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# Survey of medicinal plants and patterns of knowledge in district Swabi/ Khyber Pakhtunkhwa, Pakistan

Abdul Waheed[1], Ali Bahadur[2], Abdul Majid[1], Fahad Nasir[3], Mohib Shah[4] and Asfa Batool[5*]

**Abstract**

To investigate and document the indigenous knowledge on the medicinal flora of the native communities in Swabi district, Pakistan. A field survey was carried out and data was based on semi-structured interviews, group discussions, and questionnaire from 8 villages. 180 local individual of local communities were interviewed and collected data were analyzed by quantitative and descriptive index. During the survey, 81 species belonging to 45 families were reported. Solanaceae was the leading family with 7 species. Herb (48%) was the dominant plant habit and leaf (24%) was the most preferred used part for indigenous medicine. Moreover, decoction (28.93%) was the most prestigious method. According to the result, the highest use value was documented for Jaundice ailment (1.00-0.81). Besides, 11 plants added to the endangered species list. Local experts of Swabi district practice a huge variety of ethno medicinal plants in treating a wide spectrum of disorders, especially those plants used to cure jaundice. Our finding suggests that the pharmacological potential across some of these plants has been therapeutically validated however still need to explore the pharmacological properties of other species. Hence, the present investigation, aside from being a source of new insight for ethno botanical and pharmacological cure of many disorders, might contribute to upgrade the sustainability, conservation, and management of medicinal flora in the BachaiSikandari, district Swabi.

**Keywords:** Medicinal plant; Use value; Local community; Jaundice; District Swabi

## Introduction

Ethnomedicinal surveys have established emphasis on the association between the local communities and plants usage [1]. These surveys are imperious in highlighting substantial plant species, mainlyto enlighten thenovel crude drugs [2]. Moreover, ethno-botanical investigations also play a vital role in conserving naturaltreasure, mainlymedicinal plants biodiversity [3]. Medicinal plants are important for the source of revenue in developing countries all over the world and considered as a promising source for key bioactive compounds. Out of the 32000 species of higher plants [4]. more than 10 percent are used medicinally. Guesstimate recommends that global medicinal plant business will achieve $5 trillion (US) by 2050 [5]. Ethnobotany was firstly based on quantitative methods such as recording of plants and their uses, with a key focal point on the economic importance. Studies by international and national organizations (WHO) have shown that for 75-90 % of the rural population of the world depends on the ethnomedicinal cure ap- proaches. The total relationship of the target human society with plants has covered ethnobotanical studies but they have been aimed at mainly in plants used for food and medicine [6]. Previ- ous exploration of plant-based cure of ailments and ethnobotanical studies has played a significant role in the advance of new drugs in many centuries [7]. In the developed countries, 25% of the therapeutic drugs are erected on plants and their deriva-

*Correspondence: asfa12@lzu.edu.cn

[5]State Key Laboratory of Grassland Agro-ecosystems, Institute of Arid Agroecology, School of Life Sciences, Lanzhou University, Lanzhou, China

Full list of author information is available at the end of the article.

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tives (Principe, 2005). A number of studies have reported the medical applications of plants among massive indigenous assemblages [8,9]. For centuries, medicinal plants are used by the local popula- tions of Pakistan to treat several ailments. AN ethno-medicinal survey in Pakistan is steering up with the passage of time and nu- merous studies have been conducted so far in different regions of the country [10–14]. Likewise, in Khyber Pakhtunkhwa, the field of ethnobotany is quite striking [15–19]. and documented medicinal plants from different regions. District Swabi possesses the massive diversity of agroclimatic and phytoecological combinations supporting the existence of the vast spectrum of natural assets.Union Council BachaiSikan- dari (UCBS) is situated in the South -West of district Swabi. Various plants species have been reported from this area, among which mostly are medicinal and some of them are endan- gered [20–22]. The ethnomedicinal knowledge on the flora of Swabi and Khyber Pakhtunkhwa [23,24]. showed the rich di- versity and considerable effort is prerequisite to conserve the aboriginal ethnobotanical knowledge from the BachaiSikandari, district Swabi. Previous historical literature illustratestheir medicinal uses but still, there is a need to explore this natural treasure. The current study objects to document the diverse indigenous in- formation on medicinal plants of the formerly unexplored re- gion of Swabi viz., Kaddy, manthra, Rashaka, Sabir abad, Fazal camp, Baraki camp, Sher Khan Banda, Gajokhan Mira; repre- senting the people exist in near Union Council BachaiSikandari and to educate the local community for conserving the diversity of medicinal plants and the ethnomedicinal awareness.

## Material and Methods

### *Selection of study area and key informants*

The ethnomedicinal assessment was conducted in Union Council BachaiSikandari (UCBS), District Swabi/ Khyber Pakhtunkhwa, Pakistan to document the native medicinal information of the area. During the survey, the information was collected from the local people and then confirmed by the register herbalists (district administration is authorized to register the herbalists to practice local herbal remedies). UCBS and its adjoining rural areas were selected after detailed discussion with herbalists and key informants sincethe number of herbalists are practicing in these areas and local communities extensively depend upon traditional medicinal plants to cure various ailments. Keeping in mind the fact about UCBSselecting as a survey area, hencethe Afghan refugees (Fazal/Shomlloo Camp) from Soviet–Afghan War (1979) are also residing in the area that might help to explore their effects on the diversity of indigenous medicinal plants.

### *The study area*

Swabi is in the capital of Swabi district in the Khyber Pakhtunkhwa, Pakistan (Figure 1), located between Indus and Kabul river. It constitutes four tehsils (Swabi, Lahor, Topi and Razar) and fifty-six Union Councils,according to the National Reconstruction Bureau Government of Pakistan. It is one of the most archaeological and historical land of Pakistan. The area selected for this study is UCBS, situated on the South -West of district Swabi. On the north side of this, there is Gohati, while on west there is Dagai, and Lahore at the South and Shah-Mansoor isto the east. Topographically, it is situated at the height of 1138 ft. from sea level on 34° 07’ to 51° 28’ N and 72° 27’to 34° 32’ E. The total area is 46,000 Kanal (23.04 $km^2$).Most of the area is plain whereas on north-south and east there are some mountains. According to the population census of 1998, population of the area is 20,000 distributed in 2500 families. Recently a survey of Benazir Income program 2010 has been conducted, according to which the population is 30,000. Population density is 1304 /$km^2$. Geo-climatically the area is different throughout the year.

