.26		Fruits: Increase blood level Leaves: diabetes
<i>Morus alba</i> L.	Moraceae	Spin tut	T	Fruit	3	0.06	6	0.12		Tonsil, cough and throat infection
<i>Morus nigra</i> L.	Moraceae	Tor Tut	T	Fruit	3	0.06	5	0.1		Tonsil, cough and throat infection
<i>Nerium oleander</i> L.	Apocynaceae	Gandery	S	Leaves	1	0.02	2	0.04		Dental problems
<i>Olea ferruginea</i> Royle	Oleaceae	Khuna	T	Leaves, oil	2	0.04	3	0.06		Leaves: Throat infection Oil: Pain and release stress
<i>Otostegia limbata</i> Benth.	Labiatae	Spin azghay	S	Flower	2	0.04	1	0.02		Eye irritation
<i>Oxalis corniculata</i> L.	Oxalidaceae	Trevakai	H	Whole plant	3	0.06	4	0.08		Stomach-ache. Anti-vomiting
<i>Papaver somniferum</i> L.	Papaveraceae	Dodda	H	Fruit, latex, Seed	7	0.14	10	0.2		Fruit: a cough and diarrhea Latex: Narcotic, anodyne, sedative, excitement, physical vigor Seed: Tonic
<i>Periploca aphylla</i> Dene.	Asclepiadaceae	Bara-rha	S	Whole plant	2	0.04	5	0.1		Constipation, swelling and tumours, inflammation of urinary bladder
<i>Phoenix dactylifera</i> L.	Palmae	Qahjoora	T	Fruit	11	0.22	15	0.3		Laxative, tonic, aphrodisiac
<i>Pinus roxburghii</i> Sargent	Pinaceae	Nakhtar	T	Gum	4	0.08	9	0.18		Gum: Pus removing, blood purifier and hair removal
<i>Portulaca olaraceae</i> L.	Aizoaceae	Warkhary	H	Whole plant	3	0.06	7	0.14		Urinary and kidney disorders
<i>Ricinus cumunis</i> L.	Euphorbiaceae	Arhanda	S	Leaves and oil	6	0.12	8	0.16		Oil: Constipation, muscle relaxation and in delivery cases Leaves: Wound healing
<i>Rumex hastatus</i> D.	Polygonaceae	Tarookay	S	Whole plant	4	0.08	5	0.1		Laxative. skin disorder, juice of this plant is used to stop blood
<i>Salvia moorcoftiana</i> Wall. ex. Benth	Lamiaceae/ Labiatae	Kharghwag	H	Leaves, Roots, Seed	3	0.06	6	0.12		Leaves: Poultice Roots: Stomach pain and cough Seed: Dysentery
<i>Solanum nigrum</i> L.	Solanaceae	Kachmchoo	H	Fruit	7	0.14	8	0.16		Fruits: Diarrhoea, hepatic, Carminative
<i>Solanum sursttense</i> Burm.	Solanaceae	Maraghoni	H	Whole plant	2	0.04	4	0.08		Expectorant, diuretic. hypothermic and hyper thermic (CHARMEKH) in cattle
<i>Syzygium cumini</i> L.	Myrtaceae	Jaman	T	Fruit	5	0.1	7	0.14		Diabetes, piles
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Markonday	H	Shoot	4	0.08	5	0.1		Kidney stone and backache
<i>Verbiscum Thapsus</i> L.	Scropholiaraceae	Khardig	H	Shoot	3	0.06	7	0.14		Analgesic Animal's diarrhoea, dysentery and wound healings.
<i>Vitex negundo</i> L.	Verbenaceae	marvandai	S	Leaves	2	0.04	2	0.04		Diuretic and anthelmintic
<i>Withania somnifera</i> L.	Solanaceae	Kotilal	S	Leaves, bark	7	0.14	12	0.24		Leaves: Remove the pus Bark: Back-ache
<i>Zizipus jujube</i> Mill.	Rhamnaceae	Bera	T	Fruit, leaves	10	0.2	14	0.28		Leaves: Diabetes Fruit: Dysentery

Table 2 shows that the leading family is Lamiaceae (6 species- 10.52%) which agrees to (Aziz *et al.*, 2018). Other important families are Solanaceae, Moraceae, and Euphorbiaceae each with 4 species (7.02%). The reported plants were well known among the aged people for different healing purposes.

