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Recommended Citation

Sultana, K., Khan, S. W., & Shah, S. A. (2020). Diversity and Ethnobotanical Importance of Pine Species from Sub-Tropical Forests, Azad Jammu and Kashmir, *Journal of Bioresource Management*, 7 (1).

DOI: <https://doi.org/10.35691/JBM.0202.0124>

ISSN: 2309-3854 online

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DIVERSITY AND ETHNOBOTANICAL IMPORTANCE OF PINE SPECIES FROM SUB-TROPICAL FORESTS, AZAD JAMMU AND KASHMIR

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ABSTRACT

A general investigation of sub-tropical forests, from Pir Chinasi National Park, Tolipir National Park, Dhirkot Nature Reserve and Banjosa Game Reserve was carried out during different months from February 2008 to May 2010. The relative abundance of species was calculated using line transects of 50m. A total of five different species (*Abies pindrow*, *Cedrus deodara*, *Pinus wallichiana*, *Pinus roxburgii* and *Picea smithiana*) from the Pinaceae family were recorded. The main reported use of *Cedrus deodara* and *Pinus wallichiana* by the local people was for furniture and construction purposes. *Pinus wallichiana* was observed as the dominant species from all the selected sites.

Keywords: Pines, *Cedrus deodara*, *Pinus wallichiana*, chir, forest

INTRODUCTION

Pinaceae (order: Pinales) consist of 11 known genera and 228 known species worldwide (Christenhusz and Byng, 2016). This family is widely distributed, covering Asian countries (China, Japan, Thailand and Indonesia etc.), Central America and North Africa (Pinaceae, n.d.). Due to their highly coveted timber, pine species have also been introduced to New Zealand, Australia and sub-Saharan Africa. Only five species from this family have been reported from Pakistan, however, they cover a significant area (1928,000 hectares) (Zafar et al., 2010).

Pine species are commonly used for softwood timber, essential oils and in the pulp industry (Pinaceae, n.d.). Zafar et al. (2010) studied the efficacy of essential oil from *P. roxburgii* and found it to be a significantly effective antimicrobial and antifungal agent. The oil from *C. deodara* has previously been investigated for curing diseases (Parveen et al., 2010).

Ecological studies documenting medicinal importance of the flora from

different parts of Pakistan exist (Shinwari, 2010; Jabeen et al., 2010; Bibi et al., 2011; Akhtar et al., 2013). However, there is a lack of investigations focused on the ethnobotanical and population studies of the Pinaceae family from the study area. Present study was carried out to document the species belonging to the Pinaceae family in selected sub-tropical forests of Pakistan, their relative abundance and traditional use by local populace.

MATERIALS AND METHOD

A general surveillance of the Pir Chinasi National Park (April-May, 2010), Tolipir National Park (April-May, 2008), Dhirkot Nature Reserve (February, 2008) and Banjosa Game Reserve (May-June, 2009) was undertaken with the help of the relevant staff of AJK Wildlife and Fisheries Department and AJK Forest Department to collect information on general landscape of the study area. The available information on the expected biota was collected through literature search and that available from the

field staff of the Department of Wildlife and Fisheries and the Forest Department. The information thus collected was properly mapped on the satellite imagery of the tracts.

Sample Collection

The general tract of the study area was physically visited to collect all possible phyto-diversity. Attempts were made to collect/record all the plant species present under different microhabitat variation. Using such data list of the plant species present in the study area was developed. Detailed phyto-sociological studies were undertaken through unbiased staged sampling, in an endeavor to sample all possible microhabitats. Broad areas having reasonably similar vegetative conditions were identified using satellite imagery and the physical reconnaissance of the area, and were recognized as stands for sampling of the vegetation. Each stand was given a reference number and sampled using different numbers of 50 m long line transects at randomly selected locations in different parts of each stand. The length of the transect line touching or supposed to be touching a plant was recorded with the name of the plant species. The different vegetative layers (herbs,

shrubs, trees and epiphytes) were subjected to separate transect samplings.

The taxonomic identification of plants was carried out in the field. The specimens of all plants species were collected, pressed with a plant press using absorbent paper, and brought to the laboratory, where it was identified following Flora of Pakistan (Nasir and Ali, 1970-2008; Stewart, 1972; Toshiyuki and Malik, 1992, 1993) and through physical comparison with previously identified specimens, available at Herbaria of Quaid-e-Azam University, Islamabad, and Pakistan Natural History Museum (PNHM), Islamabad.

