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Research Article

Quantitative assessment and status of ethnomedicinal plants of Sheen Ghar Valley, Dir Lower, Khyber Pakhtunkhwa, Pakistan

Shariat Ullah*[1], Lal Badshah[2], Asghar Ali[3] & Noor Muhammad[4]

[1]Department of Botany, University of Malakand, Chakdara 18800, Dir Lower, Pakistan
[2]Phytosociology Laboratory, Department of Botany, University of Peshawar 25000, Pakistan
[3]Government AKL, Post Graduate College Matta, Swat 19130, Pakistan
[4]College of Horticultural, Hebei Agricultural University, Baoding, Hebei 50000, China

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Abstract

This study was conducted from March 2017 to August 2018, to enumerate the quantitative attributes and current status of medicinal plants of Sheen Ghar Valley, District Dir Lower, Pakistan. A total of 51 species were documented for their medicinal uses. These plants belonged to 31 families. Results of this study revealed that leaves were the frequently used part (50%), followed by whole plants (only 30%) in curing different ailments. Many plants were found to be having multiple uses. Based on family importance value (FIV), Lamiaceae was the leading plant family (126.30) followed by Violaceae (55.81), while highest relative frequency of citation (RFC) was noted for *Viola canescens* (0.558) followed by *Olea europaea* (0.523). Conservation study revealed that 24 species (47%) were vulnerable, 22 species (43%) were rare and 4 species (8%) were noted as infrequent. Following IUCN standards for conservation, one species *i.e. Hypericum perforatum* was declared dominant. This study recommends immediate *ex-situ* and *in-situ* conservation programme for protecting the plant wealth of the locality.

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Keywords: Ethnobotany; Family importance value; Relative frequency of citation; Conservation; Medicinal uses; Dir Lower.

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Correspondence
Shariat Ullah
✉ shariatullahuom@gmail.com

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Introduction

Existing status of the medicinal flora of any locality can be best understood by applying quantitative ethno-botanical techniques. Quantitative studies generate important primary data, which may be used to plan strategies for the conservation of plant resources (1). Ethnobotanical studies in the new millennium have taken a fresh turn and now such studies not only document the medicinally valuable plants but also throw light of their conservation status. For multiple reasons, a big chunk of global

population depends on medicinal plants for curing a variety of health disorders; hence medicinal plants are regarded as a very important natural resource. Though, in most localities these medicinal plants occur in abundance and their use is of tremendous value in health care but over consumption may lead to a potent threat for medicinal flora (2). According to an estimate 50,000 medicinal plants are in use to benefit 80% of world's population (3). Ethno-medicinal information has been compiled with traditional uses and recipes for 45 medicinal plants in Bahawalpur (4). In Kurram Agency, Parachinar, 64 herbs with medicinal importance were reported from Lamiaceae, Papilionaceae and Asteraceae (5). In another study 50 medicinal plants along with methods of formulating crude drugs from them were recognized in Talash Valley Dir Lower, Pakistan (6). In North Waziristan Agency the Wazir and Dawar tribes use 88 medicinal plants for the treatment of different diseases (7). From District Tank of Khyber Pakhtunkhwa province, 205 plants along with their medicinal value were reported (8). A study revealed that 67 medicinally important plants were recorded from Jandool Valley District Lower Dir, which were utilized by inhabitants to cure various ailments (9). From Mastooj Valley of District Chitral, 82 medicinal plants were documented along with recipes (10). In Dir Kohistan region 62 species of plants were documented which were used for various diseases (11). From Gollen Valley of District Chitral 36 medicinal plants were documented with their local uses (12). Ethno-medicinally important 88 plants were recorded from Jalalpur Jattan of Punjab province (13). From Balochistan, 61 important plant species were reported from Kalat and Khuzdar (14). An inclusive study on ethno-medicinal treasure of Chitral Valley recorded medicinal plants, conservation status and their uses (15). Around 51 medicinal plants were recorded from Gilgit-Baltistan (16). Thirty-one medicinal plants were recorded from Wazirabad, District Gujranwala, Punjab, Pakistan (17). A detailed checklist of some ethno-medicinally important plants along with their traditional uses were prepared from Swat (18). Two separate studies described 140 and 126 medicinally important plant from Kabal and Ghalegay areas of District Swat (19-20). Some notable ethnobotanical studies from various parts of Pakistan include reports on Chakwal (21), Kohat Pass, Khyber Pakhtunkhwa (22-23) and Harichand, Charsada (24).

