Research Article

Folk Benefits from the Indigenous Angiosperms Flora of Shiekh Buddin National Park Dera Ismail Khan, Pakistan

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Abstract | National parks are considered assets of an area in conserving and preserving flora and fauna and recreational purposes, but these parks also provide valuable folk benefits for the local peoples. This study aimed to document the folk benefits obtained by local inhabitants from different indigenous angiosperms and their products in Sheikh Buddin National Park. Information from 250 respondents (240 male, 10 females) was gathered randomly about plants' medicinal and folk uses in the park. One hundred and sixteen plants species belonging to 99 genera and 50 families were recorded and identified with the help of available literature. Of these, monocots were represented by 17 species under 15 genera and 5 families, while dicots were represented by 99 species belonging to 84 genera and 45 families. The results reflect that 24% of plants were used as fodder, 29% fuel, 20% medicinal, 17% construction, and furniture, while 8% were used for ornamental purposes. The majority of the plant species were used as multipurpose. The most important medicinal plants were *Caralluma edulis* (Pamana), *Withania ovata* (Aspeghol), *Pla- ntago ciliate* (Aspeghol), *Tribulus terrestris* (Maklindey), and *Fagonia indica* (Spelaghzaie). Leaves and shoots were frequently utilized as remedies. We conclude from the study that angiosperms flora of the park can be used for different folk purposes and treating gastrointestinal, skin, and blood disorders ailments. In addition, we recommend the sustainable use of the flora to maintain the proper floristic composition in the studied site.

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Introduction

Ethnobotany is the scientific study of the relationship between plants and peoples for beneficial purposes with distinct emergence in the 20th century where economic benefits of plants were included in its domain (Wickens, 2001). In a broader sense, Ethnobotany organized information about plants, i.e., name, uses, people's perception, and medicinal and folk uses linking biological diversity with cultural and social environment (Hussain *et al.*, 2008). Primary life needs like food, shelter, clothes, timber, fruits, medicines, and fuel requirements are manifested from different plant species and considered essential for human beings (Ahmad *et al.*, 2012). Rural area population upto 80% in developing countries depend

on medicinal plants and their extracts which are effective, inexpensive and mostly have no side effects (Azaizeh *et al*., 2003) and therefore have rich knowledge about the ethnobotanical uses of plants and its products benefiting themselves from plant populations over the centuries (Sarwat *et al*., 2012). This ethnobotanical information is important for medicinal and folk purposes and provides baseline data for pharmacologists, ecologists, wildlife managers, and taxonomists to uplift area peoples' living standards (Ibrar *et al*., 2007).

Pakistan has distinct morphological, geographical, and physiological regions, i.e., different valleys, mountainous regions, deserts, and salt ranges, covering about 79.9 million hectares of land (Pakistan 4th national report, 2009). The country has a rich flora with more than 6,000 vascular plants, of which 12% are used for medicinal and folk purposes by local inhabitants (Shinwari, 2010). Recent anthropogenic disturbance and alien species invasion have deliberately threatened and endangered the indigenous plant species in every part of the world to preserve and conserve. National parks are vital (Forest and Biodiversity information/ Data report 2010). The world has 209,429 protected areas covering 32,868,673 Km2 areas, of which 6,555Km2 occupied by national parks (Deguignet *et al*., 2014). Pakistan has 29 national parks so far, covering 3% land of the country area. In Gilgit-Baltistan, Central Karakoram National Park covering 9,73,845 hectares, is considered the largest, while Toli National Park of Poonch district, covering 1000 acre land, is considered the smallest national park. Sheikh Buddin National Park (SBNP), standing 16th on the list, is one of the important National Parks situated at Dera Ismail Khan and Lakki Marwat (Pakistan wildlife foundation; Aug 2020).

Many researchers studied the important ethnobotanical plants in various regions of Pakistan, *e.g.* (Sarwat *et al*., 2012; Khan *et al*., 2013; Khan and Bibi, 2013; Zahoor *et al*., 2009; Marwat *et al*., 2011; Attaullah *et al*., 2010) while Ullah *et al*. (2015) worked on the flora of SBNP enlisting the different angiosperms and ecological life forms found in the park. The local peoples frequently visit and benefit from the national park's flora, but no attention was paid to this aspect. The present research was conducted to list the medicinal uses and folk benefits of the local communities' plants in their daily lives and is the first attempt in this regard.

Materials and Methods

Study area and climate

Sheikh Buddin National Park is located in the Dera Ismail Khan District of KPK, Pakistan. The residential area of SBNP is at a 7 km distance from Pezu pass. Someone can use the excess through the national highway from Dera Ismail Khan to Peshawar (Nizami and Sheikh, 2009).

