

THE VALLEY OF FLOWERS

VIRENDRA KUMAR

FOREWORD

The Valley of Flowers, an alpine meadow is located at an elevation of 3700 m in the great Himalayan range and is one of the most beautiful landscapes in the world with rich biological diversity. The Valley of Flowers has attracted many plant explorers, and mountaineers, right from the then British Army Officers to the outstanding nature lovers from all over the world. The valley harbors some 600 species belonging to 300 genera of flowering plants. Because of its unique landscape features and rich biodiversity, the Valley of Flowers is also one of the World Heritage Sites. It is ringed by ice covered peaks on its North-west flanks – the famous Trishul, Nanda Devi, Neelkantha & Chaukhamba. The Valley spreads over an area of 10.5 sq.km between the two river divides – the Dhaul Ganga on its north eastern flank and river Alaknanda on its western flank, and both the rivers join at Vishnu Prayag at 1370 m elevation. Geologically it has very interesting origin. The valley was carved out due to fast geophysical action of Pleistocene glaciers and filled with ice at one time. At the end of the glaciations, ensuing warming spell converted it into a lake which ultimately broke through on the narrow south-eastern end and carved a deep gorge through which the Bhyundar river moves out with its origin from north placed snout of Tipra glacier, originating from Ghori Prabat. Subsequently a unique community consisting of herbaceous flora has evolved with floristic elements drawn from the temperate-alpine areas of North America, Europe, Trans-Caucasia and Central Asia.

During the summer season flocks of sheep would cross over into the Valley for over nights stay and take shelter in small tents. The overnight stay of the flock. The droppings and the urination change the edaphic condition of the nearby soil, which creat conditions for the entry and the profanation of invasive of the plant species, like Polygonum and Impatiens species. Next day early morning hours the flock of sheep and the shepherds move to meadows located at the higher elevation in the north-west direction. The summers are spent in grazing the

grass, called 'bugg' and the meadow are called as 'buggyal'. The flocks returns on the onset of Autumn Season. Thus the valley also serves the economic benefit of the villages near by. *The grasses occurring in the alpine meadows are nutritious*

I am pleased to write the Foreword for this book "The Valley of Flowers" by Dr. Virender Kumar, a botanist and an outstanding naturalist who has explored the Himalayas and spent his entire life time looking at the floristic diversity in the Great Himalayan ranges particularly in the Valley of Flowers. His studies on flora in the Valley of Flowers has enabled him to bring out this valuable book. The book provides a comprehensive account of the Valley and its rich flora to the nature lovers. The book contains an introductory chapter that covers presentation of the initial discovery of the Valley to the western world, and presenting the geobotanical origin, its colonization and also what special features make it unique. Also discussed is the impact of the ensuing spell of global warming, what will possibly be the future of the Valley – a small note is made in the end. I am sure that the book will be useful to nature lovers, mountaineers, students, horticulturists, ecologists and tourists.

Prof. M.G.K. Menon, FRS

Most of flowering plants species are unpalatable, hence avoided by the sheeps. Primulas, Saxifragas, Epilobium etc. are a few examples

The Valley of Flowers

Dedication

Icy Pinnacles of the Himalaya, lush green meadows – ever-changing spectacle of colourful flowers – divine dancing in the wind. Rejoicing nature in the spring – frenzied rush of mating – birds singing in the woods.

Nature rejoices again – trees and shrubs enter festivities – bright colours of autumn leaves.

Frost bells the end of celebrations - a quiet descends – a white cover of snow is gently laid.

Spring arrives! Nature wakes up! Dancing and singing begins – dramatic cycle repeats – a cosmic phenomenon!

- V.K - 2012

The Valley of Flowers

THE VALLEY OF FLOWERS

Contents

1. The Discovery
2. Geo-botanical origin of the Valley
3. Ecological Succession and Plant colonization
4. Uniqueness of the Valley
5. Location
6. Approach
7. Faunal Diversity
 - a. Butterflies
 - b. Birds
 - c. Mammals
8. Future of the Valley
9. References

The Valley of Flowers

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I also thank the following persons for contributing a few pictures for the book: Shri Jagdish Chauhan of the Bhyundar village: picture nos. 65 & 173; Shri Ashok Dilwali, a keen and well-known photographer of Western Himalaya: picture no. 5 and Dr. Suresh Babu, University of Delhi: picture nos. 87 (a), 94 (a & b), 126 (a & b). These pictures added much to the value of this book. Rest of the pictures were taken by the author during early 1970's while conducting a research project on the 'Cytogenetic studies on High Altitude Himalayan Plants' under the Fundamental Research Scheme of the Indian National Science Academy (INSA), New Delhi.

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The Valley of Flowers

The Discovery

The discovery of the valley of flowers in Garhwal Himalaya in the year 1931 was incidental. A group of English mountaineers while returning from an expedition to Mt. Kamet (7770 m) crossed over the cold, rainy and mist covered Bhyundar Pass (5090 m), landed in a valley flushed with flowers. It was difficult for them to avoid stepping on a flower as the valley floor was a floral carpet, the blooms of *Primula denticulata* had emerged from the soil after spring melting of snow. The name "Valley of Flowers" was, spontaneous. The presence of such a valley in the Himalaya was an exciting discovery for the western world.

In the Survey of India maps the valley was marked as "Bhyundar Valley" and was known to many in India as "Nandankanan", meaning 'Garden of Flowers'. To the local residents of the Bhyundar village, the valley was an abode of Parvati Maa (divine mother Parvati). The local communities knew this as "Phoolon ki Ghati", which is same as 'Valley of Flowers'. It is pertinent to mention here about the sacred nature of the place which the villagers referred to as the domain of Goddess Parvati, the consort of Lord Shiva, who presides over the Himalaya, a land of purity and spirituality, an abode of Gods. According to the Indian mythology, among the Trinity of 'Brahma-Vishnu-Mahesh (*Shiva*)', Lord Shiva resides at Mt. Kailash in Tibet. The rhythmic changes of the vegetation, coinciding with the seasons, had influenced the sensibilities of the local folks; they sensed the purity and spirituality prevailing in the valley¹.

