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## OAKS (FAMILY: FAGACEAE) DIVERSITY FROM MOIST TEMPERATE FORESTS OF LESSER HIMALAYAS, PAKISTAN

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### ABSTRACT

A detailed survey was conducted in five national parks and game reserves of Azad Jammu and Kashmir, Pakistan to assess the biodiversity of family Fagaceae. Identification of the species was done using literary sources and comparison of samples with herbaria from Quaid-i-Azam University, Islamabad and Pakistan Museum of Natural History, Islamabad, Pakistan. A total of eight different species belonging to two genera were identified, including *Quercus* spp., *Castanea sativa*, *Quercus glauca*, *Quercus baloot*, *Quercus incana*, *Quercus velutina*, *Quercus alba* and *Quercus dilatata*. The greatest biodiversity was found in Banjosa Game Reserve (BGR) and Tolipir National Park (TNP), while Pir Chinasi National Park (PCNP), Pir Lasura National Park (PLNP) and Dhirkot National Reserve (DNR) had the least number of species.

**Keywords:** Fagaceae, *Quercus*, *Castanea*, angiosperm, Lesser Himalayas.

### INTRODUCTION

The family Fagaceae consists of 8 genera and about 927 species. They are evergreen or deciduous shrubs and trees (Christenhusz and Byng, 2016). Fagaceae are economically important plant species that provide several benefits to both man and nature. The wood from this family has great economic value and used for various purposes including timber and a source of fuel wood in remote areas. Several species are as source of food and habitat for several species of animals. Some plants are also grown for ornamental purposes.

This family is extensively dispersed in the Northern Hemisphere. It has its greatest species richness in Southeast Asia and Mexico (Jian-Qiang, 1996; Petit et al., 2013). *Castana* (single species) and *Quercus* (6 species) are the only reported genera of family Fagaceae from different regions of Pakistan (Shah et al., 2005; Farooq et al., 2012; Nisar et al., 2016). The current survey

was aimed to assess the biodiversity of family Fagaceae in selected Lesser Himalayan regions of Pakistan.

### MATERIALS AND METHODS

#### *Study Area*

Five national parks and game reserves including Dhirkot Nature Reserve, Tolipir National Park, Pir Chinasi National Park, Pir Lasura National Park and Banjosa Game Reserve were taken as study sites. An initial survey was conducted from April, 2015 to May, 2016 during different seasons at selected areas. General landscape of the prospective areas was recorded and information on the expected biota was collected through literature search and that available with the field staff of the Wildlife and Forest Departments.

Multiple unbiased 50m long transects were used. At some places the cover in different layers was thick and the branches of the adjacent trees were

intermingled. In such stands the total tree cover under the present sampling exceeded 100% suggesting an overlapping canopy layer from some part. The actual cover occupied by a species was divided by the total vegetation cover in the stand to calculate the relative cover of the vegetation. The stand data was subjected to computer-based ordination to develop communities based upon the stand similarities in the vegetative composition.

Identification of the species was done using literary sources (APG, 2009) and

comparison of samples with herbaria from Quaid-i-Azam University, Islamabad and Pakistan Museum of Natural History, Islamabad, Pakistan.

## RESULTS AND DISCUSSION

In this survey, eight (8) species of angiospermic plants belonging to two genera of family Fagaceae were identified viz; *Quercus* spp., *Castanea sativa*, *Quercus glauca*, *Quercus baloot*, *Quercus incana*, *Quercus velutina*, *Quercus alba* and *Quercus dilatata* (Figure 1a & 1b).

