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Nafeesa Hanif Qudsia

*PMAS-Arid Agriculture University, Rawalpindi, Pakistan*

Kishwar Sultana

*PMAS-Arid Agriculture University, Rawalpindi, Pakistan*

Safdar Ali Shah

*Chief Conservator, Wildlife Peshawar, Pakistan, sashah\_786@outlook.com*

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## BERBERIDACEAE FROM MOIST TEMPERATE FORESTS, NORTHERN AREAS, PAKISTAN

NAFEESA HANIF QUDSIA<sup>1</sup>, KISHWAR SULTANA<sup>1</sup>, SAFDAR ALI SHAH<sup>2\*</sup>

<sup>1</sup>PMAS-Arid Agriculture University, Rawalpindi, Pakistan

<sup>2</sup>Chief Conservator, Wildlife Peshawar, Pakistan

\*Corresponding author: sashah\_786@outlook.com

### ABSTRACT

A quick visit of the protected forests of Banjosa, Dhirkot, Pir Chanasi, Pir Lassura and Tolipir was carried out. Berberidaceae belong to a family also known as the Barberry family (Elpel, n.d.). In Pakistan, there are 3 genera and 22 species belonging to this group (Jafri, n.d.). Species of this family are extensively cultivated due to their aesthetic and medicinal value. In the past, researchers would consider this family to get an idea about the habitat degradation of temperate areas. This study was aimed to produce a comprehensive list of species richness of this family in five National Parks of Pakistan. Overall three species from this family were observed in the study sites. The greatest diversity was seen in Banjosa Game Reserve. DNR, PLNP and TNP each reported only the presence of *Berberis lycium*. However, the constancy percentage of this species represented a good density. Using this data, further research may be conducted to ascertain the level of protection the National Parks have been able to afford this family and their surrounding biodiversity as an extension.

**Keywords:** Barberry, angiosperm, species richness, national park, berberis

### INTRODUCTION

Banjosa Game Reserve (BGR) is a single unit area having reasonably regular shape fitting hill contours, with perimeter of 18 km (satellite map-based area 3.07 km<sup>2</sup>). It mainly comprises of a U-shaped folded hill slopes with a narrow valley, with an entry from the western side. A small lake (10 feet deep) is located towards open end of valley, which has a surface drainage and receives water from springs and hill slopes and is associated with a beautiful undulating grassy plot and rest houses and a private hotel. Hill folds gradually rise from 1,800 m above sea line (asl.) to 2,080 m asl. in south, 2,140 m asl. in east and 1,880 m asl. in north. Natural hill ravines drain the snowmelt, rain or spring water into the lake.

Dhirkot is a Tehsil Headquarter of District Bagh, the State of Azad Jammu and Kashmir. The town is located at an altitude of around 1820 m (5500 feet) above mean sea

level. It is a beautiful relatively small town and hill station located at a distance of some 24 km from Kohala, the Gateway to Azad Jammu and Kashmir, 65 km from Mazaffarabad, and 132 km from Islamabad.

The top folds of the hill ranges in Pir Chanasi National Park have altitudes above 2,500 m above mean sea level (asl), some peaks even above 3,000 m asl, with a general east-west orientation, having north facing and south facing slopes. The top folds of the hill have patches of good highland pastures with relatively gentle slope or leveled plains.

Berberidaceae belong to a family also known as the Barberry family (Elpel, n.d.). It is a part of the Ranunculales order and has nearly fourteen genera and 700 species (Christenhusz and Byng, 2016). In Pakistan, there are 3 genera and 22 species belonging to this group (Jafri, n.d.). Individuals from this family prefer northern temperate regions and tropical mountains (Jafri, n.d.). The wood from the *Berberis* family is easy to

recognize due to its bright yellow colour (Ulloa, 2009). This family was thought to be the oldest angiosperm group with a high number of discontinuous genera (Tiwari et al., 2012). Species of this family are extensively cultivated due to their aesthetic and medicinal value. In the past, researchers would consider this family to get an idea about the habitat degradation of temperate areas.

This study was aimed to produce a comprehensive list of species richness of this family in five National Parks of Pakistan. Previously, studies have been conducted on pollen of this family from Pakistan (Perveen and Qaiser, 2010), phylogenetics and distribution in the Northern hemisphere (Wang et al., 2007). Using this data, further research may be conducted to ascertain the level of protection the National Parks have been able to afford this family and their surrounding biodiversity as an extension.

## **MATERIAL AND METHOD**

A quick visit of the protected forests of Forest Compartment No 18 (located in Dhirkot), and Compartment No 13 (located some 6 km from Dhirkot) was undertaken under the guidance of the staff of the Wildlife and Fisheries and the Forest Department of AJK. The general tract of the National parks were physically visited to collect all possible individuals belonging to the Berberidaceae family. different microhabitat variation. Using such data list of the plant species present in the study site was developed.

