

SPECIES DIVERSITY AND ETHNO BOTANICAL STUDY OF ALLAI VALLEY IN THE WESTERN HIMALAYAN REGION OF PAKISTAN

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ABSTRACT

Allai valley, in the western Himalayan Mountains of Pakistan, is a rich origin of diverse flora of vast medicinal importance. A detail survey was conducted during 2014-15 for documentation of indigenous flora of the valley. On the basis of preliminary survey of the valley and discussion with the inhabitants, four ecologically diverse sites namely Jambura, Biari, Pashto and Banna were selected for the current study. The study consisted of three parts; firstly, all plants were documented, secondly, the available medicinal plants were identified and thirdly, the preferences of local people regarding the use of plants, its parts and forms for treatment of various disorders were studied. The data were collected through a questionnaire survey. Overall 174 species belonging to 86 families were documented. Maximum species were from family Asteraceae (12), followed by Libiateae (8), Rosaceae (7) Moraceae (6) and Papilionaceae (6). Similarly maximum species were herbs (84), followed by shrubs (46) while minimum species were trees (43). Moreover, out of total 174 species, 60 species (34%) belonging to 39 families were identified as medicinally important. The results revealed that the top 10 medicinally important species in terms of percent preferences were Berberis lyceum (20%), Paeonia emodi (13%), Fumaria indica (10%), Rumex hastatus (8%), Achillea millefolium (8%), olanum surratense (8%), Mentha longifolia (8%), Zizyphus vulgare (5%), Acorus calamus (5%), Bergeniaciliata (5%). The finding further established that the leading number of disorders treated with medicinal plants were associated with the digestive system system (25%), followed by those associated with wounds (17%), followed by Respiratory (15%), Blood Purification (12%), Skin (8%), Brain and nerves (8%), Nutrition and tonic (7%), Bones and joints (3%), Reproduction and Urinary System (3). Furthermore, the survey concluded that supreme preferences roots (32%), leaves (31%), whole plant (12%), seed (9%), Bark (8%), fruit (7%), flower (1%), rhizome (0%) were used by the local community. Finally, the study

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found that maximum utilization of medicinal plants was in the form of Powder (32%), juice (23%), paste (22%), cooked (6%), decoction (6%), tea (5%), fresh (3%), tincture (2%) and cream (1%). The study concluded that out of 174 plant species found in Allai Valley, 60 species were medicinally important. *Berberis lyceum* was the most preferred medicinal plant species while powder form was the most preferred form of utilization by the people of Allai Valley.

Key words: Allai Valley, ecological diversity, inhabitants, medicinal importance, Western Himalayan.

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INTRODUCTION

Allai is a Valley which is located in the Western Himalayan region of Pakistan with overall area of 56081 hectare. Tehsil-i-Allai is surrounded by the valley Kohistan in the north, by vast grazing lands of Choor in the east side, by the valley Battagram in the south and River Indus is located on the west side. The Valley is mostly uneven geographically and hilly which have various slopes from moderate to precipitous counting agricultural, desert, forest covers, alpine grazing lands and ranges in altitude from 545 meter at Thakot to 4690 meter at Sokkaisar above average sea level as per GPS readings. The width of Allai valley varies from Half km to Five km and is manageable from Besham via Kund Saiyidan and Thakot located on KKH. All the small streams of the valley fall into the main stream on different locations, which fall into River Indus near Besham at Kund. The small streams which contribute to the main stream are, Jabar, Gantarr, Bateela and Pashto Khwarrs (Khan et al., 2015).

Species diversity enlarges the main elements of medicines in the folk systems of therapeutic and is the leading source of motivation for a large number of main pharmacological drugs. Approximately one out of four species have medicinal value (flora of ziarat ethnobotanical and medicinal importance). This is an expression of the magnitude of share of natural flora in relations of number of species used in the substitute medicines. About eight thousand plant species contribute to traditional medicines in South Asia, Still facing many constraints. Such as the medicinal value of some plants have not been completely identified, inventoried and categorized, information and knowledge not being adequately documented and spread, and the alarming profitable

collection and subsequent genetic destruction of medicinal plants (flora of ziarat ethno botanical and medicinal importance).