One of the mountaineers from the earlier expedition, Frank Smyth, revisited the valley in 1937 and a year later published the book titled "The Valley of Flowers". The valley became popular among

¹ The womenfolk of the nearby Bhyundar village used to visit the valley twice a year, during early spring and late autumn, to collect small quantities of wild herbs for culinary and medicinal purposes. This harvest followed great reverence for the valley and sustainable utilization of its offerings to the villagers. The women during their visits changed their cotton 'ghagras' (skirts) to the woollen ones (a woollen skirt was considered pure over the cotton one) and entered the valley bare feet as if a pilgrim entering a temple. For this traditional garment changeover this place came to be known as Ghaghria or Ghangria. This locality has since been renamed as Gobind Dham, after the establishment of a Sikh Gurudwara.

The Valley of Flowers

naturalists, botanists and sundry nature lovers. An improved access to this region by a network of roads starting from the early 1960's was instrumental to the increased flow of visitors/tourists, mainly from the Indian plains as well as other international countries. The local communities continued with their traditional lifestyle of grazing sheep and other livestock in a meadow located at an elevation of 4200 m. This alpine meadow locally called "Bugyal", a rich source of nutritious grasses ('bugg') is popular to the shepherds who frequent there with their sheep. Flocks numbering more than 1000 to 2000 sheep pass through the valley on way to the alpine meadow. The overnight halt of the flocks passing by resulted in the nutrient enrichment of the soil, this also enabled the entry of invasive weeds like *Persicaria wallichii* (previously known by names: *Polygonum polystachyum* & *Aconogonon polystachyum*) and others into the valley. Thus, the fame and popularity of the valley brought with it a culture of overexploitation of natural vegetation in the valley and its several other ecosystem services².

Geographically, the valley is in a transitional zone located on southern face of Zanskar range of the Great Himalaya. Across the Great Himalayan range lays the Tethys Himalaya, a rain-shadow area, abutting Tibet. The valley's location of Zanskar range is benefitted from the annual spell of monsoon, thus providing enough moisture to sustain the diversity of flora. Two major river valleys, Alaknanda on the northwest and Dhaulī on the northeast and, ice-clad ring of mountains surround the Valley of Flowers. The ring starts on the southeast from Mt. Trishul (7200 m), Nanda Ghunti (7407 m) a bell-shaped peak and Nanda Khat (7406 m), its top flat like a bed, all satellites of Nanda Devi Massif (8014 m) in the northeast. Shifting north-westwards are the Ghorī Parbat (6883 m) resembling a horse and, the Hathi Parbat (6727 m) that looks like the back of an elephant; the Rataban peak (6365 m) standing prominently behind Ghorī Parbat feeds the Tipra Glacier located on the north-eastern

² The author frequently visited the area in 1960's and 70's to study high altitude Himalayan flora. He brought it to the notice of then Prime Minister Mrs. Indira Gandhi in a meeting held at her residence in the month of July 1980 in the presence of the noted agriculture and environmental scientist, Dr. M.S. Swaminathan, who suggested that the valley be given protection as a National Park under the Wildlife Act of 1972, which was subsequently done. Later, the valley of flowers was made a part of the nearby Nanda Devi Biosphere Reserve. It has since been upgraded and listed as a World Heritage Site in 2004.

The Valley of Flowers

end of the Valley of Flowers - Bhyundar-Ganga river emerges out of the snout of this Glacier. Further north-westwards lies Nilgiri Parbat (6645 m), Mana Parbat (7272 m), Nar Narayana Parbat (± 3400 m), Satopant glacier system, which forms the origin of Alaknanda river – a major tributary of river Ganga. To the northwest is Mt. Neelkantha (6763 m) which stands behind the Badrinath Shrine (3753 m) a world famous pilgrimage centre of the Hindus. The idol of Lord Vishnu who presides over the region is installed in the Temple. The surrounding mountain peaks around the valley - one mountain range merges with the other. Lying further westwards, ends with massif of Chaukhamba (± 7000 m). The prominent Gangotri glacier descends on the western flank and terminates at Gomukh (± 3900 m), resembling the mouth of a Cow. It forms the snout, out of which river Bhagirathi emerges and descends down to Devprayag (± 830 m) in the lesser Himalaya and makes confluence with river Alaknanda. Henceforth, the river is known as Ganga, a sacred river of India.

Geo-botanical Origin of the Valley

Towards the end of Pleistocene Glaciation (c. 10,000 years ago), the rapid movement of large glaciers from the surroundings into the valley deepened it to a bowl-shaped valley. With the ensuing warm period, the ice melted rapidly and the valley floor turned into a large lake. With continuous inflow of ice melt, the water volume that could no longer be held eventually broke through the narrow outlet on the south-eastern end of the valley. The rapid passage of water from the Valley led to the formation of a deep gorge. The Bhyundar River which is fed by the Tipra Glacier flows out of the valley and confluences with the Alaknanda at Govindghat (1828 m) and further joins Dhauli Ganga at Vishnuprayag (1372 m).

Ecological Succession and Plant colonization

Once the water was fully drained out from the bowl-shaped valley, the exposed sediment and rock strata offered new opportunity for ecological succession, colonisation and speciation of varied life-forms. The receding glacier had left the valley floor strewn with large

The Valley of Flowers

and small boulders as well as the sediments and loose soil rich in minerals which were washed down from steep high slopes on the north-western flank. The established moraines left behind by the retreating glacier were also gradually colonized by flora. The seeds and fruits of different species of flowering plants were transported by various agencies like the avalanches falling into the valley, wind, birds and terrestrial animals.

It is viewed that the floristic elements which once existed and evolved during the inter-glacial warm periods were repeatedly pushed down to take refuge at the warmer lower elevations. At the end of the last ice age, the stratified flora at lower elevations started moving up and reoccupied the ice-free area at higher elevations. The valley floor which was mostly covered with glacial moraine deposits, mineral rich soils, rocks and boulders was gradually colonized by the plant succession on the exposed rocks and boulders by the crustose and other forms of lichens - the ecological pioneers. With the passage of time, it led to the gradual formation of a thin soil cover. The rock crevices were colonised by erect life-forms like grasses and sedges. There was hardly any exposed rock or boulder not carrying a crustose lichen.