Unbiased staged-sampling was done to estimate the probable microhabitats. Broad

areas having reasonably similar vegetative conditions were recognized as stands for sampling of the vegetation. Where possible, the plants were identified in the field. All specimens were gathered and pressed on absorbent paper, and assessed using Flora of Pakistan (Stewart, 1972; Toshiyuki and Malik, 1992, 1993) and samples from Herbaria of Quaid-e-Azam University, Islamabad, and Pakistan Museum of Natural History, Islamabad.

Information from the transects was used to develop estimates on the vegetative cover occupied by different plant species and the total vegetative cover of the stands. This data was subject to computer-based ordination to develop vegetation types, based upon the stand similarities in the vegetative composition. The distribution of different plant communities was placed on the digitized maps of national parks, using satellite imagery. The benefits of the plant species in the area were determined through the information gathered from the resident population and the literature searched.

The constancy appearance of each species was calculated by the number of transects having the species divided by the total number of transects studied in each stand and expressed in percentage. Each species was assigned one of the five constancy classes (class I = < 21 %, II = 21 - 40, III = 41-60, IV = 61-80, V = > 80) following Muller-Dombois and Ellenberg (1974). The data on the absolute cover occupied by different species in a total of 51 transect samples were analyzed through Cluster Analysis (CA), using PC - ORD version 4.16, 1999 software.

## RESULT

**Table 1. List of species from Berberidaceae family recorded from Banjosa Game Reserve**

Scientific Names	Remarks	Usage
<i>Berberis jaeschkeana</i> Schneid. (Sumblu)	2 m tall, deciduous stem at first slightly reddish, yellow brown at maturity, spines 3-fid, green at both sides, flowers 9-13 m across, berries oblong, ovoid, red. Flowering May to June.	-
<i>Berberis kunawurensis</i> Royle. (Sumblu)	1.6 meters tall, young shoot red, mature stem glabrous brown or yellowish red, internodes 1-2 cm long, spines; 1-3 fid, leaves 15-40 mm long & 5-14 mm broad, narrowly obovate, elliptic, sub sessile, flowers red-brown, often found in open places. Flowering May-June.	-
<i>Berberis lycium</i> Royle (Sumblu, Zarch)	3 m tall erect or sub erect, semi deciduous, stem and branches pale whitish to grayish, Flowers pale yellow, fruit berry blackish with heavy grey white.	Brown extract from roots and lower parts mixed with water as tonic & eye lotion, roots for skin disease, chronic diarrhea, piles, blood purifier and tonic.

**Table 2. Relative vegetative cover of trees (% ±) shared between different plant species in different vegetative types established in BGR by Ward's method.**

Names	Vegetative layer						Constancy	
	A (10, 40-41, 44-45)	B (5, 11, 13, 16, 19, 22, 24, 48)	C (25, 35, 43)	D (2-3, 6-7, 17-18, 20, 27-29, 31-32, 36, 46)	E (8, 12)	F (1,4, 9, 14-15, 21, 23, 26, 30, 33, 34, 37-39, 42, 47, 49-51)	%	Class
	AV ± S.E	AV ± S.E	AV ± S.E	AV ± S.E	AV ± S.E	AV ± S.E		
<i>Berberis lycium</i>	0.30 ± 0.27	-	0.75 ± 0.37	0.05 ± 0.04	1.10 ± 1.10	2.14 ± 1.23	27.45	II
<i>Berberis jaeschkeana</i>	6.56 ± 3.97	-	-	0.34 ± 0.33	0.74 ± 0.38	0.04 ± 0.03	15.69	I
<i>Berberis kunawurensis</i>	-	0.32 ± 0.29	-	-	-	0.43 ± 0.41	5.88	I



Figure 1. Species of Berbericadeae Family (a) *Berberis lycium*(b) *Berberis kunawurensis*

Table 3: List of plant species list identified from Dhirkot

S.No	Names	Local Names	Remarks
1.	<i>Berberis lycium</i>	Sumloo, Sumbal	Medicinal Shrub in sub-tropical Cidrus pine zone at 914- 1524m. Fruits edible while bark used in skin diseases, and as blood purifier.

Table 4. Relative vegetative cover (%  $\pm$ ) shared between different plant species in different vegetative types established in DNR by Ward's method.

Names	Vegetative Type						Constancy (%)
	A (1, 15, 22)	B1 (4, 7, 12, 16, 18, 20, 9, 21, 17,10,11, 26, 27, 28)	B2 (23, 24 , 25)	C (8, 19, 13, 14)	D1 (2)	D2 (3, 5, 6)	
<i>Berberis lycium</i>	(3.27+3.22)	(0.64+0.29)	(0.10+0.06)	(0.95+0.49)	0.10	(0.20+0.15)	67.57

Table 5: Vegetative biodiversity of PCNP

#	Scientific Names	Remarks	Usage
1.	<i>Berberis kunawurensis</i> Royle.	1.6 meters tall, young shoot red, mature stem glabrous brown or yellowish red, internodes 1-2 cm long, spines; 1-3 fid, leaves 15-40 mm long & 5-14 mm broad, narrowly obovate, elliptic, sub-sessile, flowers red-brown, often found in open places, flowers: May- June.	-
2.	<i>Berberis lycium</i> Royle (Sumblu)	Up to 3 m, erect or sub erect, semi deciduous, stem and branches pale, whitish to grayish.	Roots and lower part extract mixed with water work as cooling agent/tonic, eye lotion/ skin disease, chronic diarrhea, piles.