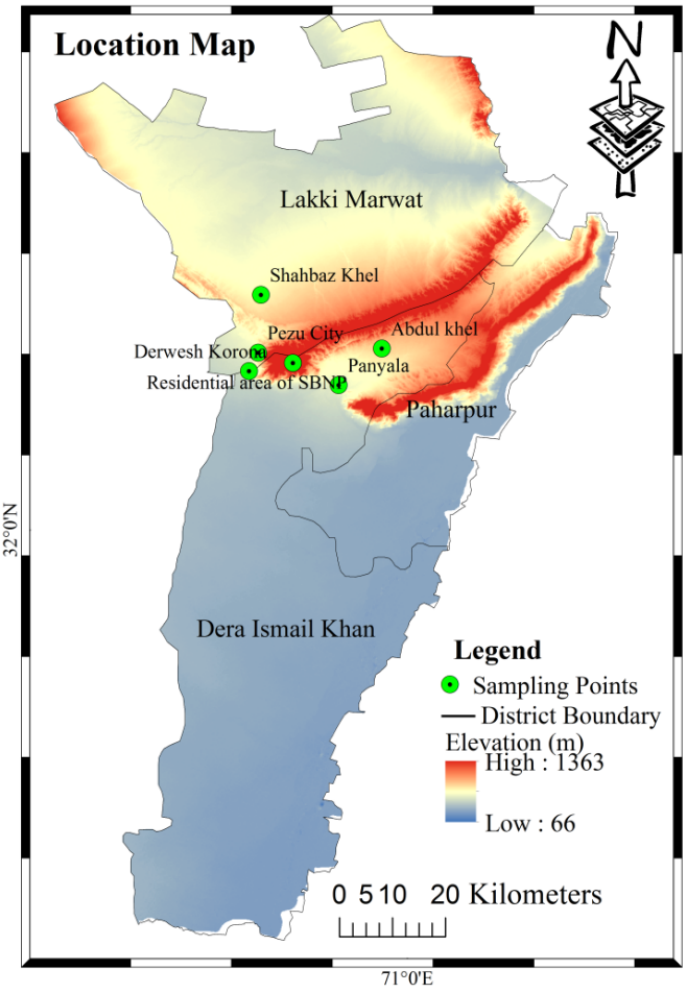

Figure 1: *Location Map of study area showing sampling points with Digital elevation model.*

The district is bounded on the North by District Tank and Lakki Marwat, on the south and east by the province of Punjab, on the west by the recently merged district of South Waziristan. It was upgraded to the national park category in 1993 via notification number # soft. Forest 1 (FFT) VIII, Peshawar, Dated 15/07/1993. It lays at the 32°22'N-32°38'N latitude and 70°54'E to 71°12'E longitude with an elevation of 300-1363. (Figure 1) It is the 16th largest national park globally, covering about 15540 ha (Ullah *et al*., 2015). The area's climate varies through the year, and January is the coldest while Jun and July are the hottest months of the year. (Table 1) In the district,

Table 1: *Mean maximum and minimum monthly temperature and mean precipitation of Dera Ismail Khan for the year 2016-17.*

Year	2016		2017		2016	2017
Month	Maximum monthly temperature in ^{0}C	Minimum monthly temperature in ^{0}C	Maximum monthly temperature in ^{0}C	Minimum monthly temperature in ^{0}C	Mean precipitation	
Jan	20.3	4.2	19.9	4.1	2.2	0.3
Feb	21.1	7.3	21.5	6.8	47.2	8.3
Mar	26.9	12.9	25.3	11.7	16	1.6
Apr	33.5	18.5	34.2	19.1	19.7	74.6
May	38.7	23.1	37.9	22.9	1	3.6
Jun	41.5	26.8	41.8	25.9	9.9	7.2
Jul	38.5	26.9	39.2	24.7	53.5	83.7
Aug	37.4	26.4	36.8	26.8	89.5	133.7
Sep	36.7	23.8	35.9	22.9	39.3	120
Oct	33.4	17.3	32.7	16.9	5	1
Nov	27.7	10.5	28.2	11.5	1	1
Dec	21.9	5.3	21.3	5.6	0	17.1

maximum precipitation occurs in August while it is minimum in January.