The present study enlisted the ethno-medicinally important plants of various areas of Sheen Ghar Valley, District Dir Lower. This study was aimed to document ethnomedicinal uses of plants among various Khels (Sub-tribes) in Sheen Ghar Valley, Dir Lower and to record their present conservation status.

Materials and Methods

Sampling technique and data collection method

Ethno-medicinal survey was conducted from March 2017 to August 2018 in different areas of Sheen Ghar Valley in District Dir lower. Mostly the upper areas were selected because here proper medical facilities are wanting, and locals mostly depend on natural therapies. Informants were nominated according to "purposive sampling technique", a technique which is gaining popularity among ethno-botanists across the globe (25). Totally, 86 informants were selected including males, females and local Hakeems (Traditional healers). Ethno-medicinal data was gathered through semi-structured interviews.

Collection, identification and preservation

Field trips were arranged for the collection of plant samples or their parts with the help of locals who shared valuable information regarding their uses and recipes. Plant samples were dried, preserved by using 1% $CuSO_4$ and mounted on standard herbarium sheets. A voucher number was given to each species. The plant specimens were identified with help of available literature (26-28). Collected samples were duly deposited at the Herbarium of Botany Department University of Malakand for future reference and examination.

Quantitative analysis of data and conservation status

The collected plants were categorized into different classes based on information collected, regarding their ethno-medicinal uses. The relative frequencies of citation and family importance values were calculated as per formulae:

$$RFC = I/N \quad (0<RFC<1)$$

RFC -Relative frequency of citation

I- Number of informants who mentioned the plant

N - Total number of informants

$$FIV = FC/N \times 100$$

FIV- Family importance value

FC - Frequency of citation of the family

N - Total number of informants.

Conservation status of the medicinal plants was calculated as per IUCN standards (29).

Results and Discussion

Ethnic composition of the area

People inhabiting the study area are Pashtuns and Pashto is the language in the area. Major sub-khels (sub-tribes) of this part of Khyber Pakhtunkhwa include Landai, Mandomanzai, Marofa, Garband, Ondisa, Kass, Shako, Bairay and Darmal.

Ethno-botany and conservation status

In the current study, the medicinal uses and conservation status of 51 plants were evaluated. Medicinal flora of the study area was examined based on plant habit, part used, FIV, FC, RFC, their respective ethno-medicinal utilities and conservation status. A total of 86 individuals were interviewed for the ethno-medicinal information. The results indicated that of these 51 medicinal species (29 species, 57%) were herbs followed by trees *i.e.* (15 species, 29%) and (7 species, 14%) belonged to shrubs (Fig. 1). Based on parts used leaves were the most frequently used part (50%) followed by whole plants (30%), fruits (15%), Seeds (10%), flower and bark (5%) and latex, gum (1%) (Fig. 2). Similar studies were conducted in other areas of Pakistan by different ethno-botanists such as 84 plants of medicinal importance were reported from Lal Suhanra National Park, Bahawalpur (30) while, 51 plants of medicinal value were documented from Thakht-e-Sulaiman Hills (31). Similarly, in another study not only recorded 169 medicinal plants from Malakand Pass Hills but also elaborated that shoots were the commonly used part followed by leaves and whole plant (32). However, our results are in line with the study (33) which revealed that in Pashtun tribal areas usually whole plants are used followed by leaves for the treatment of various diseases.

