

## FLORISTIC DIVERSITY OF VASCULAR PLANTS IN FORESTS OF LANGATE FOREST DIVISION IN KASHMIR HIMALAYA

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### ABSTRACT

The paper deals with the rich biodiversity of Langate Forest Division of Kashmir Himalaya. During the floristic inventorization of the study area, in all 301 species of vascular plants belonging to 204 genera distributed over 79 families were encountered. Among these, dicotyledons and monocotyledons were represented by 248 species distributed in 162 genera and 59 families, and 36 species distributed in 27 genera and 12 families respectively on the other hand, gymnosperms share 7 species representing 7 genera and 3 families, whereas pteridophytes share 10 species in 8 genera and 5 families. Based on the number of species, Asteraceae with 30 species was the largest family and *Polygonum* with 6 species was the largest genus.

**Key words:** Biodiversity, Inventorization, Vascular plants, Gymnosperms, Langate Forest Division.

### INTRODUCTION

Biodiversity is essential for human survival, economic well-being and for the ecosystem function and stability (McNeely *et al.*, 1990). Diversity at all organizational levels, ranging from genetic diversity within populations to the diversity of ecosystems in landscapes, contributes ultimately to global diversity. Species diversity has functional consequences, because the number and kinds of species present at any place, determines the organismal traits that influence ecosystem processes. Man has

extensively altered the global environment and the biological diversity. Unfortunately, this precious biological wealth has been eroded to an alarming level by ruthless anthropogenic activities (Kushwah and Kumar, 2001).

The composition, diversity and structure of vascular plants are important indicators of ecosystem health. Because vegetation is the source of primary production and a primary determinant of habitat for the organisms, changes in vegetation can affect many elements of an ecosystem. The composition and structure of plants, therefore, assumes much superiority (Bilgrami, 1995). The floristic and vegetation studies of Kashmir Himalaya have been carried out since first half of the twentieth century ( Rao, 1960; Dutt *et al.*, 1964; Javeid, 1968; Stewart, 1967, 1972; Singh and Kachroo, 1976; Dar and Kachroo, 1992; Dhar and Kachroo, 1983, Dar *et al.*, 1983; Dar and Naqshi, 1995, 2001). However, there are still many areas which need thorough floristic investigation. Langate Forest Division, falling in Kupwara and Baramulla districts, is one such example. Except a few reports on some general flora (Khuroo, 2003; Lone, 2004; Lone and Pandit, 2007), no extensive survey of the forest has been carried

out so far as to have an insight in to the floristic wealth of the area. The present work was, therefore, undertaken with the view to document the floristic diversity of vascular plants in Langate Forest Division, in Kashmir Himalaya.

#### MATERIAL AND METHODS

The present study was undertaken during different seasons from June 2004-October 2006 on Langate Forest Division of Kashmir Himalaya. The Division falls in north-west part of Kashmir valley and is situated between  $34^{\circ} 15'$  and  $34^{\circ} 45'$  N latitude and  $73^{\circ} 45'$  and  $74^{\circ} 35'$  E longitude. The Division extends over an area of about  $360 \text{ km}^2$  and occupies north-eastern slopes of Kazinag and Shamasbari Ranges. The plant specimens were collected from various places, viz. Mawar, Rafiabad, Rajwar and Magam ranges of Langate Forest Division. Three to four specimens of each species were collected. Using standard taxonomic methods, the plant specimens were properly processed for preparation of herbarium specimens. The specimens were identified by using the available literature (Stewart, 1972; Fl. Ind., 1996; Polunin and Stainton, 1997). The identified voucher specimens have been deposited in the Kashmir University Herbarium (KASH).

#### ENUMERATION OF SPECIES

The plants collected during frequent field trips to Langate Forest Division are listed below. While the genera and species are arranged alphabetically, the families are listed according to Bentham and Hooker's system of classification (1862-1883) with slight modification after Cronquist (1981). Each plant species is provided with its botanical name and author citation.

#### ANGIOSPERMS DICOTYLEDONS

##### RANUNCULACEAE

- Aconitum chasmanthium* Stapf ex Holmes.
- Aconitum heterophyllum* Wallich ex Royle.
- Aconitum laeve* Royle.
- Actaea spicata* Linn.
- Anemone falconeri* Thomson.
- Anemone obtusiloba* D. Don.
- Anemone polyanthes* D. Don.
- Anemone tetrasepala* Royle.
- Aquilegia fragrans* Benth.
- Caltha alba* Cambess.
- Clematis grata* Wallich.
- Delphinium denudatum* Wallich ex Hook. f. & Thomas.
- Delphinium roylei* Munz.
- Ranunculus laetus* Wallich ex D. Don.
- Ranunculus hirtellus* Royle ex D. Don.
- Ranunculus palmatifids* Riedl.
- Thalictrum cultratum* Wallich.