### *Socio-economic Status of the informants*

UCBS has several species of commercially important medicinal plants, traditionally used as medicine. The local residents meettheir domestic requirements from agriculture. For economic benefits, they cultivate tobacco, wheat, maize and populus tree species. The ethnographical composition of the UCBS is mainly having Pakhtuns (Pathan) with subtribes such as Muhajir (migrated from Afghanistan), Mohmand, Yousafzai (dominant), Awan, Gojar, and Mughal. Awami National Party (ANP) is the largest Pashtun nationalist party in Khyber Pakhtunkhwa, Pakistan, having more influence in the study area. The local community is mostly educated and young generation, in particular, is upgrading. The UCBS is comparatively more advanced in health facilities and education. However, the Afghan refugees of this area are totally devoid of basic education and health services. Overall, the people of study area are farmers and businessmen by profession, and they have much knowledge about the use of traditional plants.

### *Ethnobotanical data collection*

The ethnomedicinaldata was collected through rapid appraisal approach (RAA) that was based on direct interaction with indigenous communities and observation during the field vis-

its (Martin, 1995). Team members visited several times the study area for collecting information. In order to report theethnomedicinal importance of plants, proper equipment was prepared like questionnaire, field notebook, field presser, cutter and other material related to work and collected data was confirmed by various local herbalists. In this phase, the age, education, and profession of the informants were noted. Interviewed were conducted from 180 informants (male)with age range between 20–80 years in eight different remote villages of UCBS. The plants were collected along with root, stem, and leaves and mostly during the flowering and fruiting stage. The survey was mainly focused on collecting the traditional knowledge, plant part used, disease treated and the administration and preparation method. Interviews were organized in the local language (Pakhto or Pashto (Afghani native language)) at village male gathering places, (Hujras: the traditional gathering place of Tribe Pakhtun), former gathering under tree shadows (Jangy: especially summer male gathering place), mosques and houses.

***Collection and identification of plant material***

Throughout field survey, the collected specimens of vascular plants species were herborized, equestrian as herbarium voucher specimens, and deposited for ecological and taxonomic identification, approval, and inclusion in the Herbarium of the Hazara University, Khyber Pakhtunkhwa, Pakistan. The plant species were classified according to the online "Flora of Pakistan" (http://www.tropicos.org/project/Pakistan) by Mr. Sayed Afzal Shah. List of the taxa was prepared according to the alphabetical order of the families. The species classification and their names were confirmed with the online database "The Plant List" (http://www.theplantlist.org/) and "Flora of Pakistan" as reported by Ali and Nasir, 1989–1991. Vouchers collected at fruit and/or with flowers were noted and evaluated according to the specimens listed in the HU Herbarium.

***Statistical analysis***

The data reported from the local community of BachaiSikandari, District Swabi/ Khyber Pakhtunkhwa, Pakistan and analyzed by using SPSS 22.0 version, origin 9.0 and Microsoft Excel to demonstrate different variables (plant habit, plant part used, disease categories and preparation type) and draw figures. Use Value: The relative significant per medicinal plant species for traditional use by native informants was evaluated by analyzing its use value demonstrated by Philips and Gentry (1993).

## Results & Discussion

This study highlights one of the highly populated areas of district Swabi which remained unexplored in the previous investigations. This is the first ethnomedicinal documentation from local and Afghan refugee communities residing in council Sikandare. A total of 180 knowledgeable informants belonging to 8 vil- lages including Afghan refugee (the Shomlo camp/Fazal camp) of district Swabi provided evidence on 81 medicinal plants, in- cluding wild, cultivated and tree species belongs to 45 fami- lies. The present investigation region is the symbol of Pashtun (Pakhtun) culture where women are accustomed to "veil" (typi- cal veil known as Chail) hence it is hard for male interviewerto conduct any ethnobotanical investigation, so we failed to con- duct interviews from female gender and it is contradictory to the statement proposed by [25].

The demographic data of the respondents are reported in Table 1. The age of informants varied between 20 and 80 years, with a high average of informants aged between 20 and 40 (53%) years while only 4.44% of informants were between 71-80 years. Likening to other study accompanied in the same district/province, our study reported the informants that were older at age of 80 and it is similar to the findings by [3]. while it contra- dicts the study of [23]. Age of informants and number of plants showed the association representing that medicinal plants prac- tice increased with the increase in informants age and vice versa. Previous reporters were also of this judgment such as [26,27]. Likewise, the informants were divided into groups according to their education level. The greater numbers of informants were illiterate (57%), while only 5% of them had the master level (Table 1). This adverse negative correlation could be credited to the fact that schooling individuals seldom experience usage of herbal medicines in their young age, yet there is an emerg- ing tendency of intense practice of allopathic medicine by edu- cated informants. In another fragment of the world, the people are more expected to be visible to modernization [28]. In spite of the changing trends towards synthetic medicine, majority of the people still prefer herbal medicine for their healthcare to evade side effects of synthetic/allopathic medicines [29].

***Medicinal plants diversity and ailments treated***

In the present study, we reported 81medicinal plant species reflected bya high number of families (45), disseminated across 39 wild plant, 24 cultivated and 23 trees species. Our discoveries conferred the significance of traditional ethno medicinal flora by local community to treat various ailments (Table 2). The highest number of medicinal flora (260) have so far been recorded from Gadoon [24]. followed by Dheri baba hill and Peer Taab Graveyard (72) (Shah and Rozina, 2013), district Swabi respectively, and the lowest number of medicinal flora (20) from Salim Khan [20]. was studied. This assessment designates that our cur- rent study area is one of the significant spots of district Swabi for medicinal plants biodiversity.

Family Solanaceae contributed the highest number of medicinal plant species (4) wild Sp, (3) cultivated) used as native medicinal plants, followed by the Ru- taceae, Papilionaceae, and Poaceae (6 Sp. each) ((5) wild Sp, (8) cultivated and (5) trees), Asteraceae, Brassicaceae, Moraceae and Cucurbitaceous were represented by four species and rest other families were represented by two and one species hav- ing indigenous medicinal importance (Table 2). Recently, lot of ethno botanical studies has been carried out across the globe as well in Pakistan, particularly in the area of district Swabi, Khy- ber Pakhtunkhwa/Pakistan [30–33]. In terms of habit dissemi- nation, the main sources of indigenous medicines plants were herbs 48%, tracked by trees 22%, climbed 17%, and shrubs 11%, respectively (Figure 2), that signifying the regular accessibility of herbs for medicinal drives. The current investigation exposed vernacular names of all medicinal plants which could be a sign of admiration for local practitioners and herbalists.