Priority in the sustainable management of medicinal flora includes the protection of this biological variety at the level of ecosystem, species and genetic sources. It is only probable through the association of all shareholders and interested parties to take it of greatest significance. Pakistan is amongst the quietly distinct countries in natural assets, where people's dependence on natural sources for diet and health is enormously strong. Pakistan has ironic and continuous practice of the use of medicinal plants and other natural resources for healthcare requirements (Siddiqui and Chaudhary, 2001). It has been observed that livestock raisers and therapists everywhere have traditional ways of ordering, curing, stopping and treating common animal ailments. Many of these "ethno veterinary" practices offer feasible substitutes or complement to orthodox western style veterinary medicine - particularly where the later is inaccessible or unsuitable. The use of medicinal plants constitutes major part of ethno veterinary medicine (EVM) in Pakistan. Use of medicinal plants as an anthelmintic (de-wormer) has been given as an example (Iqbal *et al.*, 2005). Pakistan has almost half of its registered plants renowned as ethno botanically important. About three hundred species are stated be used in folk treatment (Haq, 1998; Perveen and Hussain, 2007); Still, one thousand and ten species have been recognized for their medicinal importance, which makes about 16.8% of the entire recorded flora (Shinwari, 2010).

Pakistan, though, not among the biodiversity hot spots of the world, still faces immense challenges of conservation and sustainable utilization of biological resources. Degradation in natural resources is visible, caused by increased human activities related to the growing population coupled with, human demolition of natural habitations, relocation of human population causing in the change of land use pattern, introduced species, the increasing demand for natural assets and its incorrect management. Furthermore, no organized work has been carried out on the status and dangers to environments, and also the effects of universal climate change are poorly understood. The administration of a suitable arrangement of resources, in numerous locations and underneath deferent circumstances would be one of the well-organized ways to conserve ecosystem that offers the medicinal wealth.

In this backdrop, the present study is designed to achieve the objectives to enlist the available plant species in the valley, to identify the medicinally important species of the valley, and to prioritize the locally preferred medicinal species, its parts used, ailments addressed and recipes prepared.

MATERIALS AND METHODS

The survey was conducted at Allai Valley in the western Himalayan region of Khyber Pakhtunkhwa, Pakistan. To initiate the important study, at first instance the whole valley was extensively visited and local herbalists, Agricultural and Forest experts, local elders and leaders were interviewed. The valley comprises of eight union councils and to facilitate the study valley was divided into four ecological diverse sites every site were consist of two union councils to cover all ecological diversities of the study area.

Selection of sites

On the basis of preliminary survey of the valley and interviews of stakeholders, four ecologically diverse sites namely Jambera, Banna, Biari, and Pashto were selected on the basis of differences in their ecological aspects especially difference in elevation, slope, landscape, habitat, and type of flora.

All the four sites of the research area were extensively visited. The study was divided into three parts. Firstly, the flora of the research area was studied and specimens of all the available species was collected and brought to the herbarium of Hazara University Mansehra for expert identification with the help of flora of Pakistan. The common names, technical names, family names and type of plant or growth habit were properly recorded and documented secondly, local herbalist, agricultural and forest experts, local elders, and leaders were interviewed. The available literature on the subject was studied and relevant information was used to help document plants which are medicinally important and available at the valley. Thirdly, the preferences of local people for the different diseases in terms of medicinal plants used, part used the category of diseases treated and the form of therapeutic use were analyzed with the help of questionnaire survey in the whole valley. A total of 100 respondents 25 from each of the four sites were interviewed. In each site 5 most populous villages were selected and from each village 5 eldest respondents were interviewed and the data was summarized in percent preference.

Selection of season

Medicinal plants of Allai valley were studied in two major seasons: winter and summer. Plants specimen for identification and data on various parameters were collected during November to march for winter and during April to August for summer season. The study was divided into three parts.

1. Enlistment of the total plant species available at Allai Valley

The research area was visited on weekly basis in both summer and winter and specimens of all the available species were collected from all of the four sites and brought to the herbarium of Hazara

University, Mansehra, for identification by the experts and with the help of flora of Pakistan. The local names, common names technical names, family names and type or plant growth habit was properly documented.

2. Identification of medicinally important plant species

Local herbalist, agricultural and forest experts, local elders, and leaders were interviewed and the plants species enlisted in the first part of the study were discussed with them. More ever the available literature on the subject was thoroughly studied and relevant information was used to help document the plant species which were medicinally important and available in the valley.

3. Determination of community preference

The preference of local people for the treatment of numerous disorders in term of medicinal plant used, part used, the category of diseases treated and the form of therapeutic use (recipe) were analyzed with the help of a questionnaire survey conducted in the whole valley. The questionnaire covered the following four major themes.