Data collection

The survey was conducted in SBNP and its surrounding areas, including Pezu city (Bazar), Darwesh Korona (Located on the way to SBNP), Residential area of SBNP, Abdul Khel, Panyala, and Shahbaz Khel. These areas were selected because the peoples of these areas frequently visit (as the park has no protection and boundary walls) the SBNP for different activities, including cutting wood, collecting plants for medicinal, forage, and fuel purposes. Data for plant uses were recorded in this specific cultural domain to estimate the local knowledge about the plants during 2016- 2017. Three qualified and well-known local inhabitants were selected to help understand local cultural norms and avoid unnecessary antagonism of local inhabitants during the field trips. The angiosperms plants used by local peoples for their benefits were collected, identified, properly preserved, and handed over Herbarium Department of the Botany University of Malakand. Plant identification was based on the morphological characteristics of leaves, flowers, and fruit following the flora of Pakistan (Nasir and Ali, 1972; Ali and Qaisar, 1995).

The Piezu village and SBNP were estimated to be 1256 individuals, of which 20 % of the respondents were sampled for analysis. Semi-structured questionnaires and non-structured interviews were conducted to collect information about the local peoples' folk uses of identified angiosperm plants. A total of 250 respondents were selected randomly from the selected areas following the procedure adopted by White *et al*. (2005). The respondents sampled were mostly old, illiterate, authoritative herbal practitioners, cooperative and enthusiastic to answer the questionnaires and interviews. All the information reported here is based on a minute, critical and systematic study about the plants and their uses by local inhabitants of the park and its surrounding areas. The data obtained as a result of different meetings and interviews were analyzed carefully. All the information reported here is completely based on the local knowledge, as revealed in Figure 2, in which local inhabitants collect fuel wood from SBNP. The data obtained were fed to excel for tabulation and percentage calculation. The study area map was built in Arc-GIS version 10.5.

Results and Discussion

A total of 116 species of 99 genera belonging to 52 families were recorded from Sheikh Buddin National Park. Out of these, 17 species of monocots belonged to 15 genera of 6 families, and 99 species of dicots were recorded of 84 genera's and 46 families. Among these, Lamiaceae and Poaceae having (8 plant species each) were the leading families, followed by Asteraceae (7 species), Fabaceae, and Apocynaceae (6 plants species) while Solanaceae and Mimosaceae (5 species). Based on habit, there were 66 herbs (56.89%), 22 shrubs (18.96%), and 28 trees (24.13 %) species (Figure 3).

Figure 2: *Examining local inhabitant collecting wood for fuel purposes after returning from Sheikh Buddin National Park, Khyber Pakhtunkhwa, Pakistan.*

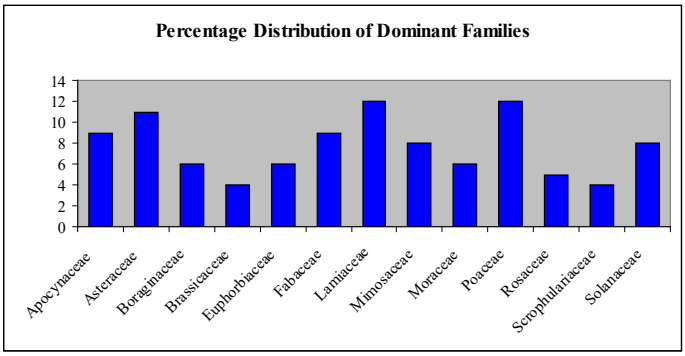

Figure 3: *Percentage family wise distributions of dominant plant species collected in Sheikh Buddin National Park, Khyber Pakhtunkhwa, Pakistan.*

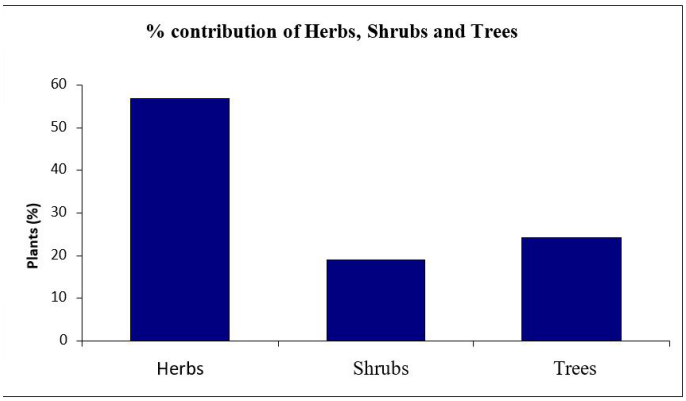

Figure 4: *Percentage distributions of herbs, shrubs and trees in Sheikh Buddin National Park, Khyber Pakhtunkhwa, Pakistan.*

Amjad *et al.* (2015), working on the indigenous flora folk uses, reported 104 angiosperms plant species from Pir Nasoora National Park, Azad Jammu, and Kashmir Akhtar *et al.* (2018) reported 103 important indigenous angiosperms species from district Karak. Compared to these studies, we reported 116 angiosperms species from SBNP, revealing that the park has more diverse indigenous angiosperms flora. The species reported in the inventories were mostly herbs, as evident in Figure 4.