**Table 1** Demographic characteristics of the traditional informants interviewed.

| Demographical characteristics | n (%) |
|---|---|
| **Age (years)** | |
| 20-40 | 95 (52.78) |
| 41-50 | 23 (12.78) |
| 51-70 | 54 (30.00) |
| 71-80 | 08 (04.44) |
| **Education level** | |
| Illiterate | 102( 56.67) |
| Primary level | 49 ( 27.22) |
| Secondary level | 20 ( 11.11) |
| Master level | 09( 05.00) |

**Table 2-**Ethnomedicinal plants and their uses from Sikandare, District Swabi. Column headings: X: part used; Y: habit; Z: flowering period; UV: Use Value; FC: Frequency citation. Meaning of symbols: Column X: F; fruit, L; leaves, s; stem, R; root, B; bark, f; flowers, S; seeds, b; bulb, r; rhizome, T; tuber, O; oil, l; latex. W; whole plant Column Y: Ħ; herb, ₴; shrub, ₸; tree, ₡; climber/twinner Column Z: Ĵ; January, ʃ; February, Ṃ; March, Ã; April, Ḿ; May, ɟ; June, ĩ; July, Ä; August, $; September, Ŏ; October, Ñ; November, Ḍ; December

| Family | Taxa with voucher no. | Vernacular name | X | Y | Z | Application | Therapeutic uses | UV |
|---|---|---|---|---|---|---|---|---|
| **Wild Species** Acanthceae | *Justicaadhatoda* L. (HU-2912) | Bekhar | R, L | ₴ | Ã, ɟ | Decoction | Cough, tuberculosis | 0.12 |
| Amaranthaceae | *Digeriamuricata* L. (HU-2909) | Soorgulai | W | Ħ | ɟ, ĩ | Decoction | Laxative, urinary disorders | 0.11 |
| Asteraceae | Cichoriumintybus L. (HU-2913) | Kashni | R, W | Ħ | Ã, ĩ | Decoction, oil | Anthelmintic, antipyretic, jaundice | 0.73 |
| Asteraceae | *Tagetesminuta* L. (HU-2935) | Gul –e- sakbar | W | Ħ | Ŏ, Ñ | Powder | Protect plants by repelling nematodes and white fly of tomato plant | 0.15 |
| Asteraceae | *Carthamusoxyacantha*M.Bieg. (HU-2915) | Kareeza | S | Ħ | ɟ, ĩ | Oil, powder | Extracted oil used for dressing ulcer, against itch, jaundice | 0.71 |
| Asparagaceae | *Asparagus adscendens*Roxb. (HU-2916) | Shah ghundala | r | Ħ | Ŏ, Ñ | Decoction | Tonic, diarrhoea, dysentery, general debility, jaundice | 0.79 |
| Asclepiadaceae | *Calotropisprocera* Aitch L. (HU-2917) | Spalmai | W | Ħ | Ŏ, Ñ | Powder, decoction | Dysentery, tonic, digestive, stomachic, purgative, snake bite , jaundice | 1.00 |
| Brassicaceae | *Capsella bursa-pastoris* (L.) Medik (HU-2920) | Bambaisa | L, S | Ħ | $, Ŏ | Infusion | Seeds are stimulant, diuretic, dropsy | 0.22 |
| Cactaceae | *Opuntiamonacantha* Haw. (HU-2922) | Sapera | F | Ħ | ɟ, ĩ | Juice | Asthma, whooping cough, laxative | 0.58 |
| Caesalpiniaceae | *Cassia occidentalis* Linn. (HU-2923) | LaramBotai | L | Ħ | Ŏ, Ñ | Past, poultice | Scorpions bite | 0.63 |
| Canabinaceae | *Cannabis sativa* L. (HU-2927) | Bung | L, f | Ħ | Ḿ, ĩ | Juice, powder | Sedative, anodyne, narcotic, anti-lice, amenorrhea | 0.63 |
| Caryophyllaceae | *Sileneconoidea* L. (HU-2929) | Mungota | W | Ħ | ɟ, ĩ | Decoction, past | Emollient, message | 0.19 |
| Euphorbiaceae | *Euphorbia helioscopia* L. (HU-2934) | PiryanDholi | W | Ħ | ɟ, ĩ | Decoction, juice | Skin diseases, purgative, anthelmintic, jaundice | 0.82 |
| Convolvulaceae | *Convolvulus arvensis* L. (HU-2930) | Prevatai | W | Ħ | Ṃ, Ã | Decoction, poultice | Purgative, skin diseases | 0.70 |
| Cuscutaceae | *Cuscutareflexa*Roxb. (HU-2931) | Zeelai | W | ₡ | ɟ, ĩ | Powder, decoction | Anthelmintic, carminative, purgative, diuretic, jaundice | 0.58 |
| Fumariaceae | *Fumariaindica* (Husskin) H.N. (HU-2936) | Papra | W | Ħ | Ṃ, Ã | Powder, juice | Blood purifier, diaphoretic, antipyretic, jaundice | 0.90 |
| Libiatae | *Ocimumbasilicum* L. (HU-2938) | Kashmaloo | W | Ħ | Ŏ, Ñ | Juice, raw | Antipyretic, diaphoretic, dyspepsia | 0.44 |
| Lamiaceae | *Menthalongifolia* (L.) Huds (HU-2939) | Villanay | W | Ħ | Ä | Powder | Stomachic, vomiting, acnes, jaundice | 0.75 |
| Menispermaceae | *Tinosporamalabarica*Miess. (HU-2942) | Gello | W | ₴ | ɟ, ĩ | Powder | Antipyretic, aurticaria, cough, blood purifier, animal disease, Jaundice | 0.78 |
| Malvaceae | *Malvaneglecta* Wall. (HU-2943) | Panerak | L | Ħ | Ṃ, Ã | Cooked | Digestive agent, anti-constipation, laxative for children | 0.51 |
| Moraceae | *Ficuscarica*Forsk. (HU-2949) | Inzar | F, L, I | Ħ | Ḿ, ɟ | Raw, powder | Laxative, piles, asthma, sexual debility | 0.47 |
| Oleaceae | *Jasminumofficinale* L. (HU-2950) | Rambail Chambal | W | ₴ | $, Ŏ | Oil | Skin diseases, headache, diuretic, anthelmintic, Used in rash. Oil is rubbed on heart as nerve sedative. | 0.21 |
| Portulacaceae | *Portulacaoleracea* L. (HU-2958) | Warkharae | W | ₴ | Ã, Ḿ | Infusion, powder | Kidney disorder, liver, urinary bladder and lungs problems, Jaundice | 0.95 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Papilionaceae | *Medicagodenticulata*Willd (HU-2959) | Shpeshtae | W | ℍ | Ṃ, Ă | Decoction | Laxative, diuretic | 0.13 |