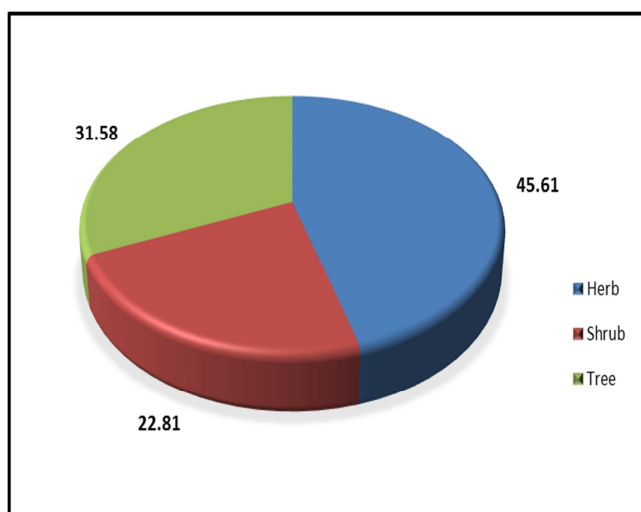
However, in young generation, the knowledge regarding the traditional use of plants was low due to easy availability of synthetic drugs and lack of interest about the traditional usage of medicinal plants.

**Table 2.** Percentage family contribution of documented medicinal plants.

Family name	No. of species	% of contribution	Family name	No. of species	% of contribution
Acanthaceae	1	1.75%	Nyctaginaceae	1	1.75%
Aizoaceae	1	1.75%	Oleaceae	1	1.75%
Apocynaceae	1	1.75%	Oxalidaceae	1	1.75%
Asclepiadaceae	2	3.51%	Palmae	1	1.75%
Asteraceae	1	1.75%	Papevaraceae	1	1.75%
Brasicacea	1	1.75%	Papilionaceae	1	1.75%
Caesalpinaceae	1	1.75%	Pinaceae	1	1.75%
Cannabaceae	1	1.75%	Polygonaceae	1	1.75%
Convolvulaceae	1	1.75%	Pteridaceae	1	1.75%
Cuscutaceae	1	1.75%	Rhamnaceae	1	1.75%
Equisetaceae	1	1.75%	Sapindaceae	1	1.75%
Euphorbiaceae	4	7.02%	Sapotaceae	1	1.75%
Fumaraceae	1	1.75%	Scrophliaraceae	1	1.75%
Iridaceae	1	1.75%	Simaroubaceae	1	1.75%
Labiatae	6	10.52%	Solanaceae	4	7.02%
Meliaceae	1	1.75%	Umbelliferae	1	1.75%
Memosaceae	3	5.26%	Verbenaceae	1	1.75%
Moraceae	4	7.02%	Zygophyllaceae	1	1.75%
Myrtaceae	2	3.51%	-	-	-

In this regards the present determination is related to previous findings (Khan and Khatoon, 2007; Shinwari *et al.*, 2011). Herbs are important ethnomedicinally as they have high potential,

regeneration and easy to use. The herbs are dominantly used by local comprising 26 species (45.61%) followed by trees (31.58%) and shrubs (22.81%) as shown in Fig.1.