I. Most preferred medicinal plants species

The respondents were asked to mention the name of medicinal plants species which was mostly preferred by the local people for traditional healthcare. The percent preferences for each mentioned species was calculated with the help of the following formula:

$$\text{Percent preference of a species} = \frac{\text{Number of respondents who termed it as most preferred species} \times 100}{\text{Total number of respondents}}$$

II. Most preferred type/category of ailment, cured with medicinal plants

The respondents were asked to mention the type of an ailment which was mostly preferred by the local people for traditional healthcare. The percent preference for each mentioned species was calculated with the help of following formula:

$$\text{Percent preference of an ailment} = \frac{\text{number of respondents who termed it as most preferred ailment} \times 100}{\text{Total number of respondents}}$$

III. Most preferred type of plant part used

The respondents were asked to mention the name of a plant part which was mostly preferred by the local people for traditional healthcare. The percent preferences for each mentioned plant part was calculated with the help of the following formula:

$$\text{Percent preference of a plant part} = \frac{\text{number of respondents who termed it as most preferred ailment} \times 100}{\text{Total number of respondents}}$$

IV. Most preferred form of utilization (recipe)

The respondents were asked to mention the form of utilization or recipe which was mostly preferred by the local people for traditional healthcare. The respondent's preference for each mentioned form or recipe was calculated with the help of the following formula:

$$\text{Percent preference of a recipe} = \frac{\text{number of respondents who termed it as most preferred recipe} \times 100}{\text{Total number of respondents}}$$

Total of one hundred (100) respondents, 25 from each of the four sites, were interviewed. In each site 5 most populous villages were selected and from each village 5 available eldest respondents were interviewed (Khan *et al.*, 2012) and the data on all the parameters was recorded.

Statistical Analysis

The data recorded was tabulated theme wise and Microsoft Excel program was used in the calculation of percent preferences and its presentation in graphical form.

RESULTS AND DISCUSSION

1.1. Enlistment of the total plant species available at Allai Valley

The detail list of total plant species enlisted at Allai Valley is given in Table 1.3 while its summary of classification based on family and growth habit in Table 1.1 and Table 1.2 respectively. Total species identified were 174 belonging to 86 families. Maximum species 12 were from family Asteraceae, followed by 8 species belonging to labiatae family while rosaceae family were found with 7 species and Moraceae and papilionaceae family were found 6 each. Similarly maximum species were of growth habit herbs (84), followed by shrubs (46), while minimum species were of growth habit trees (43).

The results presented in the following tables show that Allai valley is very rich in terms of species diversity. During field survey, 174 total plant species belonging to 86 families, with 60 medicinally important species were found. Maximum species 12 were from family Asteraceae (Compositae), followed by 8 species belonging to labiatae family while 47 families were found with just a one species. Asteraceae are the larger family indigenous to the valleys of Pakistan (Fazalet *et al.*, 2010). It is suggested that these medicinal plants may affect due to agricultural practices (Usman *et al.*, 2010) therefore, efforts should be made to conserve these medicinal plants. It was noted that maximum species were of growth habit herbs 84, followed by shrub 46, while minimum plant species were of growth habit trees 43. Similar results were obtained by Khan *et al.*, (2015) who documented 202 species of wild and cultivated plants of Khanpur valley, Pakistan, with all mention

of botanical name, common name, family name, plant type and traditional uses. The efforts on the ethno botany and documentation of valuable flora have been carried out since long. Zaman and Khan (1970) described hundred medicinal plants of West Pakistan with their family, botanical name, scattering, explanation, ingredients and uses. Khan (1985) conducted another survey and reported that 95 species were used by Hakims and the yearly depletion of medicinal plants was more than 5.65 million kg which prized around Rs. 36 m. Haq (1993) documented 53 wild 17 cultivated plants of Mansehra District. He enlisted these plants with botanical, English and vernacular names, families, parts used, distribution, constituents, medicinal and local uses.

Table-1. Classification based on Family of plant species identified at Allai Valley.

Total # of species	Total # of families	asteraceae	Labiatae	Rosaceae	Papilionaceae	Moraceae	Polygonaceae	Amaranthaceae
174	86	12	8	7	6	6	5	4

Table-1.2. Classification Based on growth habit of plant species found at Allai Valley

Species with growth habit as Herb	Species with growth habit as shrub	Species with growth habit as tree
84	46	43

2. Identification of Medicinally Important Plant Species

As second part of the study 60 species 34.48% out of 174 total plant species were found to be medicinally important (table 1.5). These medicinally important species were belonging to 39 families. Maximum species 6 were from family labiatae, followed by 4 species belonging to polygonaceae and asteraceae family while 29 families were found with just a one species. Similarly maximum species were of growth habit herbs (29), followed by trees (15) and shrubs (15).