| Papilionaceae | *Trigonellafoenum-graecum* L. (HU-2961) | Malkhuzae | W | ℍ | Ă | Powder | Digestive and menstrual pains, increase breast milk, reduce blood cholesterol and urine sugar, tonic, carminative. | 0.21 |
| Papilionaceae | *Trigonellacorniculata* L. (HU-2953) | Sangie | L, S,s | ℍ | ɟ, ĩ | Powder | Bones fracture and pain in joints | 0.42 |
| Polygonaceae | *Rumexdentatus* L. (HU-2966) | Shalkhay | L, R | ℍ | Ă, Ḿ | Decoction, cooked | Diuretic, astringent, demulcent, and it also soothes the irritation caused by Uriticadieoca | 0.35 |
| Polypodiaceae | *Adiantumvenustum*D.Don. (HU-2967) | Sumbal | L | ℍ | No | Decoction | Aromatic, emollient, bronchial problems, expectorant, febrifuge | 0.08 |
| Poaceae | *Cynodondactylon* L. (HU-2954) | Kabal | W | ℍ | ɟ-Ä | Decoction | Blood purifier, control bleeding, Jaundice | 0.87 |
| Rutaceae | *Rosa moscata* J. Herrn (HU- 2974) | Gulab | f | ☙ | Ṃ, Ă | Decoction | Brain tonic, skin care | 0.21 |
| Sapindaceae | *Dodonaeaviscosa* (L.) (HU-2975) | Ghoraskay | L, s | ☙ | ɟ, ĩ | Powder, poultice | Astringent, anti-rheumatic, aromatic, used in swelling, burns | 0.07 |
| Scrophulariaceae | *Verbascum Thapsus* L. (HU-2976) | Khardhag | L, f, S | ℍ | $, Ŏ | Poultice, decoction | Asthma, cough, pulmonary diseases, bleeding of bowels and lungs, astringent, demulcent, aphrodisiac, narcotic | 0.61 |
| Solanaceae | *Solanum nigrum*Benth. (HU-2977) | Kachmachoo | F, L | ℍ | Ä, $ | Decoction, cooked | Gas trouble, stomachic Used to treat body and joint swelling, skin diseases, mouth Gums, for inflamed and painful parts of body and to wash wounds, Jaundice | 0.88 |
| Solanaceae | *Solanum xanthocarpum*Schrad. (HU-2979) | Maraghuney | W | ℍ | Ŏ, Ñ | Decoction | Fruits are given to the animals to increase hunger. Whole plant is boiled in water and decoction is taken for coldness of body. (Refrigerant) | 0.38 |
| Solanaceae | *Datura stramonium* L. (HU-2981) | Daltora | W | ℍ | Ŏ, Ñ | Juice, powder | Anodyne, earache , Effective against cough, asthma and intestinal worms | 0.43 |
| Solanaceae | *Withaniasomnifera* (L.) Dunal. (HU-2969) | Kutilal | R | ☙ | Ñ, Ḏ | Powder | The roots are used for the treatment of general body pain, pregnant women | 0.37 |
| Zygophyllaceae | *Fagoniaindica* L. (HU-2987) | Azghakey | W | ℍ | Ŏ, Ñ | Juice | Blood purifier, refrigerants, Scabies infection, tautness, antiemetic, antipyretic, jaundice | 0.96 |
| **Cultivated Species** | | | | | | | | |
| Alliaceae | *Allium sativum* L. (HU-2908) | Ouga | W | ℍ | ɟ | Raw, past | Blood pressure, carminative, aromatic, condiments, diaphoretic, diuretic, expectorant, antiseptic | 0.41 |
| Alliaceae | *Allium cepa* L. (HU-2907) | Piaz | L, b | ℍ | ĩ, Ä | Decoction | Stimulant, diuretic, aphrodisiac, expectorant, antiseptic, jaundice | 0.81 |
| Apiaceae | *Coriandrumsativum* L. (HU-2910) | Dhania | S, L | ℍ | Ă, Ḿ | Decoction, cooked | Aromatic, stimulant, carminative, diuretic, tonic, stomachic, aphrodisiac, flatulent colic, bleeding piles, dyspepsia, jaundice | 0.89 |
| Apiaceae | *Foeniculam vulgare* Miller. (HU-2911) | Kaga | S | ℍ | ɟ, ĩ | Juice | Stomachic, digestive, cure | 0.37 |
| Araceae | *Alocasiamacrorrhiza* L. G.Don (HU- | Kachaloo | b | ℍ | No | Decoction | Laxative, diuretic, labitual constipation, Piles | 0.64 |
| Asteraceae | *Helianthus annuus* L. (HU-2914) | Nwarparast | S, f | ℍ | ĩ, Ä | Oil, Powder | Laxative, diuretic, heart disease | 0.53 |
| Brassicaceae | *Rapinis sativa* L. (HU-2921) | Mooli | R, S, L | ℍ | Ṃ | Juice, raw | Diuretic, laxative, diarrhoea, stomachic, urinary tract, cooling effects, carminative, expectorant, jaundice | 0.67 |
| Brassicaceae | *Brassica rapa* L. (HU-2919) | Thipper | R | ℍ | Ṃ | Decoction, cooked | Stomachic, curative, carminative, jaundice | 0.75 |
| Brassicaceae | *Brassica campestris* L. (HU-2918) | Sharshum | L, S | ℍ | Ṃ, Ă | Oil | Oil used in cooking, for massage of body and hairs, ointment, jaundice | 0.85 |
| Cucurbitaceae | *Cucurbita maxima*Duch. ex Lam. (HU-2925) | Khogkadoo | F, S, f | ℂ | M, ɟ | Cooked, Decoction | Ulcer or other digestive problems, stomachic, anthelmintic, jaundice | 0.82 |
| Cucurbitaceae | *Cucurbita pepo* L. (HU-2926) | Peta kadoo | F, S | ℂ | Ṃ, ɟ | Cooked, Decoction | Diuretic, anthelmintic, jaundice | 0.84 |
| Cucurbitaceae | *Cucumissativus* L. (HU-2927) | Badrang | F, S | ℂ | ĩ, Ä | Raw | Nutritive and demulcent, used as tonic, cooling, diuretic, jaundice | 0.76 |
| Cucurbitaceae | *Momordicacharantia* L. (HU-2928) | karela | F | ℂ | ɟ, ĩ | Juice | Diabetic, cooling | 0.37 |