Medicinal plants of SBNP

Nearly 20% income of the local people of the park are generated by collecting, preserving, and selling wild medicinal plants, especially *Caralluma edulis,* herbs, honey, and mushrooms from the park. Data was collected based on the frequency and abundance of several medicinal and socio-economically important plants within the Park area and the seasonality and degree of the commercial harvest by the inhabitants.

It is clear from Table 2 that 66 medicinally important plants were collected from the study area, which were used by the public for various therapeutic purposes, out of these *Caralluma edulis*, *Convolvulus arvensis* (Parwathyie), *Peganum harmala* (Spelanaie), *Citrullus colocynthis* (Ghata maraghoniye), *Portulaca oleracea* (Warkharaie), *Plantago ovata* (Aspaghol), *Plantago ciliata* (Aspaghol), *Rhazya stricta* (Ghanderaie), *Solanum nigrum* (Malgebaie), *Solanum surattense* (Wara maraghoniye), *Tamarix aphylla* (Ghaz), *Withania coagulans* (Makhmazoora) and *Ziziphus jujuba* (Bira) were commonly under practice by the local inhabitants, While *Olea ferruginea* (Shwawan), *Periploca aphylla* (Barara), *Salvadora oleoides* (Plaman), *Acacia modesta* (Palosa) and *Phoenix dactylifera* (Khajora) were the second most useful plant species frequently used for medicinal purposes. Similarly, *Calotropis procera* (Spalmaka), *Malva parviflora* (panerak), and *Alhagi maurorum* (Thundan) were also popular medicinal plants in the area. Some of the medicinal plants i.e. *Rhazya stricta* (Ghanderaie), *Aleo vera* (Kamal Panha), *Solanum surattense* (Wara maraghoniye), *Plantago ovata* (Aspaghol), *Plantago ciliata* (Aspaghol), *Convolvulus arvensis* (Parwathyie) became critically endangered in SBNP because of its overexploitation by the local inhabitant for medicinal purposes (Table 2). The other factor possibly contributing to the reduction of the useful medicinal plants was probably uncontrolled grazing and browsing because of no restriction in entrance of grazing animals. Moreover, natural factors like soil erosion by landslides also prevail in the area. Similar anthropogenic and natural factors were also listed

Table 2: *List of critically endangered species and their status in the region for comparison.*

Plant name	SBNP Assessment	General status	Reference
Rhazya stricta	Endangered	Endangered	Orsenigo *et al*. 2016
Aleo vera	Endangered	Common	Grace 2011
solanum surattense	Endangered	Infrequent	Khalil 2020
Plantago ovate	Endangered	Rare	Khalil 2020
Plantago ciliata	Endagered	Rare	Khalil 2020
Convolvulus arvensis	Endangered	Vulnerable	Khalil 2020

Table 3: *Plants with their medicinal and socio-economic importance reported from Sheikh Buddin National Park.*