The efforts on the ethno botany and documentation of valuable flora have been carried out since long. Abbasi *et al.* (2009) reported thirty plant species belonging to twenty four families used by local experts for the cure of jaundice and hepatitis. Alam *et al.* (2011) concluded that 141 plant species of medicinal importance are found at Chagharzai area of Bunir District, Pakistan. Khan *et al.* (1985) conducted another survey and reported that 95 species were used by hakims and yearly use of medicinal plants was more than 5.6 m kg which cost up to Rs. 36 m.

Table-1.3. Classification of medicinally important species found at Allai Valley

Total families	Total species	Species under Labiate	Species under Polygonaceae	Species under Asteraceae	Species under Herb	Species under Shrub	Species under Trees
39	60	6	4	4	30	15	15

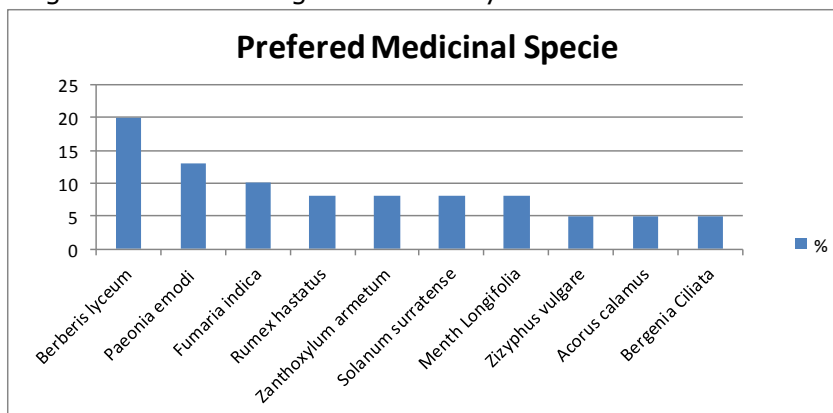
3. Determination of community preferences

Community preferences for medicinal plant species, part used, ailment addressed and mode of utilization or recipe, was judged with a scientific survey and the results are given below.

I. Most preferred medicinal plants

In terms of species preferences the top 10 medicinally important species were *Berberis lyceum* (20%), *Paeonia emodi* (13%), *Fumaria indica* (10%), *Rumex hastatus* (8%), *Zanthoxylum armatum* (8%), *Solanum surratense* (8%), *Mentha longifolia* (8%), *Zizyphus vulgare* (5%), *Acorus calamus* (5%) and *Bergenia ciliata* (5%).

The people of various valleys and regions prefer specific medicinal plants, locally available. Lai *et al.* (2005) studied medicinal plants and concluded that Euphorbiaceae is an important plant family especially recognized for its anti-cancer components, anti-hepatitis B components and carcinogenic factor. They further stated that only a few species were preferred as widespread medicines while most of its species were recognized only as preferred by one tribe or another. Similarly, Valles *et al.* (2004) identified *Sambucus nigra* bush of family Caprifoliaceae as one of the most commonly used medicinal plant by the inhabitants of Catalonia and in many mediterranean regions the most preferred species of Allai Valley is *Berberis lyceum*, which is among the dominant vegetation of hilly areas.

**Figure 1.** %age of respondents' preferences for medicinal plants

II. Most preferred type/category of ailment, cured with medicinal plants

The results obtained on this parameter are given in Figure 1.2. the results revealed that the largest number of ailments cured with medicinal plants were associated with digestive system (25%) , followed by those associated with Wounds (17%), followed by Respiratory15%, Blood purification12%, Skin8%, Brain and nerves8%, Nutrition and tonic7%, bones and joints3%, Reproduction3% and Urinary System2%. Further finding were regarding ailments cured. The largest number of ailments cured with medicinal plants was associated with the digestive system followed by those used for wounds healing followed by respiratory, blood purification, skin, brain and nerves, nutrition and tonic, boons and joints reproduction and urinary system. The logic behind this finding could be the most commonplace diseases are associated with the digestive and respiratory disorders (Rasool *et al.*, 2010; Jan *et al.*, 2008) and hence the people of the research area use medicinal plants for these ailments. Similar results were obtained by Khan *et al.*, (2015), who identified the use of medicinal plants in folk recipes by the inhabitants of Khanpur Valley, KP Pakistan.