The plant succession events continued with the entry of low lying shrubs like Junipers (*Juniperus communis* subsp. *alpina*) and Caraganas (*Caragana pygmea*), and *Rhododendron anthopogon* colonizing the moraine deposits close to the snout of the glacier. The nature of the valley floor ecosystem continued to remain in flux dictated by numerous natural causes, such as avalanches, glacier retreat, sharp fluctuations in temperature, strong wind action, etc. In that sense, climatic and edaphic fluxes created new grounds in the valley for succession events to continue. In the past, succession events had allowed herbaceous flora to gradually fill up the valley with numerous perennial herbs. The herbaceous vegetation possesses perennating underground propagules in the form of rhizomes, bulbs, corms, etc. The underground propagules develop vegetative and floral buds with mature pollen and ovules at the end of autumn season and remain covered with a snow cover. On the onset of spring, these reproductive

The Valley of Flowers

buds shoot out and produce flowers, which are rapidly pollinated- the unfurling of new leaves follows. The plant body including the developing young fruits and seeds utilize the food stored during the growth season of the preceding year. The seed formed in previous autumn upon germination develop a feeder leaf. Gradually, over the years of growth a vegetative shoot develops. Each year, the food produced is stored in developing storage organs such as rhizomes, corms, bulbs, etc., which then serve as vegetative propagules. Most of the high altitude herbaceous plants have to spend a number of years as juvenile vegetative individuals storing much of the photosynthate in their underground storage organs that enriches the vegetative propagules. After sufficient resources have been accumulated over a period of number of vegetative growth years, the plant enters into reproductive phase. Towards the end of the growth period by late autumn, the reproductive individuals set fruits which dehisce to release mature seeds. Simultaneously, the plants complete the development of reproductive and vegetative buds on the underground propagules for next year. These adaptive precisions at these higher elevations make the vegetation specialized to cope with the short growth periods of three to four months with a 'spring-autumn' growth cycle, preparing in advance for the next spring season.

In the temperate-alpine zone, such as Valley of Flowers, trees and shrubs like dwarf Rhododendrons, *Acer* spp. (Maples), *Betula utilis* (Birch or Bhojpatra), *Sorbus foliolosa* and others develop two kinds of buds on branches - one carrying the mature flower buds and other the vegetative buds; former for reproduction and latter for vegetative growth, forming new set of branches and leaves.

A few preliminary experiments were performed by the author with seed germination of a few plant species from the valley through research had indicated that the mature seeds have various degrees of dormancy. The seeds sprout with the onset of spring but not in the autumn even though the growth conditions are almost akin to spring. An early frost cover sets in the seed dormancy, which is broken during the end of cold winter season and enables the seeds to germinate readily when spring arrives. The seedling produces a

The Valley of Flowers

feeder leaf which starts developing an underground root-stock. After a few years of vegetative growth, the young plant starts bearing flowers.

The seasonal changes in spring, summer and autumn influence the appearance of vegetation in the Valley. The melting of the snow cover during early spring heralds the emergence of underneath grassy patches sprinkled with blossoms of *Primula* spp. that pop out of the grassy meadows. Soon afterwards, plant species which are taller than the previous ones rise to bloom. Early spring and summer bloomers include: *Anemone* spp., *Caltha palustris*, *Epilobium latifolium*, various species of butter cups (*Ranunculus* spp.), bloom along the snow melt water channels and marshy land made by the overflowing channels of stream; *Rheum moorcroftianum* and a number Primrose species (*Primula* spp.) start to rise up from the soil with flowers, as the snow cover gradually start receding.

The small trees and shrubs like *Rhododendron campanulatum*, *R. anthopogon*, *R. arboreum* and *Acer* spp., *Syringa emodii*, *Betula utilis*, bloom in early summer. The species which flower in late summer and autumn are: *Aconitum ferox*, a various colourful *Potentilla* spp., *Gentiana depressa*, *Saussurea gossipiphora* (c. 4000 m), *S. obvallata* (3500-4500 m), *S. simpsoniana* (4500 m), etc.

The flowering spell rise like a wave in early spring and subside with the onset of autumn. Thus the same patch of land gives rise to various flowering species during different time frames. This cyclical change is almost like the periodic changes made in the backdrop of the stage while enacting different scenes in a drama. It exemplifies harmonious co-existence of plant communities and other life-forms in the valley. Since the end of the last ice age and the beginning of the warm periods, this phenomenon is being repeated year after year. The local human communities have come to appreciate this natural dance and drama of life in the Valley and have moulded their belief systems in complete harmony with her nature. It would be sacrilegious to disturb this harmonious living. However, recent thrust on tourism development and other human activities might

The Valley of Flowers

have led or may lead to habitat disturbances/fragmentation/loss and entry of invasive weeds may gain the foothold.

Uniqueness of the Valley

The Himalaya start rising from Rishikesh (c. 370 m), and after covering a distance of nearly 300 km, enters the Great Himalayan ranges at Joshimath township – also called as Jyotirmath c. 2000 m. A winding road descends down to Vishnuprayag (1372 m), where river Alaknanda passing through a steep gorge in the north, makes confluence with Dhaul Ganga arriving from the northeast, a rain-shadow region in the Tethyan zone. Across a bridge at Vishnuprayag an ascending road leads to Govindghat (1828 m), a distance of c. 16 km. A steep climb of 13 km leads to Gobind Dham (Ghangaria, 3050 m). The path passes through the Bhyundar village (2575 m) wherefrom temperate zone vegetation begins. The valley and its adjacent alpine territories such as Hemkund, Ghangaria, Chopta and adjacent Gori Ganga valley harbours ± 300 genera with ± 600 species. The vegetation panorama of the valley passes through subtropical – temperate to cold-temperate – subalpine climates – Gobindghat (1828 m) to the Valley of Flowers core zone (3700 m) and Hemkund Shrine (4630 m). A wide range of floristic elements representing North America, Europe, Mediterranean, North Africa, North Iran, Balkans, Caucasia, Central Asia, Eastern Tibet, North Myanmar, China and Northeast Asia occurs in this zone. This generic diversity represents a pool of genetic wealth with different adaptive evolutionary histories. The significance lies in the fact that, though the Himalayan range is located at subtropical latitudes, the elevational gradient simulates the temperate-alpine-sub-arctic and circumpolar climatic zone akin to higher latitudes. While several floristic elements have come from different phytogeographic regions, this genetic assemblage has been exposed to new set of growth conditions. These include low atmospheric pressure, rarefied air, exposure to higher ultraviolet radiations, sharp fluctuations of diurnal temperatures ranging between 50°C during the day and 10°-15°C below freezing point at night. There exist contrasting humidity and precipitation scenarios that lead to habitat heterogeneity — the southern face of the Greater Himalaya