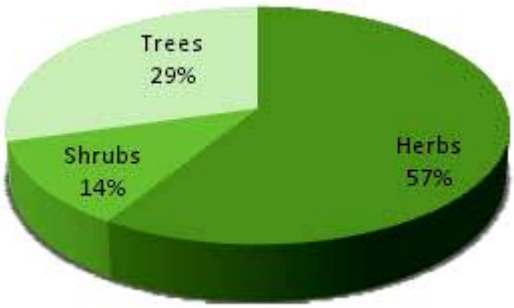

Fig. 1. Classification of plants based on their habit

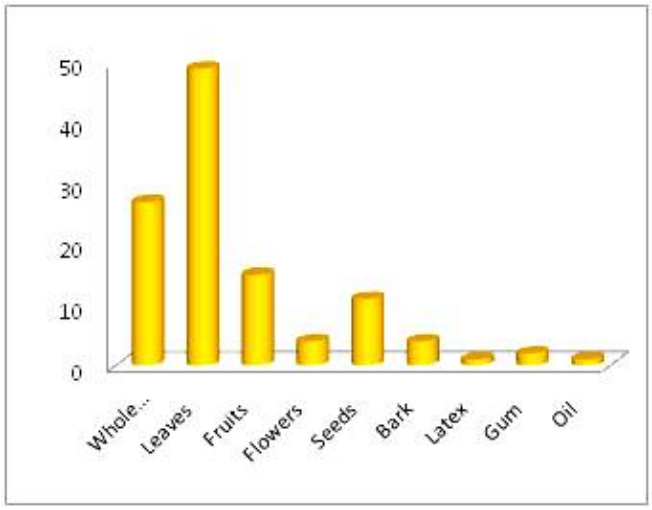

Fig. 2. Classification of plants based on their parts used

Administration of plant extract was common in the area. Some medicinal plants or their effective parts are powdered while in few cases fresh plants were used directly as crude drug (Supplementary Table 1). Our findings revealed that most of the species had multiple uses while few had single application such as leaves of *Rumex dentatus* were used to cure scabies, *Duchesnea indica* in eye infections, *Fumaria indica* whole plant powder was used as blood purifier, *Equisetum arvense* as a diuretic, *Salix acmophylla* as analgesic and *Portulaca quadrifida* was found to be demulcent. Medicinal plants which were used raw included *Rumex hastatus*, *Carthamus oxyacantha*, *Helianthus annuus*, *Rubus fruticosus*, *Cotoneaster microphyllus*, *Acacia nilotica*, *Mentha arvensis*, *Rabdosia rugosa*, *Bergenia ciliata*, *Ziziphus oxyphylla* and *Viola canescens*. These plants were used to treat various ailments such as carminative, blood clotting agent, antiseptic, skin itching, antidiabetic, cough, heart problems, gastric disorders, as vermicide and insecticide, wound healing, muscular pain and as anti-pyretic. Similar studies were conducted in Ladha, South Waziristan and Mohmand agency, which reported 82 and 64 medicinal plants respectively, used for treating different types of ailments (34-35). These ethno-medicinal importance of plants were also reported by other scholars in different parts of Pakistan (36-37) and abroad (38-40). Our findings are strongly backed by these studies. Human population explosion and improper collection methods increase the stress on the medicinal flora which leads to low population density of medicinally important plants. Beside their utilization for medicinal purposes the residents modify the vegetation cover during construction of domestic units, increased fuel demand and for agriculture purposes.

Relative frequency citation (RFC)

Relative frequency of citation is concerned with the local use of a plant species for the treatment of different types of ailments. The RFC values also show the strong and long-term association of residents with local flora (41). Highest RFC value was noted for *Viola canescens* (0.558) followed by *Olea europaea* (0.523), *Juglans regia* (0.522), *Rumex hastatus* (0.384), *Mentha arvensis* (0.383), *Zanthoxylum armatum* (0.382), *Salvia moorcroftiana* (0.235), *Dodonaea viscosa* and *Ziziphus jujuba* (0.232) each, while that of *Ajuga integrifolia* was (0.220), (Supplementary Table 1; Fig. 3). *Skimmia laureola* had highest RFC value *i.e.* 0.321, followed by *Juglans regia*, *Olea europaea* and *Papaver somniferum* (0.294 each) during a study conducted in Hindukush Range, District Swat, Pakistan (42). These species were used for treating various diseases like respiratory disorders, for scorpion bites, digestive and liver diseases. The importance of these species was also described by other scholars from different regions of the country for curing of these diseases (43-45).

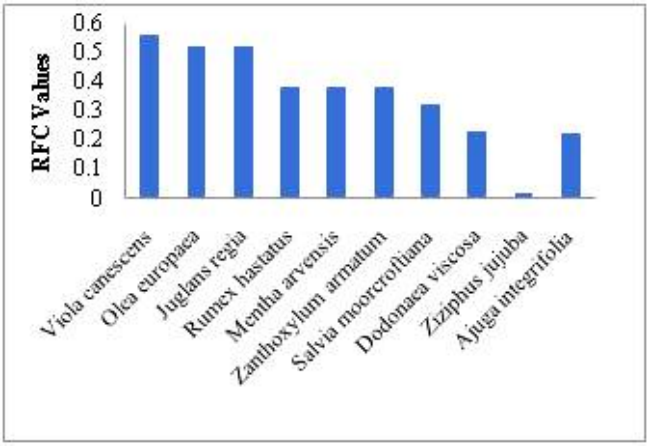

Fig. 3. Species with highest (RFC) values

Family importance value (FIV)

FIV reveals the number of locally important species belonging to a family. Our results revealed that leading family was Lamiaceae (126.30%) followed by Violaceae (55.81%), Pinaceae (54.65%), Oleaceae (52.32%), Juglandaceae (52.31%), Polygonaceae (40.69%), Rutaceae (38.37%), Sapindaceae (26.74%) and Rosaceae (20.93) (Supplementary Table 1; Fig. 4). These families were also reported as important families regarding their medicinally important plants by other researchers from different parts of the world (46-49).