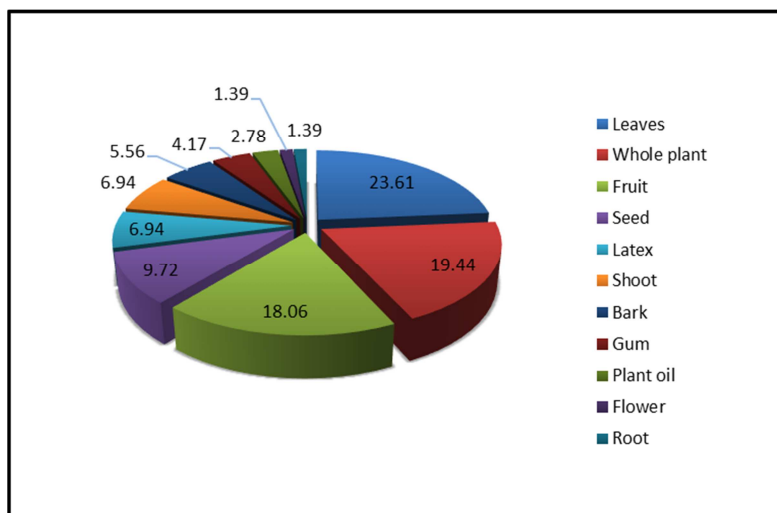
**Fig. 1.** Habit percentage

Similar findings were also reported by other workers (Jan *et al.*, 2017; Giday *et al.*, 2003 and Megeesra *et al.*, 2013). Fig. 2 illustrates the uses of different plant parts against various ailments. The local people use as leaves (23.61%), whole plant (19.44%), fruit (18.06%), seed (9.72%), latex (6.94%), shoot (6.94%), bark

(5.56%), gum (4.17%), plant oil (1.39%) and root (1.39%) of the reported medicinally important plant species, which are supported by the results of (Dogan and Ugulu, 2013; Tareen *et al.*, 2016 and Jan *et al.*, 2017). Leaves are easy to utilize and have greater photosynthetic ability due which they are

pharmacologically are more active (Abebe and Ayehu, 1993; Giday *et al.*, 2003; Ahmad *et al.*, 2009; Giday *et*

*al.*, 2009; Zheng and Xing, 2009; Rokaya *et al.*, 2014; Shah and Rahim, 2017).



**Fig. 2.** Percentage of parts used

The local flora was well known among the aged people in regards of their ethnomedicinal knowledge and experiences. Among the reported plant species *Mentha arvensis* L. (0.42) has the highest Use Value (UV) whereas the highest Relative frequency citations (RFC) has been reported for *Cannabis sativa* L. (0.32). As shown in Table 1 the major ailments of the localities were diabetes, wound healing stomach problems, blood and skin disorders and constipation.

The people of the localities also consume plants for other diseases including a diuretic, dysentery hepatic problems, analgesic, back-ache, Laxative, Piles, Throat infection, carminative, pus removing, vomiting and Itching which are given in Table 1.

**Conclusion**

The native people use medicinal plant species for the treatment of different human ailments.

The medicinal value of plants was less common among the young generation. Further trips for exploration and spreading of ethnobotanical awareness of plant resources among the young generation are highly recommended.

**Acknowledgment**

We are thankful to the aged people of the areas for sharing their ethnomedicinal knowledge.

Furthermore, we are also thankful to all our respected teachers and dear friends for their support during plant collection and identification.

**References**

**Abebe D, Ayehu A.** 1993. Medicinal plants and enigmatic health practices of Northern Ethiopia.

**Ahmad M, Qureshi R, Arshad M, Khan MA, Zafar M.** 2009. Traditional herbal remedies used for the treatment of diabetes from district Attock (Pakistan). *Pakistan Journal of Botany* **41**, 2777-2782.

**Ali SI, Qaiser M.** 1993-2015. Flora of Pakistan 194-210. Department of Botany, University of Karachi, Karachi 194-220.

**Ali, H, Ahmad H, Yousaf M.** 2003. Trade of local medicinal herbs in Mingora City. In: *Proceedings of Workshop on Conservation and sustainable uses of Medicinal and Aromatic plants of Pakistan.* (Eds.): H. Ahmad, A.A. Khan.

**Aziz MA, Adnan M, Khan AH, Shahat AA, Al-Said MS, Ullah R.** 2018. Traditional uses of medicinal plants practiced by the indigenous communities at Mohmand Agency, FATA, Pakistan. *Journal of Ethnobiology and Ethnomedicine* **14(1)**, 2.