**Table 6: Relative vegetative cover (% ±) shared between different plant species in different vegetative types established in PCNP by Ward's method.**

#	Names	A (9, 20, 23, 38-39, 44-46, 53-55, 60)	B (3, 34, 16, 56, 7, 59, 61, 35, 36, 37, 8, 43, 47, 40, 13, 24, 32, 42, 48, 25, 29, 31, 26, 28, 27, 33, 30, 49, 50, 51, 64, 63, 52)	C (2, 18, 14, 62, 10, 11, 21, 22, 12, 41, 57, 58, 15, 1, 19, 4, 5, 6, 17, 65)	Constancy (%) / class
		Mean ± S.E	Mean ± S.E	Mean ± S.E	
1.	<i>Berberis lycium</i>	0.1±0.1	0.3±0.1	0.1±0.0	21.5/(II)
2.	<i>Berberis kunawurensis</i>	0±0	0±0	0.1±0.1	6.2/(I)

**Table 7. Vegetative biodiversity of PLNP**

#	Scientific Name	Remarks	Usage
1.	<i>Berberis lycium</i> (Sumblu)	Up to 3 m, erect or sub erect, semi deciduous, stem and branches pale, whitish to grayish.	Roots and lower part extract mixed with water work as cooling agent/tonic, eye lotion/ skin disease, chronic diarrhea, piles.

**Table 8. Relative vegetative cover (% ±) shared between different plant species in different vegetative types established in PLNP by Ward's method.**

#	Names	A (1, 3, 19, 33-35, 36, 38, 46, 47, 48, 49, 50, 56, 57, 60, 68)	B (4,5, 7, 8, 9, 10, 12,13, 17, 21, 22, 23, 25, 26, 29, 31, 32, 37, 40, 41, 42, 43, 44, 52, 54)	C (2,16, 18, 28, 30, 45, 53, 59)	D (6,11, 14, 15, 20, 24, 27, 39, 55)	Constancy (%) / class
		Mean ± S.E	Mean ± S.E	Mean ± S.E	Mean ± S.E	
1.	<i>Berberis lycium</i>	0.4±0.2	2.4±0.5	3.0±1.4	1.3±0.1	72/ (IV)

**Table 9. Biodiversity plant list of TNP**

#	Scientific Names	Remarks	Use
1.	<i>Berberis lycium</i> Royle (Sumblu)	Common up to 3 m tall, erect or sub erect, semi deciduous; stem and branches pale, whitish to grayish.	Brown extract from roots and lower parts when mixed with water used as cooling agent or tonic and as an eye lotion. Root used for skin disease, in chronic diarrhea, for piles, as a blood purifier and tonic.

**Table 10. Relative vegetative cover (% ±) shared between different plant species in different vegetative types established in TNP by Ward's method.**

Names	Vegetative Type						Constancy %	Class
	A	B	C	D	E			
	AV ± S.E	AV ± S.E	AV ± S.E	AV ± S.E	AV ± S.E			
<i>Berberis lycium</i>	-	0.08 ± 0.08	-	-	-	71.15	IV	

## DISCUSSION

The survey carried out during May – June, 2009 revealed that three species belonging to the Berberidaceae family were present in the study area of BGR. A total of 116 vascular plants were observed against which the highest relative abundance from this family was of *Berberis lyceum* in BGR. In DNR, Sumbli (*Berberis lyceum*, 62%) appeared with a high constancy of appearance. PCNP reported two species from this family; *Berberis kunawurensis* and *Berberis lyceum* with the highest relative abundance of *Berberis lycium*. Only *Berberis lycium* was observed in PLNP and TNP.

Berberidaceae family is usually located in Temperate to sub-tropical regions (Watson and Dallwitz, 1992). Khan and Khatoon (2007) conducted a study in two valleys of Gilgit, Pakistan and reported *Berberis brandisiana*, *Berberis orthobotrys* and *Berberis pseudumbellata* from the Berberidaceae family. Several researchers tend to get confused when classifying species from this group as their physical characteristics tend to overlap (Khan et al., 2014). Khan et al. (2014) cite the presence of 29 species belonging to Berberidaceae from Pakistan. Their study was limited to Gilgit-Baltistan (GB) and Central Karakoram National Park (CKNP) from 1935 to 2014.

## CONCLUSION

Overall three species from this family were observed in the study sites. The greatest diversity was seen in Banjosa Game Reserve. DNR, PLNP and TNP each reported only the presence of *Berberis lycium*. However, the constancy percentage of this species represented a good density. Since this family may be used to ascertain the level of habitat degradation of temperate areas, it is important to conduct surveys recording its population both qualitative and quantitatively.

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