| Lamiaceae | *Menthaspicata* L. (HU-2940) | Bodina | L | ℍ | Ä, $ | Decoction, powder | Dyspepsia, stimulant, carminative agent. Decoction of leaves is used as mouth wash, jaundice | 0.86 |
| Malvaceae | *Hibiscus esculentus* Linn. (HU-2944) | Bendai | F | ☙ | ɟ, ĩ | Cooked, raw | Emollient, demulcent, diuretic, it causes constipation | 0.57 |
| Papaveraceae | *Papaver somniferum* L. (HU-2951) | Apeem | F, S | ℍ | Ṃ, Ă | Decoction, powder | Narcotic, anodyne, sedative. It increases excitement and physical vigor, tonic | 0.42 |
| Papilionaceae | *Trifoliumrepens* L. (HU-2960) | Shoutal | W | ℍ | Ṃ, Ă | Cooked | Diuretic, laxative, carminative. It increases soil fertility and is cultivated for crop rotation | 0.36 |
| Papilionaceae | *Pisumsativum* L. (HU-2962) | Matar | S, F | ℍ | Ñ, Ḏ | Cooked, powder | Antiemetic, carminative, laxative | 0.31 |
| Poaceae | *Zea mays* L. (HU-2955) | Jowar | F, W | ☙ | Ă | Cooked | Urticarial, digestive disorder | 0.50 |
| Poaceae | *Triticumaestivum* L. (HU-2956) | Ghanum | W | ℍ | Ă | Cooked | It is cultivated as main staple crop grains are roasted with raw sugar. Cattle eat Hay. Hay is mixed with clay plaster as an anti-cracking agent | 0.56 |
| Poaceae | *Avena sativa* L. (HU-2957) | Jumdar | W | ℍ | ɟ, ĩ | Powder, infusion | Stimulant, laxative, nerve tonic, antiseptic | 0.43 |
| Solanaceae | *Solanum tuberosum* L. (HU-2978) | Alou | b | ℍ | ɟ, ĩ | Cooked | Important source of starch and proteins, and used in tuberculosis | 0.47 |
| Solanaceae | *Lycopersicumesculentum* L. (HU-2982) | Tamator | F | ℍ | ɟ, ĩ | Raw | Dysentery, as anti-diabetic, losing of body weight, digestive disorder | 0.53 |
| Solanaceae | *Capsicum annuum* L. (HU-2980) | Sheen Marchakey | F, S | ℍ | ɟ, ĩ | Raw | Stomach energizer, ant-rheumatic, kidney disorder | 0.46 |
| **Tree Species** | | | | | | | | |
| Bombacaceae | *Bombaxmalabarica* Mala style (HU-2983) | Sumbal | L, s, R | ₸ | ʃ, Ṃ | Poultice, decoction | Burning sensation, stomach ulcer, bone joining | 0.19 |
| Ebenaceae | *Diospyros lotus* L. (HU-2932) | Tooramlook | L, F | ₸ | Ă, Ḿ | Decoction | Dysentery | 0.10 |
| Ebenaceae | *Diospyros kaki* L. (HU-2933) | Sooramlook | F, s | ₸ | Ṃ, Ă | Raw | Laxative | 0.08 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Juglandaceae | *Juglansregia* Linn. (HU-2937) | Akoor | L, F, B | ₸ | Ã, Ḿ | Decoction | Eczema, intestinal worms, cleaning and sparkling teeth | 0.06 |
| Meliaceae | *Melia azadirachta* L. (HU-2941) | Malkaibakiana | L, S, F, B | ₸ | ĩ, Ã | Powder, decoction | Leprosy, anthelmintic, anti-dysenteric, rheumatism, diabetes, jaundice | 0.91 |
| Mimosideae | *Acacia arabica* L. (HU-2965) | Kikar | W | ₸ | Ñ, Ḍ | Decoction | Bleeding gums, prolapsed rectum, leucorrhea, spermatorrhora | 0.36 |
| Mimosideae | *Acacia nilotica* L. (HU-2985) | Kikar | W | ₸ | Ñ, Ḍ | Powder | Ear infection | 0.64 |
| Mimosideae | *Acacia modesta* Well. (HU-2964) | Paloosa | L, F | ₸ | Ñ, Ḍ | Past, decoction | Leaves and gum are used for the treatment of general weakness | 0.42 |
| Moraceae | *Morus alba* L. (HU-2945) | Spin toot | L, F, B | ₸ | Ã, Ḿ | Decoction, raw | Laxative, purgative, cleaning throat, cooling agent, anthelmintic, astringent | 0.41 |
| Moraceae | *Morusnigra* L. (HU-2946) | Tour toot | L, F, B | ₸ | Ã, Ḿ | Decoction, raw | Laxative, purgative, cleaning throat, cooling agent, anthelmintic, astringent | 0.54 |
| Moraceae | *Ficusbengalensis* Linn. (HU-2948) | Barr | W | ₸ | Ñ, Ḍ | Past, powder | Pain and cracked, toothache, tonic, diabetes, diarrhoea, cooling | 0.69 |
| Myrtaceae | *Eugenia jambolana* L. (HU-2949) | Jaman | L, S,F | ₸ | ɻ, ĩ | Raw, Juice | Diabetes, liver disorders | 0.05 |
| Platanaceae | *Platanusorientalis* L. (HU-2952) | Chinar | B | ₸ | Ã, Ḿ | Past, decoction | Toothache, diarrhea | 0.23 |
| Papilionaceae | *Dalbergiasissoo* L. (HU-2963) | Shawa | L | ₸ | Ṃ, Ã | Decoction | Wound healers, blood purifier, scabies infection | 0.48 |
| Rutaceae | *Citrus decumana* L. (HU-2970) | Gilgil | F | ₸ | ɻ, ĩ | Juice, powder | Diabetes, jaundice | 0.72 |
| Rutaceae | *Prunuspersica* L. (HU-2971) | Shuptalo | L, F, f | ₸ | Ṃ, Ã | Juice, raw | Tonic. stomachic, anticorbic, diabetes, purgative, diuretic | 0.36 |
| Rutaceae | *Prunusarmeniaca* L. (HU-2972) | Khormanai | L, F, S | ₸ | Ṃ, Ã | Juice | Refrigerant, laxative, fever, constipation, digestion, anemia, skin disorders | 0.04 |
| Rutaceae | *Pyruscommunis* L. (HU-2973) | Nashpatai | F, B | ₸ | $ | Juice | Sedative, astringent, febrifuge | 0.20 |
| Simaroubaceae | *Ailanthus altissima* Mill. (HU-2986) | Parmibakyana | L, B | | Ṃ, Ã | Juice | Anthelmintic, dysentery, diarrhoea | 0.06 |
| Rhamnaceae | *Ziziphusmauritiana* Wall. (HU-2984) | Beer | W | | ɻ, ĩ | Decoction | Emollient, expectorant | 0.03 |