<https://dx.doi.org/10.1186%2Fs13002-017-0204-5>

- Bhat JA, Kumar M, Bussmann RW.** 2013. Ecological status and traditional knowledge of medicinal plants in Kedarnath Wildlife Sanctuary of Garhwal Himalaya, India. *Journal of Ethnobiology and Ethnomedicine* **9(1)**, 1.  
<https://doi.org/10.1186/1746-4269-9-1>
- Breevort P.** 1998. The Booming U. S. Botanical Market: A New Overview. *Herbal Gram* **44**, 33-46.
- De Feo V.** 1992. Medicinal and magical plants in the northern Peruvian Andes. *FITOTERAPIA-MILANO* **63**, 417-417.
- Desideri D, Meli MA, Roselli C.** 2010. Determination of essential and non-essential elements in some medicinal plants by polarised X ray fluorescence spectrometer (EDPXRf). *Microchemical Journal* **95(2)**, 174-180.  
<http://dx.doi.org/10.1016/j.microc.2009.11.010>
- Dogan Y, Ugulu I, Durkan N.** 2013. Wild edible plants sold in the local markets of Izmir, Turkey. *Pakistan Journal of Botany* **45(S1)**, 177-84.
- Edeoga HO, Okwu DE, Mbaebie BO.** 2005. Phytochemical constituents of some Nigerian medicinal plants. *African journal of Biotechnology* **4(7)**, 685-688.
- Erasto P, Adebola PO, Grierson DS, Afolayan AJ.** 2005. An ethnobotanical study of plants used for the treatment of diabetes in the Eastern Cape Province, South Africa. *African Journal of Biotechnology* **4(12)**, 1460.
- Giday M, Asfaw Z, Elmqvist T, Woldu Z.** 2003. An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. *Journal of Ethnopharmacology* **85(1)**, 43-52.  
[https://doi.org/10.1016/S0378-8741\(02\)00359-8](https://doi.org/10.1016/S0378-8741(02)00359-8)
- Giday M, Asfaw Z, Woldu Z, Teklehaymanot T.** 2009. Medicinal plant knowledge of the Bench ethnic group of Ethiopia: an ethnobotanical investigation. *Journal of Ethnobiology and Ethnomedicine* **5**, 34.  
<https://doi.org/10.1186/1746-4269-5-34>
- Gupta S, Walia A, Malan R.** 2011. Phytochemistry and pharmacology of *Cedrus deodera*: an overview. *International Journal of Pharmaceutical Sciences and Research* **2(8)**, 2010.  
[http://dx.doi.org/10.13040/IJPSR.09758232.2\(8\).2010-20](http://dx.doi.org/10.13040/IJPSR.09758232.2(8).2010-20)
- Hadi F, Razzaq A, Rahman A, Rashid A.** 2013. Ethnobotanical notes on woody plants of Rechi Valley, Torkhow, District Chitral, Hindu-Kush range, Pakistan. *Scholarly Journal of Agricultural Science* **3(11)**, 468-472.
- Hamayun M, Khan SA, Kim H, Na CI, Lee I.** 2006. Traditional knowledge and ex situ conservation of some threatened medicinal plants of Swat Kohistan, Pakistan. *International Journal of Botany* **2(2)**, 205-209.  
<http://dx.doi.org/10.3923/ijb.2006.205.209>
- Hamilton A.** 2002. Curriculum development in applied ethnobotany. Proc. workshop on curriculum development in applied ethnobotany. Nathia gali, Pakistan. 91-95.
- Harborne JB.** 1973. *Phytochemical methods*, London Chapman and Hall, Ltd 49-88.  
<http://dx.doi.org/10.1007/978-94-009-5921-7>
- Hassan N, Nisar M, Kakar SR, Hassan F, Zhong Z, Nong L, Khan MI, Shuaib M, Wang D.** 2017b. Determination of Informant Consensus Factor of Medicinal Plants Used as Therapy in District Dir Lower Pakistan. *Journal of medicinal plant studies* **5(4)**, 183-188.
- Hassan N, Wang D, Shuaib M, Zhong Z, Nisar M, Ahmad W, Ahmed S, Khan A.** 2017a. Identification and ethnobotanical survey of profitable medicinal plants used as a remedy in Sangina Pakistan. *International Journal of Herbal Medicine* **5(4)**, 117-123.
- Heinrich M, Ankli A, Frei B, Weimann C, Sticher O.** 1998. Medicinal plants in Mexico: Healers' consensus and cultural importance. *Social Science & Medicine* **47(11)**, 1859-1871.  
[https://doi.org/10.1016/S0277-9536\(98\)00181-6](https://doi.org/10.1016/S0277-9536(98)00181-6)