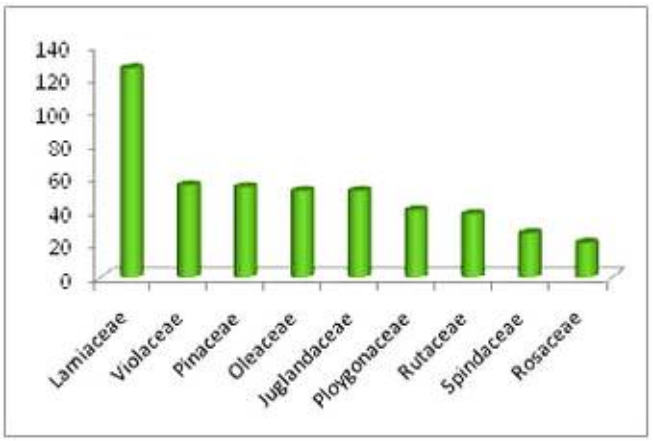

Fig. 4. Families with highest (FIV) values

Conservation status

In the current study, a total of 51 medicinal plants were evaluated for their conservation status following IUCN standard criteria. The results showed that no species was found endangered, 24 (47%) species were vulnerable, 22 (43%) species appeared to be rare, 4 (8%) species infrequent and 1 (2%) species was ranked as dominant in the area (Supplementary Table 1; Fig. 5). The results also depicted that *Hypericum perforatum* fulfilled the IUCN criteria of dominance. Some of the vulnerable species found in the area were *Carthamus oxyacantha, Foeniculum vulgare, Bergenia ciliata, Rubus fructicosus, Cotoneaster microphyllus, Dodonaea viscosa, Ficus palmata* and *Juglans regia* (Supplementary Table 1). Many of the vulnerable species were extensively collected for local therapies, while the trees and shrub species such as *Juglans regia and Ficus palmata* were utilized for construction purposes and *Dodonaea viscosa* for fuel demand. Vulnerable species need special care for their protection otherwise; they will be wiped out in near future. Some of the rare species found in the vicinity were *Olea europaea, Cedrus deodara, Ziziphus oxyphylla, Acacia nilotica, Salix acmophylla, Rabdosia rugosa, Indigofera heterantha, Zanthoxylum armatum, Salvia moorcroftiana, Xanthium strumarium* and *Urtica dioica*. The locals use these plants as medicine, as fuel and as timber. Several factors are threatening the biodiversity at alarming levels such as habitat fragmentation, over collection, fuels demand, over grazing and other abiotic stresses (50-51). While, in the present investigation the main threats to biodiversity were high market values of medicinal plants, rising fuel demand, conversion of land to residential units and agricultural extension.

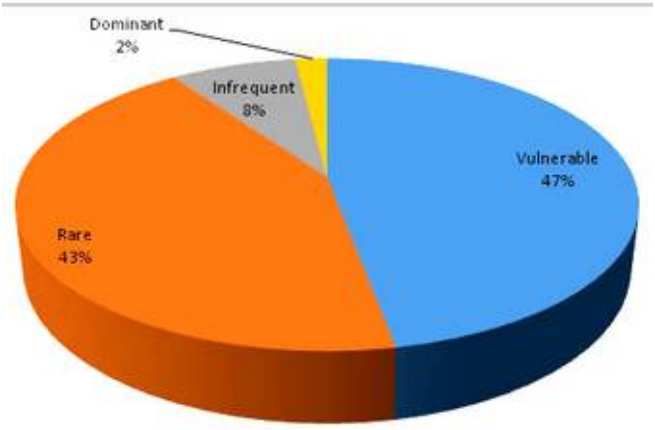

Fig. 5. Conservation status of plants

Authors' contributions

SU (Wrote the MS and collected the field data), AA (Wrote the MS and identified the plants), LB (Designed the study and edited the final MS) NM (Cross checked the field data with local healers).

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Competing interest

The authors declare that they have no competing interests.

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