**Table 3**.Indigenous herbal medicinal recipes against jaundice.

| Plant name | Herbal recipes |
|---|---|
| *Cichoriumintybus* | Washed fresh plant material then boiled along with sugar. Half cup of the decoction is administered to the patient thrice a day against jaundice for two weeks. |
| *Carthamusoxyacantha* | The seeds oil from this plant is endorsed for jaundice. The powder obtained by grinding the seeds dried under shade is prescribed for Jaundice and cooling effect. One tea spoon of powder is taken twice a day for 3-4 weeks. |
| *Asparagus adscendens* | The rhizome cut into small pieces and boiled with water (decoction) then filtrate in silk cloth is used for jaundice. |
| *Calotropisprocera* | A decoction or infusion of the stem bark and root bark, or the powdered bark in water is taken to curejaundice. |
| *Euphorbia helioscopia* | Leaf extract (juice) in combination with leaf extract of *Phyllanthusamarus*, sugar and curd is administered in 2 tea spoons thrice a day for 2-3days. |
| *Cuscutareflexa* | Fresh plant material is grinded and extracted and then half of cup of juice is administered once each night for two weeks. |
| *Fumariaindica* | Aerial parts of plant grinded and then juice is kept in open air overnight and is used before breakfast 1-3 spoons to treat jaundice. |
| *Menthalongifolia* | It is a wild herb found in canal sides. The leaves and stem are powdered and mixed with sugar used for the treatment of jaundice. |
| *Tinosporamalabarica* | Dry fruit powder mixed with honey and administered as 2 spoons once in morning for 5 - 7days. |
| *Portulacaoleracea* | Whole plant dried and made into powder and administered in 2 spoons early in the morning for about 15days. |
| *Cynodondactylon* | Leaves of plant and rose flowers are grounded together and extracted. The extract is given against Jaundice. |
| *Solanum nigrum* | Washed the whole plant and two spoonful of decoction is administered twice a day for 5 days. |
| *Fagoniaindica* | It is found in the hilly areas but very rare in distribution. Half cup of their juice is taking against jaundice for 10 to 15 days. |
| *Allium cepa* | Taking one glass of onion bulb juice after every two hours helps curing jaundice. |
| *Coriandrumsativum* | The seeds and fresh leaves are crushed mixed with sugar and taken orally daily with water for the treatment of jaundice. |
| *Rapinis sativa* | It is a cultivated vegetable. It is boiled in water or cut in small pieces and eaten against jaundice. |
| *Brassica rapa* | It is a common vegetable, boiled in water which is highly effective against jaundice. |
| *Brassica campestris* | It is a cultivated herb. Oil is extracted from the seeds which is used for the treatment of jaundice |
| *Cucurbita maxima* | Unripe and ripe fruits are used against Jaundice. |
| *Cucurbita pepo* | It is regular diet for patients suffering from jaundice; this statement is given the informants of Council Sakindare, District Swabi. |
| *Cucumissativus* | According to the informant's reports, fresh fruit of the plant is cut into small pieces and is given to jaundice patient thrice a day for thirty days. |
| *Menthaspicata* | It is cultivated herb found in moist soil. Leaves are powdered and mixed with salt and sugar and taken with water for the treatment of jaundice. |
| *Melia azadirachta* | It is large tree found everywhere. Seeds are dried and crushed (Powdered) then taken for 15-20 days against jaundice. |
| *Citrus decumana* | It is a tree cultivated in moist soil. Fruit bark is dried and crushed which is taken orally with water against jaundice for 10-15 days. |