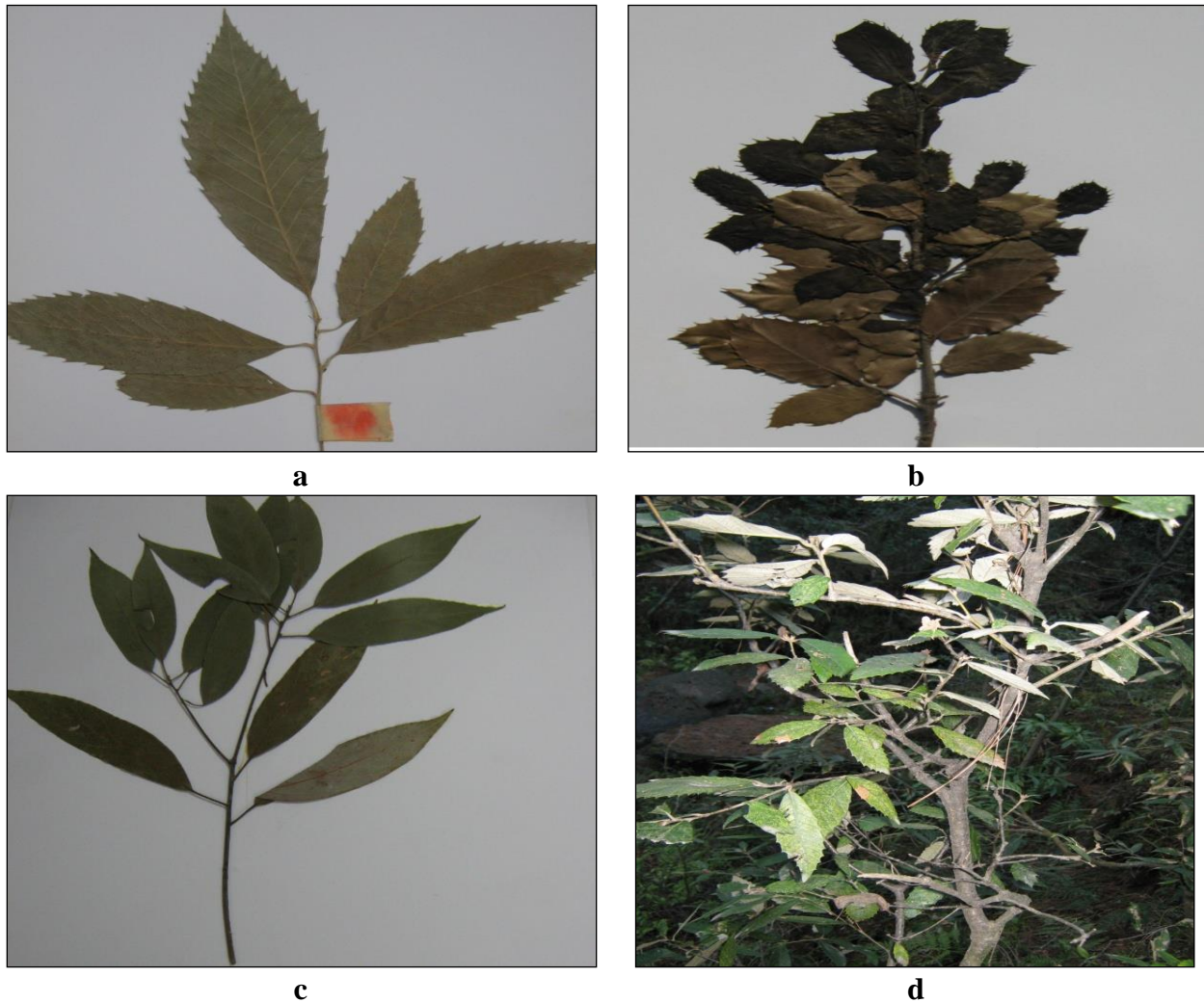


Figure 1a: Angiospermic plants of family Fagaceae; a: *Castanea sativa*, b: *Quercus baloot*, c: *Quercus glauca*, d: *Quercus incana*



**Figure 1b:** Angiospermic plants of family Fagaceae; a: *Quercus dilatata*, b: *Quercus velutina*, c: *Quercus alba*

Out of eight species of family Fagaceae, 5 species were found in Banjosa Game Reserve, but only 4 had significant vegetative cover relative to other flora present in BGR. No relative vegetative cover data was available about *Quercus incana* Roxb. Out of these, the highest (25.49%) population observed from family Fagaceae was of *Q. baloot* (Table 1).

Only one species of Fagaceae, *Quercus incana* was present in Dhirkot National Reserve (DNR). The population density of this species was higher, i.e., 40.54%, greater than that of any singular

species of Fagaceae in DNR (Table 2). Similarly, only one species of Fagaceae, *Quercus incana* was recorded from Pir Chinasi National Park (PCNP). The density of population of this species was too low to calculate the relative vegetative cover data.