The transect data was suitably pooled to develop estimates on the vegetative cover occupied by different plant species and the total vegetative cover of the stands. The stand data was subject to computer-based ordination to develop vegetation types, based upon the stand similarities in the vegetative composition. The distribution of different phyto-sociological communities was placed on the digitized map of the study area, with the help of satellite imagery. The possible use of the plant species in the area was determined through the information gathered from the local population and the literature searched.

RESULTS AND DISCUSSION

Table 1: List of Pinaceae plant species recorded from Banjosa Game Reserve (BGR)

#	Scientific Names	Remarks	Usage
1.	<i>Abies pindrow</i>	30 m tall , narrow pyrandial shape, bark fissured, light grey to brown.	-
2.	<i>Cedrus deodara</i> (Diar, Cedar)	30 m tall, gregarious 2000-3000 m altitudes, spreading horizontal branches, branch-lets drooping, male cones solitary at the tips of dwarf shoots, female cones solitary, erect, terminal at the end of shoots, young cones greenish, mature cones brown, barrel-shaped deciduous, leaving a central woody axis. Cone ripe: October- November in the second year.	Construction and furniture.
3.	<i>Pinus wallichiana</i> (Biar, blue pine)	30 m tall, grayish scaly bark, bluish to grey-green leaves, clustered 10-15 mm long male cones, 2-4 cylindrical (16-28 cm long) drooping female cones at	Wood for construction & furniture.

the tips of branches. Cone formation October – November.

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 (Tress)						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>Pinus wallichiana</i>	33.76 ± 8.50	56.04 ± 3.27	27.28 ± 1.24	29.84 ± 1.15	21.05 ± 21.05	4.26 ± 1.15	78.43	IV
<i>Cedrus deodara</i>	0.09 ± 0.08	0.70 ± 0.34	4.84 ± 2.42	1.33 ± 0.92	0.12 ± 0.12	1.05 ± 0.37	35.29	II

Table 3: List of plant species list identified from Dhirkot Nature Reserve (DNR)

#	Scientific Names	Remarks
1.	<i>Cedrus deodara</i> (Diar, Cedar)	Most valuable timber wood.
2.	<i>Pinus roxburghii</i> (Chir)	Economically important tree in sub-tropical Chir Pine zone 1000-1600 m. Flowering March- May
3.	<i>Pinus wallichiana</i> (Biar, Blue pine)	Major timber. Wood used for construction and furniture, timber. Cone formation October to November. Flowering April to June and fruit ripening October to November

Table 4: Relative vegetative cover (% ±) 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>Cedrus deodara</i>	(2.33+2.33)	(1.45+0.93)	0.00	0.00	136.00	(62.07+10.48)	40.54
<i>Pinus wallichaina</i>	(20+12.14)	(64.24+4.34)	(70.90+8.27)	(138.25+12.70)	30.90	(29.63+15.14)	94.59

Table 5: Vegetative biodiversity of Pir Chinasi National Park (PCNP)

#	Scientific Names	Remarks	Usage
1.	<i>Abies pindrow</i>	30 m tall , narrow pyrandial shape, bark fissured, light grey to brown.	Wood for construction/building, furniture, matches, paper pulp.
2.	<i>Cedrus deodara</i> (Diar, Cedar)	30 m tall, spreading horizontal branches, branch-lets drooping, male cones solitary at the tips of dwarf shoots, female cones solitary, erect, terminal at the end of shoots, young cones greenish, mature cones brown, barrel-shaped deciduous, leaving a central woody axis. Cone ripe: October- November.	Construction, furniture.
3.	<i>Pinus wallichiana</i> (Biar, blue pine)	30 m tall, grayish scaly bark, bluish to grey-green leaves, clustered 10-15 mm long male cones, 2-4 cylindrical drooping female cones at tips of branches, Cone. October – November.	Wood for construction and furniture.
4.	<i>Picea smithiana</i> <i>Boiss.</i> (Kachal)	Up to 30 m or more, bark greyish brown, branches drooping; leaves 2.5 cm; male cones axillary, solitary, 2 2.5 cm, flowers: April.	Ornamental.