S. No	Binomial	Mp	FP	FW	Vp	TW	Vg	HB	FYP	FrP	AA	OP	SP
1	*Acacia modesta* Wall.	+	-	+	+	+	-	+	+	+	+	-	+
2	*Acacia nilotica* (L.)Willd.ex Delile.	+	+	+	+	+	-	-	+	+	+	-	+
3	*Aerva javanica* (Burm.f.) juss. Ex Schul	-	+	+	-	-	-	-	-	-	-	-	-
4	*Agave sisalana* Perrine ex Engelm.	-	-	-	-	-	-	+	-	-	-	+	-
5	*Alianthus altissima* (Mill.) Swingle.	-	+	+	-	+	-	+	-	+	-	-	+
6	*Albizia lebback* (L.) Benth	+	-	+	+	+	-	+	+	+	+	-	+
7	*Alhagi maurorum* Medik.	+	-	-	-	-	-	-	-	-	-	-	-
8	*Allium griffithianum* Boiss., Diagn.	-	+	-	-	-	-	-	-	-	-	-	-
9	*Aloe vera* L.	+	-	-	-	-	-	-	-	-	-	-	-
10	*Amaranthus viridis* L.	-	+	-	+	-	+	-	-	-	-	-	-
11	*Anagallis arvensis* L.	-	+	-	-	-	-	-	-	-	-	-	-
12	*Aristida adscensionis* L.	-	+	-	-	-	-	-	-	-	-	-	-
13	*Asparagus capitatus* Baker.	+	+	-	-	-	-	-	-	-	-	-	-
14	*Asphodelus tenuifolius* Cav.	+	-	-	-	-	-	+	-	-	-	-	-
15	*Astragalus hamosus* L.	+	+	-	-	-	-	-	-	-	-	-	-
16	*Boerhavia procumbens* Banks ex Roxb.	-	+	-	-	-	-	-	-	-	-	-	-
17	*Bromus japonicus* Houtt.	-	+	-	-	-	-	-	-	-	-	-	-
18	*Calligonum polygonoides* L.	+	+	+	-	-	-	+	-	-	+	-	-
19	*Calotropis procera* (Ait) W.T. Aiton.	+	-	+	-	-	-	+	-	-	-	-	-
20	*Cannabis sativa* L.	+	+	-	-	-	-	+	-	-	-	-	-
21	*Capparis decidua* (Forssk.) Pax	+	+	+	-	+	-	+	+	-	+	-	-
22	*Caralluma edulis* (Edgew.) Benth	+	+	-	-	-	+	-	-	-	-	-	-
23	*Carthamus oxyacantha* M. Bieb	+	-	-	-	+	-	+	-	-	-	-	-
24	*Cecnhrus ciliaris* L.	-	+	-	-	-	-	-	-	-	-	-	-
25	*Chenopodium album* L.	+	+	-	+	-	+	+	-	-	-	-	-
26	*Chenopodium murale* L.	+	+	-	+	-	+	+	-	-	-	-	-
27	*Chrozophora tinctoria* (L.) Juss.	-	+	-	-	-	-	-	-	-	-	-	-
28	*Citrullus colocynthis* (L.) Schrad.	+	-	-	+	-	-	+	+	-	-	-	-
29	*Convolvulus arvensis* L.	+	+	-	+	-	+	+	-	-	-	-	-
30	*Conyza stricta* Willd.	+	+	-	-	-	-	-	-	-	-	-	-
31	*Cordia myxa* L.	+	-	+	-	+	-	-	+	-	-	-	-
32	*Cotoneaster nummularia* Fischer and C.A.Mey	+	-	+	-	+	-	-	-	-	-	-	-
33	*Cymbopogon distans* (Nees ex Steud.) Will.	-	+	+	-	-	-	-	-	-	-	-	-
34	*Cymbopogon jawarncusa* (Jones) Schult.	-	+	+	-	-	-	-	-	-	-	-	-
35	*Cynodon dactylon* (L.) Pers.	+	+	-	+	-	-	-	-	-	-	+	-