- Jan HA, Jan S, Ahmad N, Aysha M.** 2017. Ethno-Medicinal Survey of Indigenous Medicinal Plants used by the Local Population of Goleen Valley, Chitral, Pakistan. *SM Journal of Medicinal Plant Studies* **1(1)**, 1004.
- Khan SW, Khatoon S.** 2007. Ethnobotanical studies on useful trees and shrubs of haramosh and bugrote valleys, in Gilgit Northern Areas of Pakistan. *Pakistan Journal of Botany* **39**, 699–710.
- Kris-Etherton PM, Hecker KD, Bonanome A, Coval SM, Binkoski AE, Hilpert KF, Etherton TD.** 2002. Bioactive compounds in foods: their role in the prevention of cardiovascular disease and cancer. *The American journal of medicine* **113(9)**, 71-88.  
[https://doi.org/10.1016/S0002-9343\(01\)00995-0](https://doi.org/10.1016/S0002-9343(01)00995-0)
- Megersa M, Asfaw Z, Kelbessa E, Beyene A, Woldeab B.** 2013. An ethnobotanical study of medicinal plants in Wayu Tuka district, east Welega zone of oromia regional state, West Ethiopia. *Journal of Ethnobiology and Ethnomedicine* **9(1)**, 68.  
<https://doi.org/10.1186/1746-4269-9-68>
- Mohammad I, Rahmatullah Q, Shinwari ZK, Muhammad A, Mirza SN.** 2013. Some ethnoecological aspects of the plants of Qalagai hills, Kabal valley, swat, Pakistan. *International Journal of Agriculture and Biology* **15(5)**, 801-810.
- Nadeem M, Shinwari ZK, Qaiser M.** 2013. Screening of folk remedies by genus *Artemisia* based on ethnomedicinal surveys and traditional knowledge of native communities of Pakistan. *Pakistan Journal of Botany* **45(1)**, 111-7.
- Nasir E, Ali SI.** 1970-1995. Flora of West Pakistan and Kashmir. Pakistan Agriculture Research Council, Islamabad Pakistan.
- Pei S.** 1995. Ethnobotany and sustainable use of plant Resources in the HKH Mountain Region. In Planning Workshop on Ethnobotany and its Application to Conservation and Community Development in Hindukush Himalayan (HKH) region, Nepal.
- Rokaya MB, Uprety Y, Poudel RC, Timsina B, Münzbergová Z, Asselin H, Sigdel SR.** 2014. Traditional uses of medicinal plants in gastrointestinal disorders in Nepal. *Journal of Ethnopharmacology* **158**, 221-229.  
<https://doi.org/10.1016/j.jep.2014.10.014>
- Shad AA, Shah HU, Bakht J.** 2013. Ethnobotanical assessment and nutritive potential of wild food plants. *Journal of Animal and Plant Sciences* **23(1)**, 92-7.
- Shah A, Rahim S.** 2017. Ethnomedicinal uses of plants for the treatment of malaria in Soon Valley, Khushab, Pakistan. *Journal of Ethnopharmacology* **200**, 84-106.  
<https://doi.org/10.1016/j.jep.2017.02.005>
- Shinwari S, Qureshi R, Baydoun E.** 2011. Ethnobotanical study of Kohatpasses Pakistan. *Pakistan Journal of Botany* **43**, 135-139.
- Tareen NM, Saeed-Ur-Rehman MA, Shinwari ZK, Bibi T.** 2016. Ethnomedicinal Utilization of Wild Edible Vegetables In District Harnai of Balochistan Province-Pakistan. *Pakistan Journal of Botany* **48(3)**, 1159-1171.
- Williams JT, Ahmad Z.** 1999. Priorities for medicinal plants research and development in Pakistan.
- Wright CW.** 2005. Plant-derived antimalarial agents: new leads and challenges. *Phytochemistry Reviews* **4(1)**, 55-61.  
<https://doi.org/10.1007/s11101-005-3261-7>
- Zheng XL, Xing FW.** 2009. Ethnobotanical study on medicinal plants around Mt. Yinggeling, Hainan Island, China. *Journal of Ethnopharmacology* **124(2)**, 197-210.  
<https://doi.org/10.1016/j.jep.2009.04.042>