The Valley of Flowers

receives high rainfall and across the spine a rain shadow area exists with xeric habitats. This adds to the genetic uniqueness of the flora inhabiting the valley and the vegetation in each climatic zone has developed a set of new adaptive changes.

The Valley of Flowers (3400-3700 m) located in the Great Himalayan range, and within a short distance of 19 km from Govindghat, the panorama of vegetation passes through subtropical, warm temperate to cold-temperate and alpine climatic zones. The change from subtropical to temperate occurs between Bhyundar village located at an elevation around 2575 m. Prominent tree species from this elevational zone belong to moist-temperate mixed-deciduous forests, starting with: Oak (*Quercus* spp.), Walnut (*Juglans regia*), Hazelnut (*Corylus jaquemontia*), Poplar (*Populus* spp.), Alder (*Alnus nepalensis*), Elm (*Ulmus wallichiana*), Horse Chestnut (*Aesculus indica*), Hornbeams (*Carpinus viminea*), Himalayan Bird Cherry (*Prunus cornuta*), Willows (*Salix* spp.), Mulberry (*Morus serrata*), Maples (*Acer* spp.), *Rhododendron arboreum*, *R. campanulatum*, *Syringa emodi* (fragrant lilac), Barberry (*Berberis* spp.). Wild rose climbers (*Rosa macrophylla*) and a few conifers (*Pinus wallichiana*, *Pinus roxburghii*), Fir (*Abies pindrow*), Spruce (*Picea morinda*), Himalayan Yew (*Taxus wallichiana*) occur on the northern slopes. The timberline is marked by birches (*Betula* spp.) and conifers and low lying junipers and *Caragana* species are the woody species which end at an elevation about ± 3650 m.

Ecologically, the valley forms a closed ecosystem surrounded on three sides by high mountain peaks; the only exit point lies towards the south where from Bhyundar Ganga (river) exits passing through the gorge to meet Alaknanda river confluencing with it at Govindghat (1800 m). The landscape of the valley starts with a gradual rise in elevation from approximately 3040 m near Ghangaria forest. This fact possibly is the reason for the high concentration of temperate-alpine genera existing in the valley.

The Valley of Flowers

Location

The Valley of Flowers is located in Garhwal district of the Himalayan State of Uttarakhand in North India. It is bounded by river Yamuna in the west and Kali in the East. In north, it borders with Tibet and in south by the Gangetic Plains of India. The Valley and its environs constitute the primary watershed of sacred river Ganga. A large number of religious shrines are located in the region presided by Lord Vishnu at Sri Badrinath Dham (3753 m) and, Lord Shiva who presides over the Panch Kedars: Kedarnath (3553 m), Tungnath (3680 m), Rudranath (2286 m), Madmaheshwar (3497 m) and Kalpeshwar (2200 m). In addition to these pilgrimage centres, river confluences also have great religious significance: Devprayag (830 m), the confluence of Bhagirathi and Alaknanda rivers; Rudraprayag (895 m), the confluence of Mandakini and Alaknanda rivers; Karanprayag (1451 m), the confluence of Pindar and Alaknanda rivers; Nandaprayag (1358 m), the confluence of Nandakini and Alaknanda rivers and Vishnuprayag (1372 m), the confluence of Dhaulī Ganga and Alaknanda rivers.

Approach

A rail, road or air connectivity is available from New Delhi to Hardwar – Rishikesh (a township at the bank of the sacred river Ganga) which are at a distance of 300 km in the south located on the right bank of river Ganga. The hill journey begins from Rishikesh and passes through the 'prayags' (confluences) up to Joshimath (2000 m), a major township in the region of the Valley. From Joshimath, the winding road descends down to Vishnuprayag (1372 m) and across the bridge on river Alaknanda, the road passes through a steep gorge which gradually rises to Govindghat (1828 m). At this point Bhyundar-Ganga descends from the Valley of Flowers and makes confluence with river Alaknanda. A Sikh Gurudwara located here provides food and shelter to a number of visitors. Further journey of 13 km marks a steep trek along Bhyundar-Ganga up to Ghangaria (3049 m), which is completed either on foot or by hiring a mule/horse. In good weather conditions a helicopter service is also available. On the way to the Valley, at Bhyundar village (2575 m) after a trek of 9 km from Govindghat (1828 m) there are some

The Valley of Flowers

places for overnight food and shelter. Further high is a 5 km trek along moist-temperate-mixed-deciduous forests and reaches the base camp at Ghangaria. A Gurudwara provides free meals and shelter for pilgrims and visitors. A few low budget hotels and government accommodation are available for visitors/pilgrims.

After a further trek of 3 km starts the core zone of Valley of Flowers. From Ghangaria a trek of another 5 km leads to Gurudwara Hemkunt Saheb at 4532 m elevation, where an ancient Hindu temple, Lokpal and a Sikh Shrine Hemkund Sahib exist. Both treks to the Valley and to Hemkund provide a good view of temperate-alpine flora. A beautiful glacial lake, with the back drop of seven icy peaks (Saptashring, 5030 m), provides an ethereal view. The timberline stays back above Ghangaria at around 3630 m.