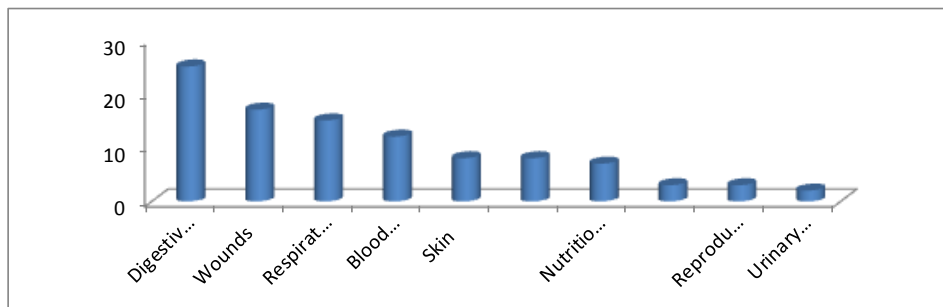


Figure 2. Percentage of Respondent's preference for category of use, medicinal plants

III. Most preferred type of plant part, Used:

The questionnaire indicated that in maximum treatments roots (32%), leaves (31%), whole plant (12%), seed (9%), Bark (8%), fruit (7%), flower (1%), rhizome (0%) were used by the local community.

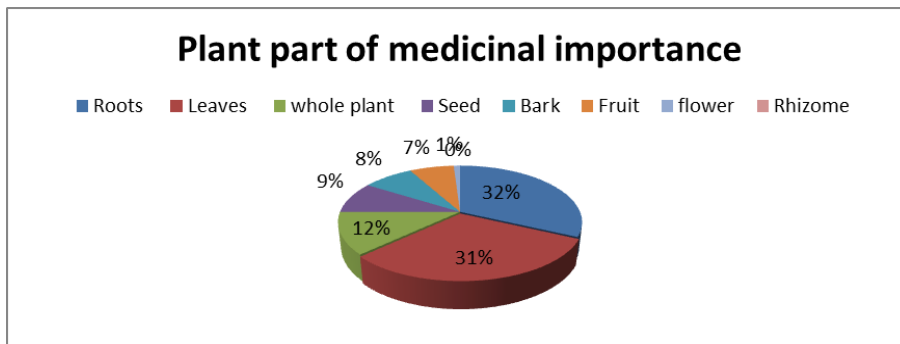


Figure 3. Percentage of respondent's preference for plant part used of medicinal plants.

IV. Most preferred form of utilization (recipe)

The third outcome of the survey was regarding the type of use (recipe). This revealed that maximum utilization of medicinal plants was in the form of Powder (32%), juice (23%), paste (22%), cooked and decoction (6%) each, tea (5%), fresh (3%), tincture (2%) and cream (1%).

The survey showed that powder form followed by juice were the most preferred forms of utilization by the local community of Allai Valley. This may due to ease of utilization in the preferred forms and is in connivance with the findings of other ethno botanists, Khan *et al* (2015) has reported the preference of respondents for part used, ailments cured and form of recipe, in Khanpur Valley of Haripur Pakistan.

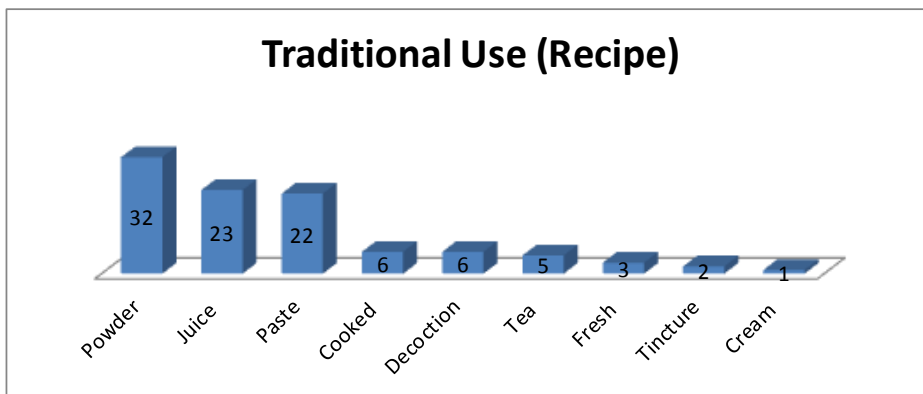


Figure 4. Percentage of respondent's preference for traditional use (recipe) of Medicinal plants.

CONCLUSION

The 174 species, belonging to 86 families, recorded at Allai Valley shows that the valley is rich in species diversity. The 60 medicinally important species were identified at the research area which means that 34.48% of the flora of Allai Valley is pharmaceutically important. The local preferences for species revealed that *Berberis lyceum*, *Paeonia emodi*, *Fumaria indica* are the most preferred medicinal plants of the Valley. It is concluded that the most preferred part of plant used is Roots and leaves. The survey found that the people of Allai Valley preferred medicinal plants used in cure of ailments related to digestive systems and healing wounds and they preferred powder form of its utilization.

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