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

#	Names	A	B	C	Constancy (%) /class
		(9, 20 ,23, 38-39, 44-46, 53-55, 60)	(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)	(2, 18, 14, 62, 10, 11, 21, 22, 12, 41, 57, 58, 15, 1, 19, 4, 5, 6, 17, 65)	
		Mean ± S.E	Mean ± S.E	Mean ± S.E	
	TREES	49	27.3	48.1	
1	<i>Pinus wallichiana</i>	0±0	12.6±2.8	47.2±3.6	60/(III)
2	<i>Abies pindrow</i>	44.7±5.4	2.4±0.9	0.6±0.6	30.8/(II)
3.	<i>Picea smithiana</i>	1.3±1.3	4.4±2.7	0±0	9.2/(I)
4.	<i>Cedrus deodara</i>	0±0	0.4±0.4	0±0	1.5/(I)

Table 7: Vegetative biodiversity of Tolipir National Park (TNP)

#	Scientific Name	Remarks	Use
1.	<i>Abies pindrow</i> (Partal Paluder pindrow fir)	Common in temperate coniferous forest, up to 30 m tall, with a pyramidal shape, bark light grey to brown, leaves spiral, 2-4 cm long, upper surface grooved, dark green, shiny, male cones 1-2 cm long, reddish-green.	Wood used for construction of building, preparation of furniture, making matches and paper pulp.
2.	<i>Pinus roxburgii</i> Roxb (Chir)	Up to 30 m tall with a soft flaky bark, leaves in clusters of 3, male cones 1.5 cm long, yellowish, in dense terminal clusters, female cones solitary or 2-3 at the tips of branches mature ones woody; bract and scale distinct, beaked, wing 2-3 times longer than seed.	Leaves used for mud roof thatching, anti-racking agent in mud plasters, for construction and furniture, resin extract for used for varnishes and Turpin.
3.	<i>Pinus wallichiana</i> (Biar, blue pine)	Up to 30 m tall with greyish scaly bark, leaves bluish to grey-green, male cones 10-15 mm long, in clusters, female cones 2-4, at the tips of branches, 16-28 cm long, cylindrical, drooping.	Wood used for construction purpose, furniture, as timber wood.

Table 8: 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 AV ± S.E	B AV ± S.E	C AV ± S.E	D AV ± S.E	E AV ± S.E	
<i>Abies pindrow</i>	57.48 ± 6.13	-	-	-	-	9.61/I
<i>Pinus roxburgii</i>	0.14 ± 0.06	0.03 ± 0.02	-	-	0.25 ± 0.09	5.77/I
<i>Pinus wallichiana</i>	0.90 ± 0.09	0.06 ± 0.03	0.18 ± 0.18	-	0.13 ± 0.05	55.77/III