FAUNAL DIVERSITY

The craggy heights of the Valley of flowers, its adjacent Ghangaria forests and adjoining Nanda Devi biosphere reserve houses beautiful butterflies, birds and four-legged mammals - herbivores and carnivores.

Butterflies - About 80 species of butterflies are known from Nanda Devi Biosphere Reserve (Arora *et al.* 1995). The important species of the core and buffer zones are: Dark clouded Yellow (*Calias electofieldii*), Painted Lady (*Cynthia cardui*), Indian Tortoiseshell (*Aglais cashmirensis*), Indian Fritillary (*Argyreus*), Queen of Spain Fritillary (*Issoria lathonia*), Comma (*Polygonia album*), Common Sailer (*Neptis hylas varmona*), Himalayan Sailer (*Neptis mahendra*), Chocolate Soldier (*Precis iphita iphita*), Blue Admiral (*Kaniska canace*), Large Silverstripe (*Childrena childreni*), Common Tiger (*Danaus genutia*) and Plain Tiger (*Danaus chrysippus*).

Birds - The avifaunal composition in the Valley of Flowers accounts for about 114 species (Arora *et. al.*, 1995). The pheasants, the partridges and the quails are well-known birds of this area. The important Galliformes of the core zone are: the Himalayan Monal (*Lophophora*

The Valley of Flowers

impejanus), the Monal Pheasant a state bird, the Snow Pigeons, the Koklas Pheasant (*Pucrasia macroplopha*), the Snow Partridge (*Lerwa lerwa*), the Himalayan Snowcock (*Tetraogallus himalayensis*) and the Chukar Partridge. Among the Falconiformes, the most common are: the Himalayan Golden Eagle (*Aquila chrysaetos*), the Himalayan Griffon (*Gyps himalayensis*) and the Lammergeier (*Gypaetus barbatus*). The abundant species of the valley are: the Crested Black Tit (*Parus melanolophus*), the Yellow-bellied Fantail Flycatcher (*Rhipidura hypoxantha*), the Orange-flanked Bush Robin (*Erithacus cyanurus*), the Bluefronted Redstart (*Phoenicurus frontalis*), the Indian Tree Pipit (*Anthus hodgsoni*), the Vinaceous Breasted Pipit (*A. roseatus*), the Common Rosefinch (*Carpodacus erythrinus*) and Nutcracker (*Nucifraga caryocatactes*). Avifaunal species richness is at its highest in the temperate zone and, a significant decline in richness is seen with an increase in altitude. The Himalayan Monal, Himalayan Snowcock, Himalayan Golden Eagle and Himalayan Griffon are considered the threatened bird species of the valley.

Mammals – The mammalian fauna of the valley consists about 13 species (Tek & Lamba, 1985), which includes, commonly spotted and sparsely populated species like the Himalayan Musk-deer (*Moschus chysogaster*), the Mainland Srew (*Capricornus sumatrensis*), and the Himalayan Tahr (*Hemitragus jemlahicu*); the rarely sighted species at higher altitudes are the Bharal (*Pseudois nayur*) and the Snow Leopard (*Panthera uncial*); and, the Goral (*Naemorhaedus goral*), not present in the core zone, are seen in huge populations in the buffer zone and often near human settlements. Large carnivores like the Black Bear (*Selenarctos thibetanus*) and the Common Leopard (*Panthea pardus*) often invade agricultural fields and settlements in the buffer zone; the Brown Bear (*Ursus arctos*) is another large carnivore; the Red Fox (*Vulpes vulpes*) a small carnivore is relatively common. Among the primates the Hanuman Langur (*Semnopithecus entellus*) and the Rhesus Macaque (*Macaca mullata*) are very common especially in the buffer zone. The Himalayan Hamster is a very common species in the temperate forests of Ghangaria. The Blue Sheep, Himalayan Tahr, Musk Deer, Serow, Snow Leopard, Common Leopard and Red Fox are considered 'threatened species' of the valley.

The Valley of Flowers

FUTURE OF THE VALLEY OF FLOWERS

The end of Pleistocene glaciations c. 15,000 years B.P. marked the beginning of the Quaternary epoch of the Cenozoic era starting at the post-glacial warming periods in the northern hemisphere. It helped in the gradual plant colonization in the ice-free high altitude regions of the Himalaya. The early colonizers were mainly the herbaceous floristic elements, followed by the woody elements of the moist temperate mixed deciduous elements.

A minor hiccup during the recent spell of little ice age beginning by the 13th – 14th century A.D. extending up to the 19th century A.D., with a drop in temperature of 1°-2° C had wide ranging repercussions on the geophysical changes and the biological speciation of the valley. It is visualized that northward movements had temporarily stalled, with glaciers swelling again and moving down into the valley. But, the spell of warming which began in the 20th century resulted in the retreat of glaciers and initiated the northward march of the floristic elements.

The forerunners of a few woody elements have already entered the valley. These are represented by *Juniperus communis*, *Caragana* spp., large shrubs such as *Rhododendron campanulatum*, *Sorbus foliolosa* and low lying shrubs like *Rhododendron anthopogon* (Dhoop), *R. lepidotum* and *Cotoneaster duthianum*.

At present the timberline constituted by moist temperate mixed deciduous forest stands at 3650 m. The prominent advance guard tree species are *Abies pindrow* (fir), *Picea smithiana* (spruce), *Pinus wallichiana* (blue pine), *Betula utilis* (birch), *Acer acuminatum* (maple) and, few other tree and shrub species.

Keeping in view the phenomenon of the global warming, the woodland stage is likely to invade the core zone of the valley at a faster pace and change the face of the valley – the herbaceous floristic elements would migrate further northward and occupy the meadows located at higher elevations – faster!

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(India)

The Valley of Flowers

References

Arora, G.S., A. Kumar and P.C. Tak. (1995). *Fauna of Nanda Devi Biosphere Reserve, a World Heritage Site*. Zoological Survey of India, Northern Regional Station, Dehra Dun. 175 pages.