36	*Cyperus rotundus* L	-	+	-	-	-	-	+	-	-	-	-	-
37	*Dalbergia sissoo* Roxb. Ex DC.	-	-	+	+	+	-	+	+	+	+	-	+
38	*Datura metel* L.	+	-	-	-	-	-	+	-	-	-	-	-
39	*Dodonaea viscosa* (L.) Jacq.	-	-	+	-	-	-	+	-	-	-	-	-
40	*Echinops echinatus* Roxb.	-	+	-	-	-	-	-	-	-	-	-	-
41	*Ehretia obtusifolia* Hochst. ex A. DC.	-	+	-	-	-	-	-	-	-	-	-	-
42	*Eragrostis minor* Host.	+	+	-	-	-	-	-	-	-	-	-	-
43	*Erodium cicutarium* (L.) L Her. ex Aiton.	-	+	-	-	-	-	-	-	-	-	-	-
44	*Eruca sativa* Mill.	+	+	-	+	-	-	+	-	-	-	-	-
45	*Eucalyptus lanceolatus* Honey.	-	-	+	-	+	-	-	-	+	-	-	-
46	*Euphorbia helioscopia* L.	+	-	-	-	-	-	+	-	-	-	-	-
47	*Euphorbia prostrata* Aiton.	-	+	-	-	-	-	+	-	-	-	-	-
48	*Fagonia indica* Burm. f.	+	-	+	-	-	-	+	-	-	-	-	-
49	*Farsetia jacquemontii* Hook. f. & Thomson.	-	+	-	-	-	-	-	-	-	-	-	-
50	*Ficus carica* L.	+	-	+	-	+	-	+	+	-	+	-	+
51	*Ficus palmata* Forssk.	+	+	+	-	+	-	+	+	-	+	-	-
52	*Filago hurdwarica* (Wall. ex DC.) Wagenitz.	+	-	-	-	-	-	-	-	-	-	-	-
53	*Grewia optiva* Drumm. ex Burret.	+	-	+	-	-	-	+	+	-	-	-	+
54	*Gymnosporia royleana* Wall. Ex Lawson	+	+	+	-	+	-	+	-	+	+	-	-
55	*Heliotropium strigosum* Willd.	+	-	-	-	-	-	+	-	-	-	-	-
56	*Isodon rugosus* (Wall. ex Benth.) Codd.	-	+	-	-	-	-	-	-	-	-	-	-
57	*Kickxia incana* (Wall.) Pennel.	-	-	-	+	-	-	+	-	-	-	-	-
58	*Kickxia ramosissima* (Wall.) Janch.	+	-	-	+	-	-	+	-	-	-	-	-
59	*Lallemantia royleana* (Benth.) Benth.	+	+	-	-	-	-	-	-	-	-	-	-
60	*Launaea nudicaulis* (L.) Hook.f	+	+	-	+	-	-	+	-	-	-	-	-
61	*Launaea procumbens* (Roxb.) Ram. & Raj	+	+	-	+	-	-	+	-	-	-	-	-
62	*Marrubium vulgare* L.	+	+	-	-	-	-	-	-	-	-	-	-
63	*Malva parviflora* L.	+	-	-	-	-	-	+	-	-	-	-	-
64	*Maytenus royleanus* (Wall. ex Lawson).	-	+	-	-	-	-	-	-	-	-		-
65	*Melia azedarach* L.	-	-	+	-	+	-	+	-	+	-	-	+
66	*Mentha longifolia* L.	+	-	-	+	-	-	+	+	-	-	-	-
67	*Monotheca buxifolia* (Falc.) A. DC.	+	-	+	-	+	-	+	+	+	+	-	-
68	*Morus alba* L.	-	+	+	-	+	-	+	+	+	+	-	+
69	*Morus nigra* L.	-	+	+	-	+	-	+	+	+	+	-	+
70	*Nannorrhops ritchiana* (Griff.) Aitch.	+	-	-	-	-	-	+	+	-	-	-	-
71	*Nerium oleander* L.	-	-	+	-	-	-	+	-	-	-	+	-
72	*Nonea pulla* (L.) DC	-	+	-	-	-	-	+	-	-	-	-	-
73	*Olea ferruginea* Royle	+	-	+	-	+	-	-	+	-	+	-	-
74	*Otostegia limbata* (Benth.) Boiss.	+	+	+	-	-	-	+	-	-	-	-	-
75	*Oxalis corniculata* L.	-	+	-	-	-	+	+	-	-	-	-	-
76	*Peganum harmala* L.	-	-	-	-	-	-	-	+	-	-	-	-
77	*Periploca aphylla* Decne.	+	-	-	-	-	-	+	-	-	-	-	-
78	Periploca calophylla (Wight) Falc.	+	-	-	-	-	-	-	-	-	-	-	-
79	*Phlomis satewartii* Hook. f.	+	+	-	-	-	-	-	-	-	-	-	-
80	*Phoenix dactylifera* L.	+	-	+	-	+	-	+	+	+	-	-	-
81	*Pistacia chinensis* Bunge.	+	-	+	-	+	-	+	+	-	-	-	+
82	*Pistacia vera* L.	+	-	+	-	+	-	-	+	-	-	-	-