*Thalictrum virgatum* Hook. f. & Thomson

**NYMPHAEACEAE**

*Nymphaea alba* Linn.

**LENTIBULARIACEAE**

*Utricularia aurea* Lour.

**BERBERIDACEAE**

*Berberis lycium* Royle.

*Berberis pachyacantha* Koenhe.

**PAPAVERACEAE**

*Meconopsis aculeata* Royle.

**FUMARIACEAE**

*Corydalis cashmeriana* Royle

*Corydalis govaniiana* Wallich.

*Corydalis rutifolia* (Smith) DC.

**HAMAMELIDACEAE**

*Parrotiopsis jacquemontiana* (Deccne.) Rehder.

**ULMACEAE**

*Celtis australis* Linn.

*Ulmus wallichiana* Planchon.

**CANNABACEAE**

*Cannabis sativa* Linn.

**MORACEAE**

*Morus alba* Linn.

**URTICACEAE**

*Urtica dioica* Linn.

**SALICACEAE**

*Populus alba* Linn.

*Populus ciliata* Wallich ex Royle.

*Populus nigra* Linn.

*Salix alba* Linn.

*Salix denticulata* Anderson (*S. elegans* Wallich ex Anderson).

*Salix wallichiana* Anderson.

**CHENOPODIACEAE**

*Acroglochin persicaroides* Moq.

*Chenopodium album* Linn.

*Chenopodium foliosum* (Moench.) Aschers.

**PORTULACACEAE**

*Portulaca oleracea* Linn.

**CARYOPHYLACEAE**

*Arenaria neelgaharensis* Wight and Arn.

*Cerastium cerastioides* (Linn.) Britton.

*Cerastium glomeratum* Thuill.

*Lychnis coronaria* (Linn.) Desr.

*Silene conoidea* Linn.

*Spergularia arvensis* Linn.

*Stellaria media* (Linn.) Vill.

**ILLECEBRACEAE**

*Hereniaria cachemiriana* Linn.

*Hereniaria hirsuta* Linn.

**HYPERICACEAE**

*Hypericum perforatum* Linn.

**MALVACEAE**

*Malva neglecta* Wallr.

*Lavatera kashmiriana* Cambess.

**VIOLACEAE**

*Viola indica* W. Becker.

*Viola biflora* W. Becker.

*Viola odorata* Linn.

**BRASSICACEAE**

*Arabidopsis wallichii* (Hook.f. & Thomson)  
Busch.  
*Arabidopsis himalaica* (Edgew.) O. E.Schulz.  
*Arabis nova* Vill.  
*Arabis pterosperma* Edgew  
*Capsella bursa pastoris* (Linn.) Medikus.  
*Cardamine impatiens* Linn.  
*Lepidium capitatum* Hook. & Thomson.  
*Thlapsi griffithianum* (Boiss.) Boiss.

**PRIMULACEAE**

*Androsace rotundifolia* Hardw.  
*Primula denticulata* Smith.  
*Primula rosea* Royle.

**CRASSULACEAE**

*Rhodiola himalensis* (D.Don.) S. H. Fu.  
*Sedum ewersii* Ledeb.  
*Sedum quadrifidum* Pall.

**SAXIFRAGACEAE**

*Bergenia ligulata* Wall. ex Engler .  
*Bergenia stracheyi* (Hook.f. & Thomas.) Engl.

**ROSACEAE**

*Alchemilla ypsilotoma* Rothm.  
*Cotoneaster nummularia* Fischer & Meyer.  
*Cotoneaster roseus* Edgew.  
*Duchesnea indica* (Andr.)Focke.  
*Fragaria nubicola* Lindley ex Lacaíta.  
*Geum elatum* Wallich.  
*Geum urbanum* Linn.  
*Potentilla argyrophylla* Wallich ex Lehm.  
*Potentilla desertorum* Bunge.

*Potentilla nepalensis* Hook.  
*Rosa brunonii* Lindley.  
*Rosa macrophylla* Lindley.  
*Rosa moschata* Miller.  
*Rosa webbiana* Wallich ex Royle.  
*Rubus niveus* Wallich.  
*Sibbaldia cuneata* Hornem. ex Kuntze.  
*Sorbaria tomentosa* (Lindley) Rehdar.  
*Sorbus lanata* (D. Don) Schauer.  
*Spiraea canescens* D.Don.