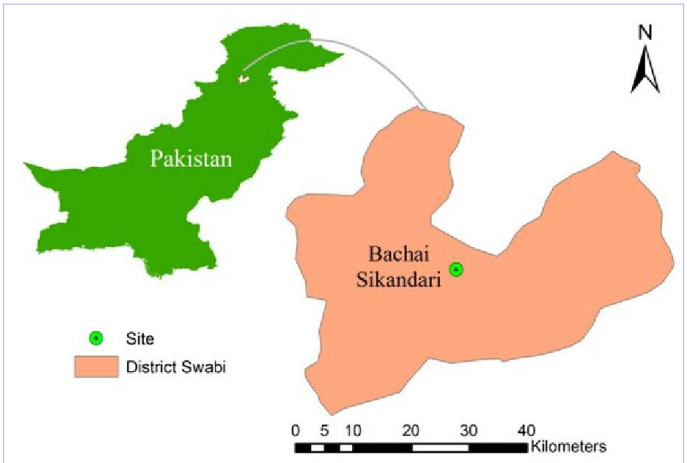


**Figure 1** Map of Pakistanshowing the study area.

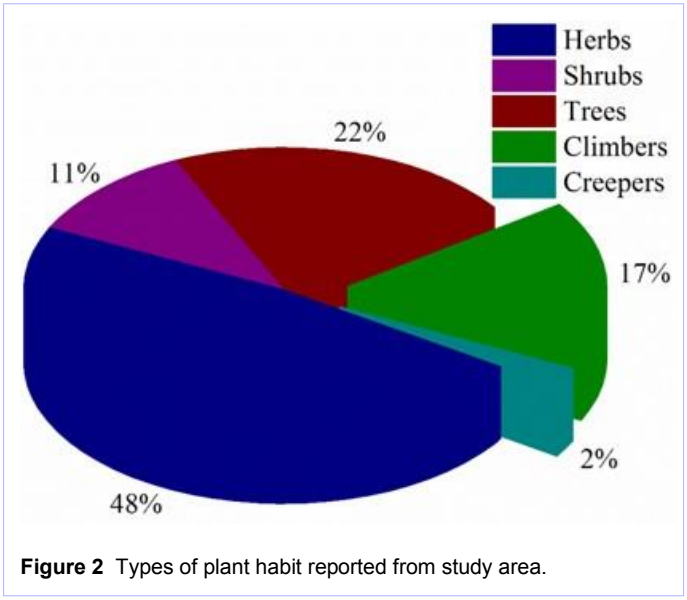


**Figure 2** Types of plant habit reported from study area.

### *Medicinal plant parts and herbal preparation*

During the field survey, it was reported that either single or multiple parts of the plants were utilized in indigenous medicines. Different plants parts utilized for curing various disorders or single plant part used for multiple ailments that's why we emphasized the plants part along with the disorder treated. We investigated 10 different plant parts of 81 species used in remedies preparation and found leaf (25%) as main sources ofindigenous medicines. In this regard our observations are in agreement with Ahmad et al. and Ba tool et al. [3,23]. followed by the whole plant (21%), fruit (19%), seed (13%), bark (6%), root (5%), stem and flower (4%), bulb, and rhizome (1, 2%)(Figure 3) which depicts that the whole plant, seeds, bark and roots were the most favored parts of the medicinal plants afterward leaves. On the Other hand, use of stem, flower, bulb, and rhizome was cited less than 5%. Though Kunwar et al. [34]. reported that below ground plant parts have the high concentration of bio active constituents however collecting of whole plant and below ground plant parts is not feasible [35]. This practice is a danger to the existence of the majority of medicinal plants used by the local communities of district Swabi. There are various techniques of herbal prepara- tion, each of which may exhibit dissimilar consequences against different disorders. So, it is vital to mention herbal preparation category. Nine different herbal preparations viz. cooked, decoc- tion, infusion, juice, oil, past, poultice, powder and raw were practiced in the study region, dominated by decoction (29%) fol- lowed by powder (20%), juice (13%), cooked (11%), raw (10%) and so on (Figure 4). These findings are in line with those pre- viously reported across other regions of Pakistan as wellas glob- ally [36]. Recently, Kayani et al [37]. found that decoction and powder were the most used types. Many active compounds are produced as a result of accelerated reactions by heating that can be more useful to treat various ailments.

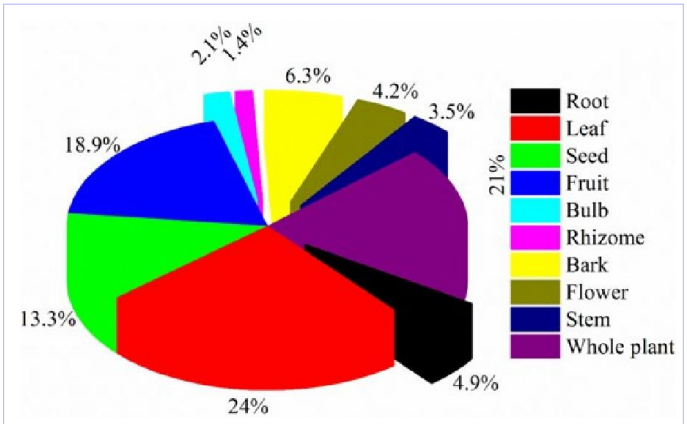


**Figure 3** Plant parts used in remedies preparation.

### *Jaundice and other disorders associated knowledge*

Exploration of indigenous medicinal knowledge and its database compilation, to certify and assist the future research is becom- ing amost potential effort. Regardless of these efforts, our find- ings revealed that specific indigenous plants and their parts and chemical constituents have been broadly utilized for jaundice in this area. Though there is a hospital to treat jaundice patients near UCBS local people mostly prefer herbal prescriptions. Ac- cording to our survey, it is found that mostly Afghan refugees havelack of basic knowledge about herbal practiceso local peo- ple assist them to use herbal recipes against jaundice and other ailments. Likewise in order to consume plants in effective cus- tom, local community always preferred to have all the additional

information. In this study, we explored herbal recipes made from 24 plants that have been shared exclusively by, and native to the local population of the study region (Table 3). Listed plants species were categorized according to their uses for various dis- eases (Figure 4) which indicate that the most common diseases are mainly treated either using cultivated species or common herbs.

Medicinal species used to cure the signs and symptoms of various diseases cited by local informants were grouped under 9 disease categories (Figure 4). Subsequently, a single plant species were recorded in numerous disorders. Regarding specific ailments, natural remedies are mostly used for treating gastrointestinal system (38 plants) (Figure 4). Other researchers also doc- umented various ethnomedicinal plants used to cure many disor- ders [38–42].

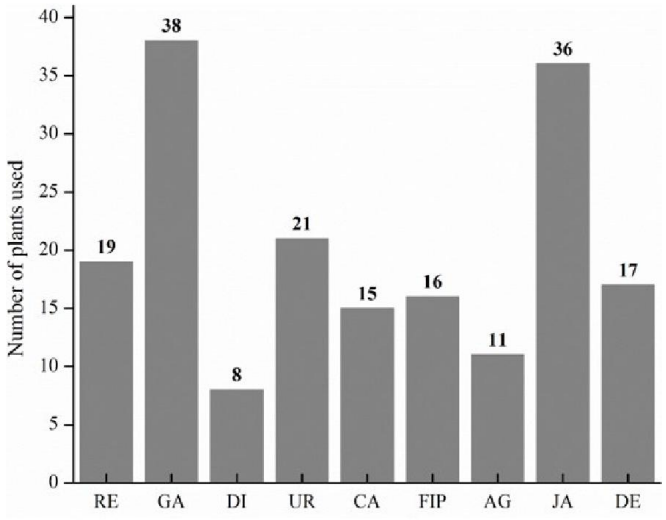


**Figure 4** Plant species used for various diseasecategories: respiratory (RF), gastrointestinal (GA), diabetes (DI), urological(UR), fever/ inflammation/pain (FIP), rological/gynaecogical (AG), jaundice (J)and dematological (DE)