83	*Plantago ciliata* Desf.	+	-	-	-	-	-	+	+	-	-	-	-
84	*Plantago ovata* Frossk.	+	-	-	-	-	-	+	+	-	-	-	-
85	*Polygala abyssinica* R. Br. ex Fresen.	-	+	-	-	-	-	-	-	-	-	-	-
86	*Polygala hohenackeriana* Fisch.	-	+	-	-	-	-	-	-	-	-	-	-
87	*Portulaca oleracea* L.	+	+	-	-	-	+	+	+	-	-	-	-
88	*Prosopis cineraria* (Linn.) Druce.	-	+	+	-	+	-	+	-	+	+	-	+
89	*Prosopis juliflora* (Sw.) DC.	-	+	+	-	+	-	-	-	-	+	-	-
90	*Prunus armeniaca* L.	-	-	+	-	+	-	+	+	-	-	+	-
91	*Punica granatum* L.	-	-	+	+	-	-	+	+	-	-	+	-
92	*Ranunculus arvensis* L.	-	-	-	-	-	-	+	-	-	-	-	-
93	*Rhazya stricta* Decne.	+	-	+	-	-	-	+	-	-	-	-	-
94	*Ricinus communis* L.	-	-	+	-	-	-	-	-	-	-	-	-
95	*Saccharum bengalense* Retz.	+	_	+	-	+	-	-	-	-	-	-	-
96	*Saccharum spontaeum* L.	+	-	+	-	-	-	-	-	-	-	-	-
97	*Salvadora oleoides* Decne.	+	-	+	-	+	-	+	-	+	+	-	-
98	*Salvia santolinifolia* Boiss.	+	-	-	-	-	-	+	-	-	-	-	-
99	*Saussurea heteromalla* (D.Don) Hand.	-	-	-	-	-	-	+	-	-	-	-	-
100	*Scrophularia striata* Boiss.	-	+	-	-	-	-	-	-	-	-	-	-
101	*Scutellaria chamaedrifolia* Hedge & Paton.	-	+	-	-	-	-	-	-	-	-	-	-
102	*Sisymbrium irio* L.	-	+	-	-	-	-	-	-	-	-	-	-
103	*Solanum nigrum* L.	+	+	-	+	-	+	+	-	-	-	-	-
104	*Solanum surattense* Burm. f.	+	+	-	-	-	-	+	-	-	-	-	-
105	*Sophora mollis* (Royle) Baker.	-	-	+	-	-	-	+	-	-	-	+	-
106	*Tamarix aphylla* (L.) Lanza.	+	+	+	+	+	-	+	-	+	+	-	-
107	*Tecomella undulate* D. Don.	-	-	+	-	+	-	-	-	+	-	-	+
108	*Teucrium stocksianum* Boiss.	-	-	+	-	-	-	-	-	-	-	-	-
109	*Tribulus terrestris* L.	+	+	-	-	-	-	-	-	-	-	-	-
110	*Trigonella monantha* C.A. Mey.	-	-	-	-	-	+	+	-	-	-	-	-
111	*Tylophora tenerrima* Wight.	-	+	-	-	-	-	-	-	-	-	-	-
112	*Vicia hirsuta* (L.) Gray.	+	-	-	-	-	+	-	-	-	-	-	-
113	*Withania coagulans* (Stocks) Dunal.	+	-	-	-	-	-	+	+	-	-	-	-
114	*Withania somnifera* (L.) Dunal.	+	-	-	-	-	-	+	+	-	-	-	-
115	*Ziziphus jujuba* Mill.	+	+	+	+	+	-	+	+	+	+	-	+
116	*Ziziphus numuleria* (Burm.f) W& A.	-	+	+	+	-	-	+	+	-	+	-	-

Note: Mp: *Medicinal Plant;* **FP:** *Fodder Plant;* **FW:** *Fuel Wood;* **TW:** *Timber Wood;* **Vg:** *Vegetable plants;* **Vp:** *Veterinary Plant;* **HB:** *Honey bee Plant;* **FYP:** *Fruit yielding Plant;* **AA:** *Agricultural Appliances;* **FrP:** *Furniture Plant;* **OP:** *ornamental plant;* **SP:** *Shadow plant.*

by Amjad et al. (2015) for the endangering of flora in Pir Nasoora National Park, Azad Jammu, and Kashmir. Moreover, the overpopulation of humans has greatly increased the population's dependence on medicinal plants for treating diseases that critically reduce the population size and diversity of medicinal plants (Ajaib et al., 2010).

Socio-economical important plants

The plants recorded in SBNP are socio-economically important, as shown in Table 3. These plants were used as fodder, fuel wood, timber wood, vegetable, veterinary plants, honey bee plants, fruit-yielding plants, agricultural appliances, furniture plants, ornamental plants, and shadow plants. Results showed that a considerable number of respondents, about 85%, were aware of the importance of trees concerning the park in one or another aspect. The majority (75%) believe that the local government should be claimed for irresponsive and insufficient efforts to decrease the forest canopy. They blamed that the current efforts taken by the government towards the protection of the area's forests are not sufficient.

Moreover, a great pessimism was found amongst the inhabitants because they consider that the use of these plants decreases due to many factors; the most noticeable was the high costs in the local markets and gradual scarcity of these valuable plants in their natural habitats. About 71% of the locals viewed a clear decline in the use of ethnobotanical medicines in the last 10 years. The majority of the respondents (90%) showed pessimism and disappointment towards the future of the important plants of the park. In comparison, 66% of the respondents were either unable or unwilling to participate actively in the conservation measures.

The local inhabitants used the park's plants for single or multipurpose benefits depending on their needs and plant type. Moreover, some plants were used as Whole plant or underground parts like roots and rhizomes, while others plants stem, twigs, latex (collected as a result of plant injury), leaves, fruits, flowers, seeds, natural excretes, i.e., gums and resins were used (Figure 5).