**ANACARDIACEAE**

*Rhus succedanea* Linn.

**PAPLIONACEAE**

*Astragalus grahamianus* Royle ex Benth.  
*Astragalus himalayanus* Klotzsch.  
*Indigofera heterantha* Wallich ex Brandis.  
*Lathyrus laevigatus* (Waldst. & Kit.) Gren.  
*Lespedeza cuneata* (Miq.) D.Don.  
*Lespedeza elegans* Cambess.  
*Lotus corniculata* Linn.  
*Robinia pseudoacacia* Linn.  
*Sophora japonica* Linn.  
*Trifolium pratense* Linn.  
*Trifolium repens* Linn.  
*Vicia sativa* Linn.

**ONAGRACEAE**

*Epilobium angustifolium* Linn.  
*Epilobium cylindricum* D.Don.  
*Epilobium hirsutum* Linn.  
*Epilobium latifolium* Linn.  
*Oenothera rosea* Linn.

**EUPHORBIACEAE**

*Euphorbia prostrata* Ait.

*Euphorbia royleana* Boiss.

*Euphorbia wallichii* Hook.f.

**POLYGONACEAE**

*Oxyria digyna* (Linn.) Hill.

*Polygonum amplexicaule* D. Don.

*Polygonum affine* D. Don.

*Polygonum amphibium* Linn.

*Polygonum hydropiper* Linn.

*Polygonum heterophyllum* Lindl.

*Polygonum nepalense* Meissner.

*Rheum emodii* Wallich ex Meissner.

*Rumex acetosa* Linn.

*Rumex dentatus* Linn.

*Rumex hastatus* D. Don.

*Rumex nepalensis* Sprengel.

**HIPPOCASTANACEAE**

*Aesculus indica* (Colebr. ex Cambess) Hook.

**BALSAMINACEAE**

*Impatiens brachycentra* Kar. & Kir.

*Impatiens thomsonii* Hook.f.

**ACERACEAE**

*Acer caesium* Wallich ex Brandis.

**OXALADACEAE**

*Oxalis acetosella* Linn.

*Oxalis corniculata* Linn.

**PHYTOLACACEAE**

*Phytolacca acinosa* Roxb.

**GERANIACEAE**

*Geranium pratense* Linn.

*Geranium procurrans* P.F. Yeo.

*Geranium sibiricum* Linn.

*Geranium wallichianum* D. Don ex Sweet.

**ARALIACEAE**

*Hedera nepalensis* C. Koch.

**APIACEAE**

*Aegiopodium alpester* Linn.

*Bupleurum longicaule* Wallich ex DC.

*Bupleurum falcatum* var. *marginatum* Wallich.

*Chaerophyllum acuminatum* Lind.

*Heracleum candicans* Wallich ex DC.

*Heracleum canescens* Lindl.

*Heracleum pinnatum* C.B. Clarke

*Selinum tenuifolium* Wallich ex C. B. Clarke.

*Torilis japonica* Linn.

**GENTIANACEAE**

*Gentiana carinata* Griseb.

*Gentiana harwanensis* G. Singh.

*Gentianopsis stracheyi* (Clarke) Kitamura.

*Jaeschkea latisejala* Clarke.

*Swertia petiolata* D. Don.

**SOLANACEAE**

*Atropa acuminata* Royle.

*Hyoscyamus niger* Linn.

*Solanum nigrum* Linn.

**PODOPHYLLACEAE**

*Podophyllum hexandrum* Royle.

**CUSCUTACEAE**

*Cuscuta chinensis* Lam.

*Cuscuta reflexa* Roxb.

**BORAGINACEAE**

*Arnebia benthamii* (Wallich ex D. Don) I. M. Johnston.

*Hackelia uncinata* (Royle ex Benth) C. Fisher.

*Lindelofia longiflora* (Benth.) Baillon.

*Lithospermum arvensis* Linn.

*Myosotis palustris* (Linn.) Nath.

*Myosotis caespitosa* Schultz.

*Myosotis micrantha* Pallsc. Lehm.

*Myosotis sylvatica* Ehrh. ex Hoffm.

*Onosma hispidum* Wallich ex G. Don.

#### **POLEMONIACEAE**

*Polemonium caeruleum* Linn.

#### **LAMIACEAE**

*Ajuga bracteosa* Wallich ex Benth.

*Ajuga parviflora* Benth.

*Lamium album* Linn.

*Leonurus cardiaca* Linn.

*Mentha Xpiperata* Linn.

*Nepeta connata* Royle ex Benth.

*Nepeta laevigata* (D. Don) Hand-Mazz.