### *Use value*

Assessing the "significance" of plants in a community is the fundamental concern in quantitative ethno botany. Like "use value "established by Tard´ıo and Pardo-de-Santayana (2008) are used in ethnobotany to assess and help in better understanding of the traditional information of plants used by the local community of that region [43]. depending upon the use of different indices for different drives. In this study, Calotropisprocera was the most commonly used plant species showing the highest value 1.00, was commonly found in the study area and used to treat- dysentery, tonic, purgative, snake bite and jaundice. These high

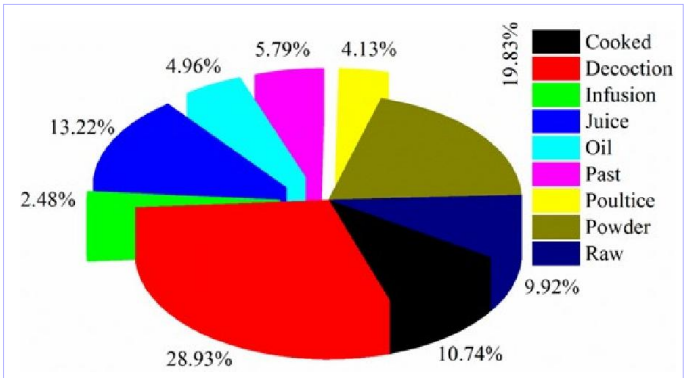


**Figure 5** Preparation types ofdifferent plant species for usage in ailments in the study area

UV plants have been previously cited in different studies without recommending them as the most frequently used plants of the area [44]. *Portulacaoleracea* accredited its usages for the cure of various ailments and has sound credit in local people. Other plants having high use values were *Fagoniaindica* (UV 9.6), *Melia azadirachta* (9.1), *Fumariaindica* (9.0), Coriandrumsativum (0.89), Solanum nigrum (0.88), Cynodondactylon (0.87), Menthaspicata (0.86), Cucurbita pepo (0.84), Cucurbita maxima and Euphorbia helioscopia(0.82), and Allium cepa (0.81) (Table 2), demonstrating the most frequent usage of these species by the aboriginal communities.

In the current study, Ziziphusmauritiana was found with the lowest use value i.e. 0.03 and it might be due to its limited accessibility in the reported area while people use it as emollient and expectorant. Other plants with lower use value were Prunusarmeniaca (UV 0.04), Ailanthus altissima and Juglansregia (0.06), Dodonaeaviscosa (0.07), Diospyros kaki (0.08), Justicaadhatoda (0.12) and Medicago denticulate (0.13). Usually, the infrequent accessibility of plants leads to the low use value ofplants.

### *Limitations*

The present survey was limited to interview from women, where women are bounded to strong traditional and conservative values, deriving its basic principles of their religion. The concepts of shame and honor, hospitality, gender segregation and veiling (Parda) are predominant within female community. Furthermore, females are strictly not allowed to talk with male members of the community except close relatives. Hence it is hard for male interviewer to conduct any ethnobotanical investigation, so we are failed to conduct interviews from female gender. The study areas are financially poor along with lack of skills, lake of marketing opportunity, lake of awareness ofalternatives, heavy human and animal pressure, and absence of any working institution are also causing major limitations to con-

duct research. Although the Afghan refugees have lived on District Swabi for about 38 years, the communication and sharing of medicinal knowledge between these groups is very limited. There is a general lack of dialogue between health professionals and local people which might be indicative of wider power structures as well as practical barriers such as a lack of time and interpreting services.

***Threats and conservation status***

Medicinal plants have assisted the human health since ancient time. In the earlier times, humans were using medicinal plants in comparatively simple ways, that information, the ethnobotanists are discovering even today. Regrettably, the local ethnomedicine knowledge is threatened because the modern epoch mostly prefers the English medicine, and there is lack of interest among the youngsters to pursue such knowledge from the elders. The present study revealed that 46% of the wild edible plant spices were collected from natural shrub lands, followed by cultivated fields (30%) and trees (25%). The level of impact of these events varied from place to place. District Swabi as a whole is the most popular area for medicinal plants diversity and trade, especially in agricultural field of Pakistan. Considering the local people's perception, overgrazing due to Afghan refugees cattle (sheep), agricultural land expansion, over-harvesting, and uncontrolled wood collection are the major threatening activities to wild edible plants species of this area. Another reason might be that indigenous community did not know how to utilize the medicinal plants, that's why these plants species facing endangered status e.g. J.adhatoda, C.oxyacantha, C.procera, O.monacantha, C.reflexa, O. basilicum, V. Thapsus, S. xanthocarpum, D.stramonium, F. indica, and D. sissoo. Since from this ethnobotanical survey, it is recommended that native people should be given more awareness about herbal recipes and preservation of the indigenous flora.

## Conclusions

In conclusion, the knowledge shared in the current study will help to preserve the precious ethnobotanical and ethnophormacological aspect of the study area, seal some break in the flow of ethnomedicinal information, and deliver allusions to pharmacologists for conducting further exploration to isolate new chemical compounds from these plants. It is cost revealing that local communities harvest medicinal plants on regular basis for self-use (wild edible plant) and commercial purposes (cultivated and trees) which lead to steady endangered of rare species. We strike the concerned higher authorities to implement some training lessons on the preservation of medicinal flora and their usage.

***Ethical approval***

The ethnobotanical survey was carried out from the local community and was duly approved by the ethical committees of the Department of Botany, from the Herbarium, Hazara University, Khyber Pakhtunkhwa, Pakistan. All informants have accepted the publication of these results.

***Conflict of interest***

The authors state that there is no conflict of interest regarding the publication of this article, and it is certified that we have no profitable relations that might display any potential conflict of interest in connection with the conducted research and submitted article.

**Author details**

[1]Department of Botany, Hazara University, Mansehra, Khyber Pakhtunkhwa, Pakistan. [2]MOE Key Laboratory of Cell Activities and Stress Adaptation, School of Life Sciences, Lanzhou University, Lanzhou, 730000, China. [3]School of Life Sciences,, Northeast Normal University, Changchun, Jilin, China. [4]Department of Botany, Abdul Wali Khan University, Mardan, Khyber Pakhtunkhwa, Pakistan. [5]State Key Laboratory of Grassland Agro-ecosystems, Institute of Arid Agroecology, School of Life Sciences, Lanzhou University, Lanzhou, China.

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