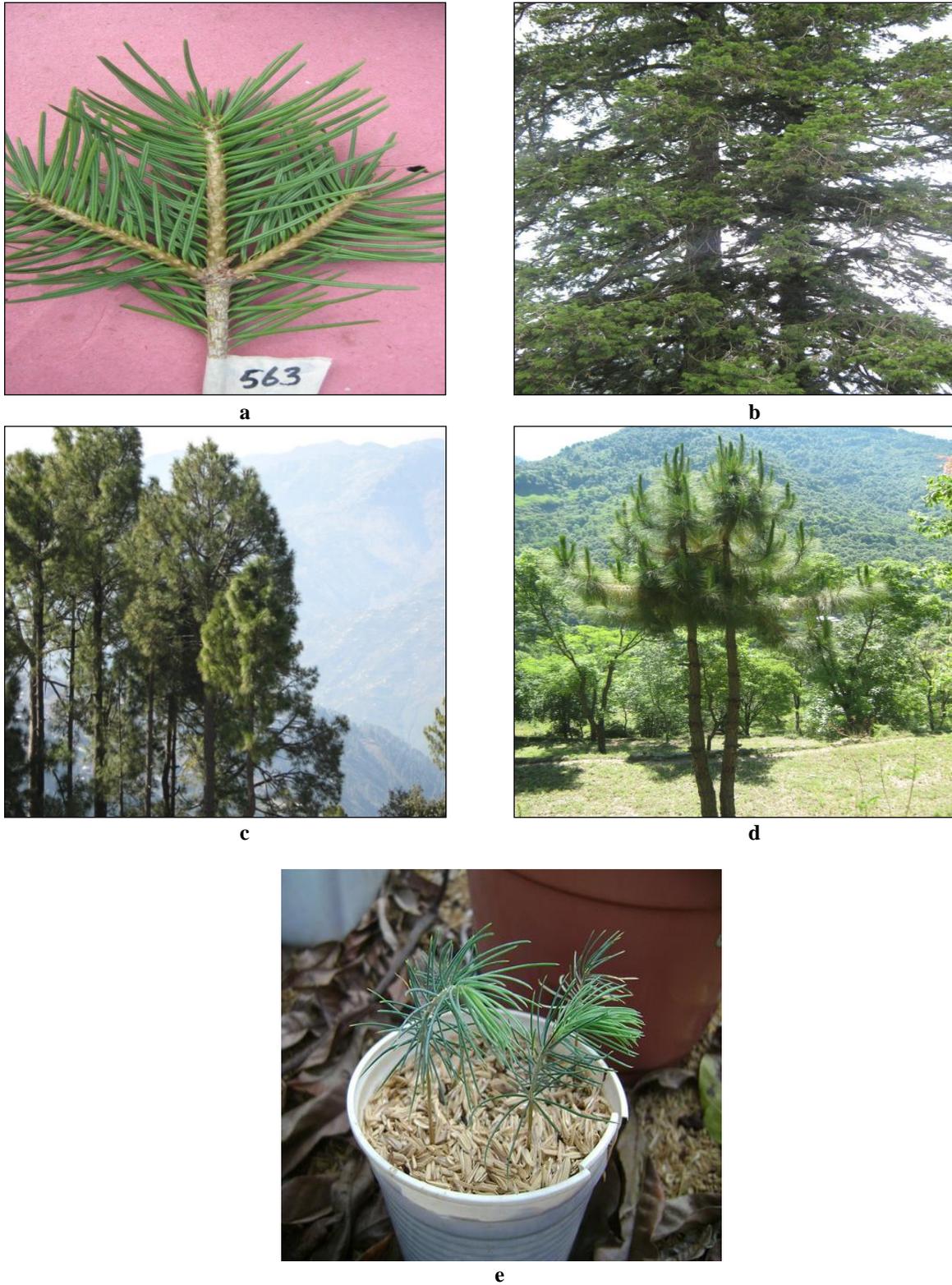


Figure 1. *Abies pindrow* (b) *Cedrus deodara* (c) *Pinus wallichiana* (d) *Pinus roxburgii* (e) *Picea smithiana*

Five different species belonging to the Pinaceae family were noted from the study sites cumulatively. Only three species each were observed from the selected national parks except for Pir Chinasi National Park (4). However, the percentage vegetative cover calculated, suggests a high-density population of species from this family.

Nearly 116 species of the vascular plants were observed from different parts of BGR. From the species observed, only three belonged to the Pinaceae family, with *Pinus wallichiana* having the highest density (constancy of appearance = 78.43%). The distribution of the tree canopy cover in different transects suggested a high tree cover (50 – 75%) in the central valley and the associated lower hill slopes.

DNR has a thick growth of vegetation, represented by three well defined layers. The tree layer provides a close canopy (represented by >100% cover caused by overlapping branches of closely located trees lying at different heights) in the major part of central DNR, a patch in northern and another patch in southern parts. A patch of almost closed canopy (93% cover) appears in the northern parts between the patches having closed canopy forest. The open canopy (65-73% tree cover) appears as wide areas in south western parts. *Pinus wallichiana* is the most widely distributed tree species of DNR, appearing in 95% of the samples and provided a high over all tree cover. While *Cedrus deodara* appeared in some 40% of the stands.

Out of 4 species of gymnosperms observed in PCNP, blue pine (*P. wallichiana*), was widely distributed. Tree canopy was generally open for the major part of PCNP, having dense growth of trees. *Pinus wallichiana* was present in all communities, attached with different other species in different combinations.

A total of 158 plant species distributed in different parts of TNP were

identified. These included 35 species of trees (including three gymnosperms), 19 shrubs, three epiphytes, four climbers, 73 herbs (including two weeds and 11 grasses), two weeds, 10 ferns, one moss, and one species of lichen. *Abies pindrow*, *Pinus roxburgii* and *Pinus wallichiana* were observed from TNP.

Cedrus deodara and *Pinus wallichiana* were commonly utilized for timber for the construction of buildings and preparation of furniture in all the study sites as their wood is very durable and of excellent quality.

The ethnobotanical uses of these species from the current study mainly included ornamental, construction, for furniture and paper. However, studies show that pines belonging to the Pinaceae family have several other medicinal uses. Haq et al. (2011) reported the local use of *Abies pindrow* for cough, respiratory issues and chest infections and *Pinus roxburgii* for ulcers, skin diseases and as an anti-venom from Nandiar Khuwarr, Pakistan. Man and Samant (2011) report the ethnobotanical uses of *C. deodara* (antiparasitic, antirheumatic and also for curing ulcers) and *P. wallichiana* (for treatment of abscesses, ulcers, blackouts and luxation). Since these species occur in abundant quantities in the study area, further studies may be carried out to discover and utilize their full potential.

CONCLUSION

Overall, five distinct species from the Pinaceae family were observed from the four different protected areas of Pakistan. *P. wallichiana* was the most abundantly present species. *Picea smithiana* was only observed in Pir Chinasi National Park. The ethnobotanical uses of these species mainly included ornamental, construction, for furniture and paper.

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