*Nepeta linearis* Royle ex Benth.

*Nepeta raphanorrhiza* Benth.

*Orignum vulgare* Linn.

*Phlomis bracteosa* Royle ex Benth.

*Plectranthus rugosus* (Wall.) ex Benth.

*Prunella vulgaris* Linn.

*Salvia hians* Royle ex Benth.

*Stachys floccosa* Benth.

*Stachys sericea* Wallich ex Benth.

*Thymus linearis* Benth. ex Benth.

#### **PLANTAGINACEAE**

*Plantago lanceolata* Linn.

*Plantago major* Linn.

#### **OLEACEAE**

*Fraxinus excelsior* Linn.

*Jasminum humile* Linn.

*Jasminum officinale* Linn.

*Syringa emodi* Wallich ex Royle.

#### **SCROPHULARIACEAE**

*Digitalis purpurea* Linn.

*Pedicularis punctata* Decne.

*Pedicularis siphonantha* D. Don.

*Scrophularia decomposita* Royle ex Benth.

*Verbascum thapsus* Linn.

*Veronica arvensis* Linn.

*Veronica laxa* Benth.

*Wulfenia amherstiana* Benth.

#### **ACANTHACEAE**

*Strobilanthes urticifolius*

#### **CAMPANULACEAE**

*Campanula colorata* Wall.

*Campanula latifolia* Linn.

*Codonopsis clematidea* (Shrenk) C.B Clarke.

*Codonopsis ovata* Benth.

#### **VALERIANACEAE**

*Valeriana hardwickii* Wallich.

*Valeriana wallichii* DC.

#### **RUBIACEAE**

*Galium aparine* Linn.

*Galium asperuloides* Edgew.

*Galium elegans* Wall.

*Rubia cordifolia* Linn.

**SAMBUCACEAE**

*Sambucus wightiana* Wallich ex Wight & Arn.

**DIPSACACEAE**

*Dipsacus inermis* Wall.

*Morina longifolia* Wallich ex DC.

**CAPRIFOLIACEAE**

*Lonicera quinqueocularis* Hardw.

*Viburnum grandiflora* Wallich ex DC.

**ASTERACEAE**

*Achillea millefolium* Linn.

*Anaphalis margaritacea* (Linn.) Benth. and Hook.f.

*Anaphalis royleana* DC.

*Anthemis cotula* Linn.

*Artemisia absinthium* Linn.

*Artemisia maritima* Linn.

*Artemisia scoparea* Waldst & Kit.

*Aster falconeri* (C. B. Clarke) Hutch.

*Aster diplostephioides* C.B. Clarke.

*Aster thomsonii* C. B. Clarke.

*Chrysanthemum pyrethroides* (Karelin & Kir.) B. Fedtsch.

*Cichorium intybus* Linn.

*Cirsium arvense* (Linn.) Scop.

*Cirsium falconeri* (Hook.f.) Petrak.

*Cirsium wallichi* DC.

*Erigeron alpinus* Linn.

*Erigeron bonariensis* Linn.

*Erigeron canadensis* Linn.

*Inula royleana* C. B. Clarke.

*Jurinea dolomiaea* Boiss.

*Leontopodium himalayanum* DC.

*Leontopodium jacquetianum* Beauverd.

*Picris hieracioides* Linn.

*Saussurea costus* (Falc.) Lipsch.

*Senecio chrysanthemoides* DC.

*Solidago virga – aurea* Linn.

*Sonchus oleraceus* Linn.

*Tanacetum doliochophyllum* (Kitam.) Kitam.

*Taraxacum officinale* Weber.

*Tusilago farfara* Linn.

**JUGLANDACEAE**

*Juglans regia* Linn.

**BETULACEAE**

*Betula utilis* D. Don.

**SIMAROUBACEAE**

*Ailanthus altissima* (Miller) Swingle.

**PLATANACEAE**

*Platanus orientalis* Linn.

**MONOCOTYLEDONS**

**ORCHIDACEAE**

*Spiranthes sinensis* (Pers.) Ames.

**LILIACEAE**

*Colchicum luteum* Baker.

*Fritillaria imperialis* Linn.

*Gagea elegans* Wallich ex D. Don.

*Polygonatum multiflorum* (Linn.) All.

*Polygonatum verticillatum* (Linn.) All.

*Trillidium govanianum* (D. Don.) Kunth.

*Tulipa stellata* Hook. f.

**ARACEAE**

*Arisaema jacquemontii* Blume.

*Arisaema utile* Hook. f. ex Schott.

*Arisaema wallichianum* Hook. f.