Four species of Fagaceae were recorded from Pir Lasura National Park (PLNP). No relative vegetative cover data was available for *Quercus baloot* as its population was too less (Table 3). From Tolipir National Park (TNP) we recorded five species of Fagaceae plants. *Quercus incana* was found abundantly in the study

area. While no relative vegetative cover data was available regarding *Castanea sativa*, *Quercus dilatata* Royle and *Quercus glauca*

because of lower number of the plant species (Table 4).

**Table 1: Relative vegetative cover (% ±) shared between different plant species in different vegetative types established in BGR by Ward's method.**

Name of Plant Species	Vegetative Type						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>C. sativa</i>	-	0.15 ± 0.14	0.37 ± 0.37	-	-	0.08 ± 0.05	9.8	I
<i>Q. glauca</i>	-	0.14 ± 0.08	-	0.04 ± 0.04	-	1.51 ± 1.45	13.73	I
<i>Q. baloot</i>	-	0.14 ± 0.13	1.13 ± 0.19	0.07 ± 0.05	-	0.52 ± 0.21	25.49	II
<i>Q. velutina</i>	-	-	-	0.01 ± 0.01	0.39 ± 0.39	0.03 ± 0.03	5.88	I

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

Name of Plant Species	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>Q. incana</i>	18.47±9.68	2.02±0.89	1.13±0.66	20.60±9.69	0.00	1.10±1.10	40.54

**Table 3: Relative vegetative cover (% ±) shared between different plant species in different vegetative types established in PLNP and TNP by Ward's method.**

Name of Plant Species	Vegetative Type				Constancy	
	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)	%	Class
	Mean ± S. E	Mean ± S. E	Mean ± S. E	Mean ± S. E		
<b>Trees→</b>	<b>13.14</b>	<b>21.56</b>	<b>46.58</b>	<b>29.08</b>		
<i>Q. species</i>	0.2±0.1	0.0±0.08	0.2±0.2	0.2±0.2	10	I
<i>Q. incana</i>	0.0±0.0	2.8±0.84	0.0±0.0	0.7±0.7	25	II
<i>Q. alba</i>	0.6±0.6	0±0.0	0.0±0.0	0.0±0.0	1.6	I
<b>Tolipir National Park (TNP)</b>						
<i>Q. incana</i>	-	0.41 ± 0.41	-	0.03 ± 0.02	25	II

A number of plant species of the study region have been traditionally exploited by the local populace as medicine, fodder, forage, edible fruit and seed, timber and furniture wood, fuel wood, for construction and ornamental purposes. Most species serve more than one function in addition to its main function (Abbasi et al., 2013a, 2013b; Khan et al., 2014).

Several plants found from the study have known use for treatment of different illnesses. The nut of the *Quercus baloot* is used to treat urinary problems, cold and cough. Dry bark of *Quercus incana* is effective for the treatment of asthma, cough, fever, rheumatism and backache diseases. *Quercus incana* is frequently exploited as timber wood for the construction of building and preparation of furniture (Khan et al., 2010; Khan et al., 2011; Sher et al., 2013; Bokhari et al., 2013).

The people living around the study area lacked basic facilities such as gas and coal, they depend on forest resources to meet the need of their fuel-wood. The prominent fuel-wood species include *Quercus baloot* and *Castanea sativa*. The wood and branches of such species are used as fuel. The wood of *Quercus baloot* and *Q. incana* is also used for preparation of agricultural tools and for making charcoal. *Quercus baloot* and *Quercus incana* leaves have agricultural value as feed for livestock (Shaheen et al., 2011b; Amjad et al., 2013; Rahman et al., 2018).

A previously conducted study in Bagh district of AJK by Shaheen et al. (2011a) shows that approximately 2.97 kilograms of wood was used per person on a daily basis in their study area. The study of Amjad (2012) concurs with the notion of previous study. This study suggests that *Q. dilatata* is unable to regenerate due to overgrazing and deforestation. Due to the aforementioned reasons, the diversity of different plants is decreasing.

## CONCLUSION

A total of eight species belonging to the Fagaceae family were observed in the five National Parks. The distribution of the species varied greatly in each National Park. Judging by the density of the species found, it is imperative that conservatory steps are taken to save the forests.

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