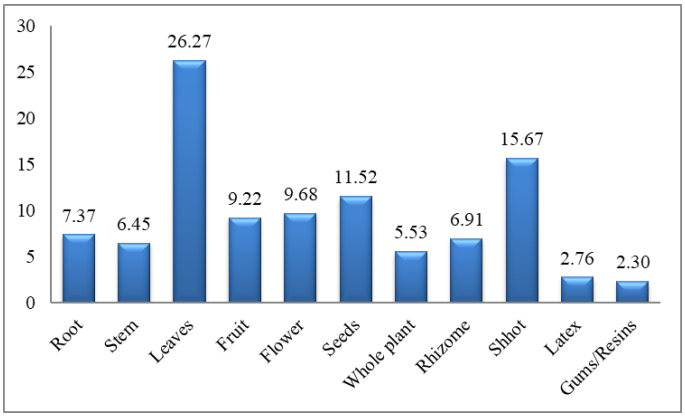

Figure 5: *Parts of plants used for medicinal purposes in plants species surveyed in Sheikh Buddin National Park, Khyber Pakhtunkhwa, Pakistan.*

The study revealed that local peoples utilize 116 species of plants, belonging to 99 genera's and 51 families for several purposes, *i.e.*, 66 plants were used as medicinal, 61 plants as fodder, 46 as fuelwood, 22 as veterinary plants, 28 as timber wood, 10 as vegetables, 64 as honey bee plants, 29 as fruits yielding plants, 17 as furniture plants, 20 as Agricultural Appliances, 6 as ornamental plants and 14 plants species were used as shadow plants by local communities of Sheikh Buddin National Park. Usually, trees were used for furniture, construction, and shadow purposes; shrubs were used as fuelwood and fodder, while the locals commonly used herbs for medicinal and fodder purposes (Table 3 and Figure 6).

Medicinal, fodder, and fuel plants were used in a high ratio compared to others; similarly, Akhtar *et al.* (2018) reported the same result from district Karak while studying the angiosperms resources of the area. It was urged by Gilani *et al.* (2003), that people living in mountainous and underdeveloped areas use local plants for fulfilling their basic life needs, which as per our findings. The plant species reported in our studies have also been reported by different researchers from other parts of the country as important sources of medicinal and folk uses (Gilani *et al.*, 2003; Wazir *et al.*, 2004; Jabbar *et al.*, 2006; Ishtiaq *et al.*, 2007; Sardar and Khan, 2009; Tareen *et al.*, 2010).

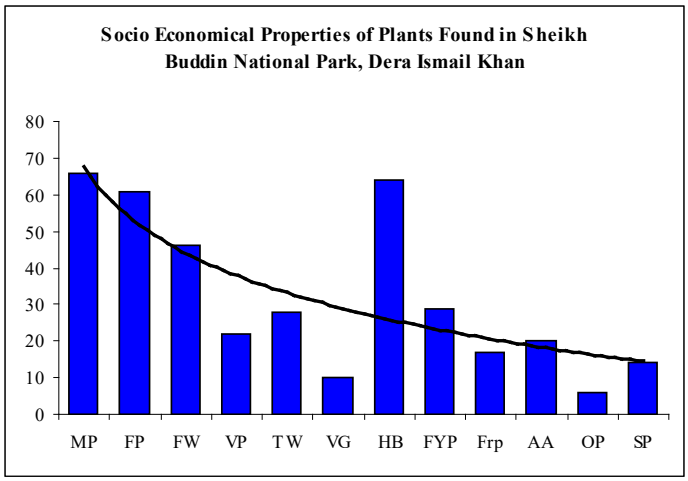

Figure 6: *Socio-economical properties and usage of plants found in Sheikh Buddin National Park, Khyber Pakhtunkhwa, Pakistan.*

Conclusions and Recommendations

The study concluded that the SBNP has rich flora representing the area's biodiversity, but local inhabitants extensively use the flora for ethnobotanical and socioeconomic purposes. Because of low-income resources, the local peoples utilize SBNP indigenous plants for medicinal and folk purposes, which may lead to endangering native flora. The government and other organizations need to conserve and preserve the flora in SBNP for the vested interest of biodiversity maintenance and provide alternatives to local peoples for uplifting their living standards. We also recommend that the flora present in the SBNP and its use for folklore purposes be performed sustainably. For this purpose proper forum of the local peoples can play an important role. Along with folklore benefits, sustainable use of the national park resources and their conservation status remained intact.

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Novelty Statement

Shiekh Buddin National Park is one of the 29 National parks that uplift its role in conserving and preserving regional biodiversity, but no attention has been given to the benefit obtained by the local peoples from flora. This research highlights the usefulness of the flora for the people of the area along with the general objectives of the Parks.

Author's Contribution

Atta Ullah: Corrected the field data and prepared initial draft of the manuscript.
Nasrullah Khan: Supervised the research work and guided in manuscript write up.
Ataur Rahman: Provided help in basic data analysis.
Rafiullah: Refined and edited the manuscript and also provided help in visualization of data and results write up.

Conflict of interest
The authors declare no conflict of interest regarding project design, field data collection, manuscript write-up and publication.

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