**DIOSCOREACEAE**

*Dioscorea deltoidea* Wall. ex Kunth.

**IRIDACEAE**

*Iris ensata* Thunb.

*Iris kashmiriana* Baker.

*Iris kemaonensis* D. Don ex Royle.

**ALISMATACEAE**

*Sagittaria sagittifolia* Linn.

*Alisma lanceolatum* With.

**POTAMOGETONACEAE**

*Potamogeton natans* Linn.

**TYPHACEAE**

*Typha angustata* Bory & Chaub.

**SPARGANIACEAE**

*Sparganium ramosum* Huds.

**MENYANTHACEAE**

*Nymphoides peltatum* (Gmel.) Kuntz.

**CYPERACEAE**

*Carex fedia* Nees.

*Carex glomeratus* Linn.

*Carex nubigena* D. Don.

*Cyperus difformis* Linn.

*Scirpus lacustris* Linn.

**POACEAE**

*Calamagrostis pseudophragmites* (Hall.f.) Koel.

*Cynodon dactylon* (Linn.) Pers.

*Phleum alpinum* Linn.

*Phragmites australis* (Cav.) Trin. ex Steud.

*Poa angustata* Linn.

*Poa pratensis* Linn.

*Poa annua* Linn.

*Dactylis glomerata* Linn.

*Stipa sibirica* Linn.

*Vulpia myuros* (Linn.) G. C. Gmel.

**GYMNOSPERMS**

**PINACEAE**

*Abies pindrow* Royle.

*Cedrus deodara* (Roxb. ex D. Don) G. Don.

*Picea smithiana* (Wall.) Boiss.

*Pinus wallichiana* A. B. Jackson.

**CUPRESSACEAE**

*Cupressus sempervirens* Linn.

*Juniperus wallichiana* Hook.f. & Thoms. ex Brandis.

**TAXACEAE**

*Taxus wallichiana* (Zucc.) Pilger.

**PTERIDOPHYTES**

**PTERIDACEAE**

*Adiantum capillus-veneris* Linn.

*Adiantum pedatum* Linn.

*Dryopteris barbigera* (Moore) Ktze.

*Pteris cretica* Linn.

**ASPLENIACEAE**

*Asplenium adiantum-nigrum* Linn.

*Asplenium trichomanes* Linn.

*Ceterach officinale* (Willd.) Bedd.

**EQUISETACEAE**

*Equisetum arvense* Linn.

**MARSILEACEAE**



*Marsilea quadrifolia* Linn.

**SALVINIACEAE**

*Salvinia natans* Linn.

**CONCLUSIONS**

From the present study, it is clear that the Langate Forest Division has luxuriant plant wealth, forming sustenance basis of the people of the region. The proportion of angiosperms, gymnosperms and pteridophytes in the flora of the study area came out to be 89.87: 3.79: 6.32 on the basis of families, 92.66: 3.43: 3.92 for genera and 94.35: 2.32: 3.32 for species. Based on the number of species within families, Asteraceae was recorded to be the largest family with 30 species. Brassicaceae with 19 species occupies the second position, being followed by Ranunculaceae (18 species), Lamiaceae (17 species), Papilionaceae (12 species), Polygonaceae (12 species), Poaceae (10 species),

Boraginaceae and Apiaceae (9 species each), Scrophulariaceae (8 species), and Liliaceae, Caryophyllaceae and Salicaceae with 6 species each. On the other hand, *Polygonum* was the largest genus with six species, followed by *Rumex*, *Rosa*, *Nepeta*, *Epilobium*, *Geranium* and *Myosotis* with four species each.

The rich floristic diversity of the forest division is getting depleted and their populations considerably decreased either because of over-exploitation or loss of habitat. Thorough explorations and collection are immediate needs of the time to have a complete picture of the floristic diversity of the region. The inventory will form a baseline for further studies, providing information on families, genera, species as also on endemism, rare and threatened taxa. Based on utilization and degree of threat, a priority list of species to be conserved can be arrived at.

**Table 1. Statistical analysis of the vascular plants of Langate Forest Division (Data in parentheses indicate percentage contribution)**

<b>Plant Group</b>	<b>Families</b>	<b>Genera</b>	<b>Species</b>
Pteridophytes	05 (6.23)	08 (3.92)	10 (3.32)
Gymnosperms	03 (3.79)	07 (3.43)	07 (2.32)
Dicotyledons	59 (74.68)	162 (79.41)	248 (82.39)
Monocotyledons	12 (15.18)	27 (13.25)	36 (11.96)
<b>Total</b>	<b>79</b>	<b>204</b>	<b>301</b>

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