Wadhwa, B.M., R.R. Rao and P.K. Hajra. (1987). Botany of the Valley of Flowers National Park and its Environs. *Bulletin of the Botanical Survey of India*. Vol. 29(1-4): 129-175.

Tek, P.C. and B.S. Lamba (1985). Nanda Devi National Park: a contribution to its mammalogy. *Indian Journal of Forestry*. Vol. 8(1-4): 229-220.

Coventry, B.O. (1923-30). *Wild Flowers of Kashmir*. Vol. 3 Raithby, Lawrence & Co., Ltd., London.

Frank S. Smythe (1938). *The Valley of Flowers*
Hodder and Stoughton Ltd., London.

The Valley of Flowers

THE VALLEY OF FLOWERS

The probable origin of Valley of flowers :

It is a drained glacial lake at the end of the Ice Age around 15,000-20,000 years ago; presently it is a stabilized moraine deposits. The altitude of the valley varies from 3,500-3735 m. Its placement is from south-west to north-east. The length of the valley is around 5 kms. to the edge and a nearly 1.5 kms.

The Tipra Glacier is fed by Rataban and Ghori Parbat. A river emerges from the glacier and north-east and makes a deep gorge on the southern end. Thus, the valley lies at the lap of the Great Himalayan peaks. This makes it unique in harbouring temperate - subalpine flora immense diversity, In terms of the representation of the plant genera representing North America, alpine and Caucasian mountains, Central Asia, Tibet, China, Myanmar, Japan and West America

Himalayan range. It is on three sides, it is surrounded by peaks with permanent snow capes. Starting from south-east the major peaks are - Trishul Mt. and towards eastern side - Nandakini, Nanda Khat, Nanda Kot and Nanda Devi and further north-west wards - Ghori Parbat, Hathi Parbat, Rataban, Nilgiri Mt. Nar-Narayan, Mana Parbat, Neelkanth, and Chokhamba Parbat.

1. **Trishul:** a view from Rudranath, partly covered with clouds.



Trishul

The Valley of Flowers

2. Sunrise on Trishul

A view of the valley from the base of the Trishul glacier, the Gohri Parbat rises. Beyond other mountains from the glacier. A view from Auli 3000 m.

View from Auli - 3000 m above Joshimath Township



3. Nanda Devi - Aerial view (Panaromic view by Air): showing Mt. Nanda Devi and Mt. Gohri Parbat (left to right).

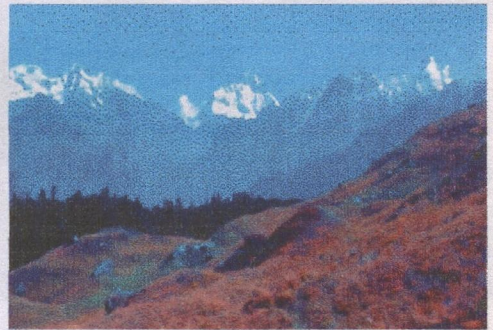
A view of the valley from the base of the Trishul glacier, Mt. Nanda Devi and Mt. Gohri Parbat are visible.

A view from valley of flowers

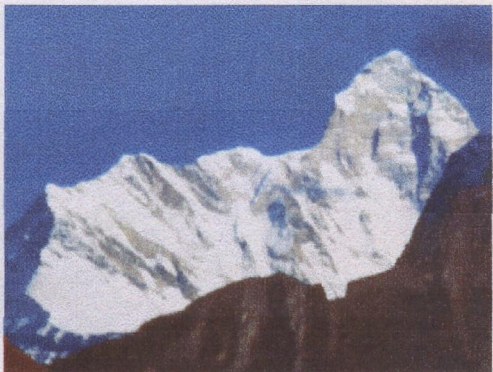


Nanda Devi

4. Nanda Devi, view from Auli Bugyal



5. Nanda Devi - (Nanda Devi and other icy peaks): North-westwards - A view from Auli a high point, above the township of Joshimath.



Nanda Devi

The Valley of Flowers

6. **Ghori Parbat** : The Valley view : at the far end of the valley above the Tipra glacier, the Gohri Parbat rises. Bhyundar river originates from the glacier. A view from Auli 3000 m.

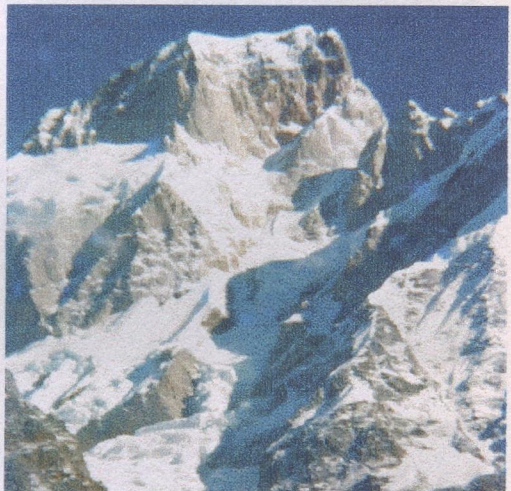
View from Auli - 3000 m above Joshimath Township



Ghori Parbat

7. **Ghori Parbat glacier** descending to feed Tipra glacier. Mt. Rataban in the back ground.

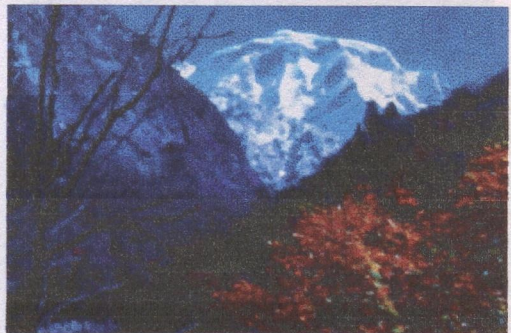
A View from Valley of Flower from - 3000 m



Ghori Parbat glacier

8. **Hathi Parbat**: south-east of the Valley.

A View from bear Bhyundar Village.



Hathi Parbat

The Valley of Flowers

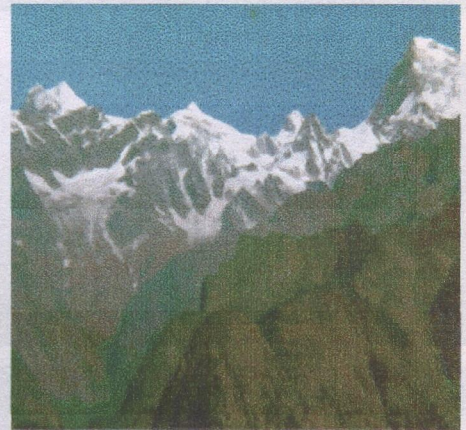
9. Mt. Rataban: In the background of the glacier.

Valley of Flowers in the foreground

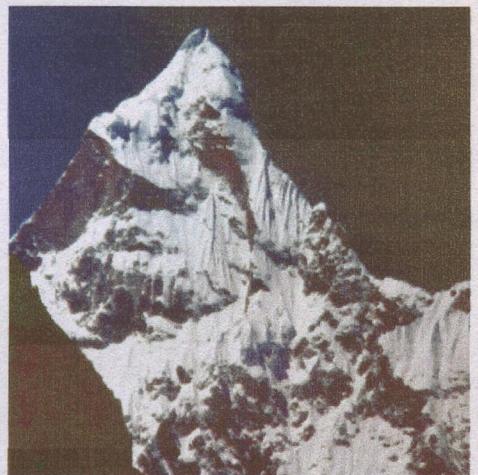


Mt. Rataban

10. Ice Fall – The Hanging Glacier - Northwest



11. Mount Neelkanth - at the back of Sri Badrinath Temple

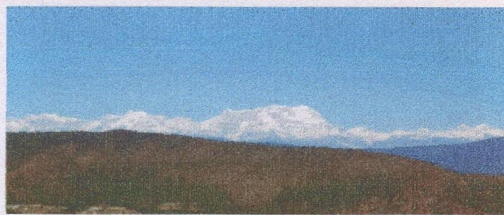


Neelkanth

The Valley of Flowets

12. Mt. Choukhamba- Divide Northeastwards - it feeds Alaknanda head waters and Satopanth glacier on the right flank.

Gangotri glacier on the left flank.



Mt. Choukhamba

W 12a. Aerial view of West Chakhamba - feeding Gangotri glacier - head waters of river Bhagirathi.



13. Glacier descending from Chaukhamba.

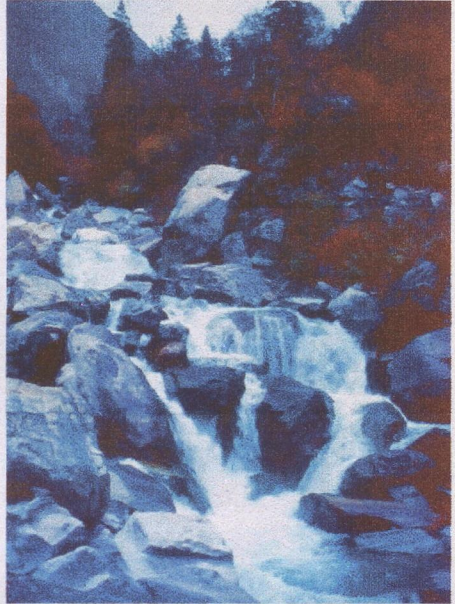


14. Meadows above Ghangaria during August.



The Valley of Flowers

15. **Bhyundar River** originating from the Tipra glacier, passes through the valley and makes confluence with Alaknanda river at Govind Ghat.



Bhyundar River

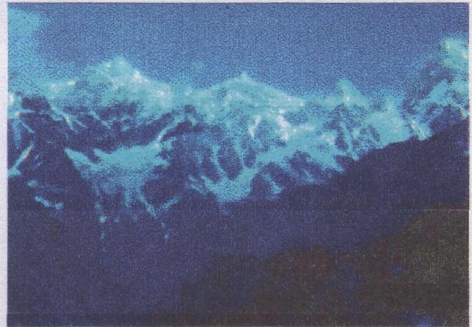
15a. Laspa River

Laspa river emerging out of Laspa valley. The river is fed by Laspa and other glaciers lying at the foot of Bankatiya peak (5,693 m). It is a tributary of Gori Ganga river.



Laspa River

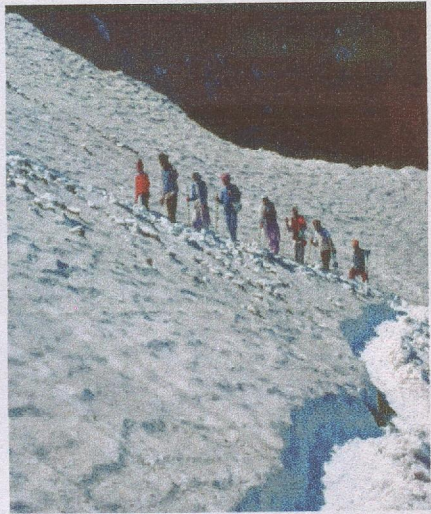
16. **Rampart of the Valley of Flowers.**



Rampart of the Valley of Flowers.

The Valley of Flowers

17. An **Avalanche** on the right bank of Bhyundar River - enroute to Valley of Flowers.



An Avalanche

18. **Snow bridge** across Bhyundar river. It is located near the entry to Valley of Flowers.



19. **Auli-Joshimath:** a view from Auli. ; Alaknanda river valley on the left and Dauli Ganga on the right.



The Valley of Flowers

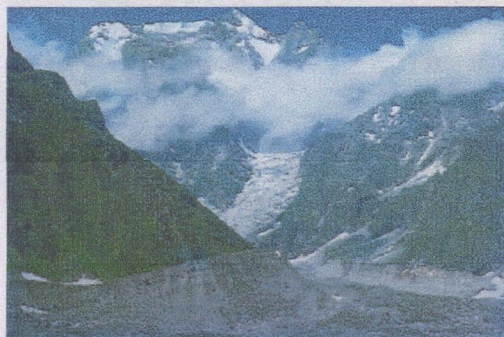
20. Ice Fall on left flank, Valley of Flowers in early spring.



21. The valley of Flowers in spring.



22. Tipra Glacier at the far end of the valley.



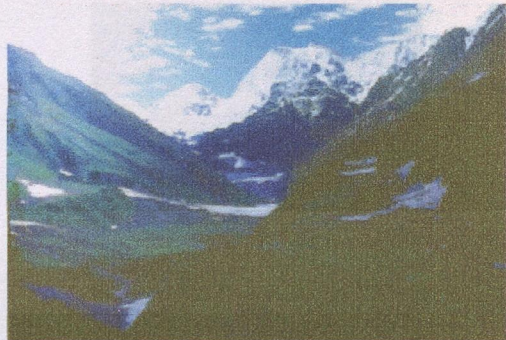
23. Valley of Flowers



The Valley of Flowers

24. Valley of Flowers

A view from Southern end

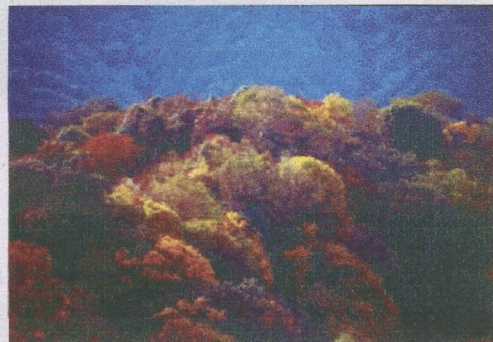


25. The Valley of Flowers - Western slope - gully formation - elevation ~ 4000m



26. On way to the Valley of Flowers in Spring

Trees in flush - new leaves and flowers



27. Valley of Flower

July

Spring Time

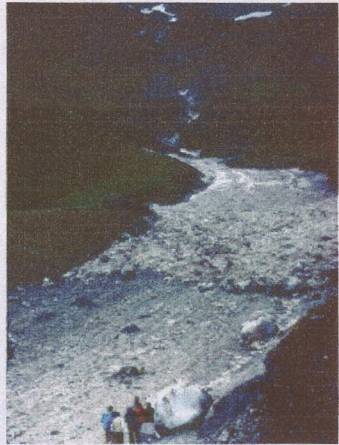
Anemone sps. rising *en-masse*



The Valley of Flowers

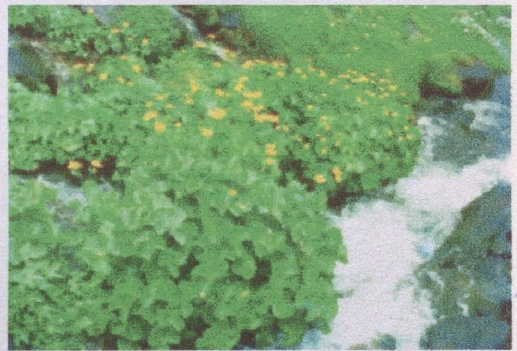
28. Tipra Glacier in retreat at the end of winter season leaving stony rubble behind.

A retreating Glacier leaves a mass of terminal moraine.



29. *Caltha palustris* L.
(Ranunculaceae)

'Marsh Marigold'; early spring (May - August); Greek: 'Kalathos' - a cup; 'Paluster' - in marshy area; root poisonous; grows gregariously along streams formed by snowmelt; Widely distributed; temperate - cold-temperate regions of Northern hemisphere (North America, Europe and the Sino-Himalaya).



30. *Rheum moorcroftianum* Royle (Polygonaceae)

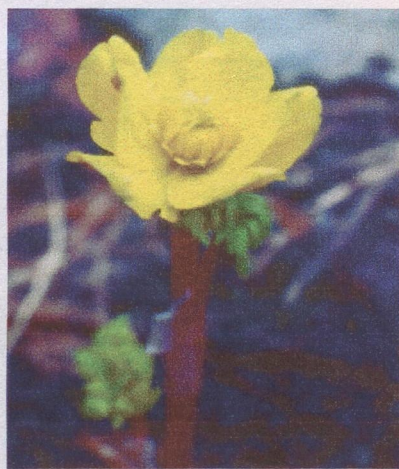


The Valley of Flowers

'Rhubarb'; early spring as the snow cover recedes (July - August); The underground root stocks, sprout into a red coloured young leaf rich in carotene constituting the chlorophyll pigments; when fully open turns green; occurs close to timberline among boulders; temperate - cold-temperate zone.

31. *Trollius acaulis* Lindl. (Ranunculaceae)

'Dwarf Globe Flower'; early spring - emerges out as soon as the snowmelt at the end of winter (May-June); Scandinavian: 'Troll' means 'a witch'; Hemkund lake; on damp meadows in the valley above timberline slopes (4100 m); cold-temperate - alpine Himalaya.



32. *Primula denticulata* Sm. (Primulaceae)

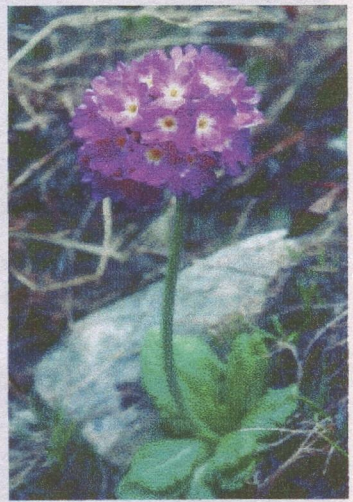


The Valley of Flowers

'Drumstick Primrose or Himalayan Primrose'; appearing in early spring as soon as the winter snow cover melts; the flower pops out with leaves following (March - June); Latin: 'Primers' means 'first', referring to its early flowering; on open rock faces in forest clearings or damp meadows; Garhwal-Kumaon Himalaya; temperate and cold-temperate zones.

33. *Primula macrophylla* D. Don (Primulaceae)

'Large Leaf Primrose'; June-August; along glacial stream or on open grassy slopes and rock crevices in wet boulders; valley meadows in the core zone and above timberline near Hemkund lake; temperate - cold-temperate - alpine zones of the Sino-Himalaya.



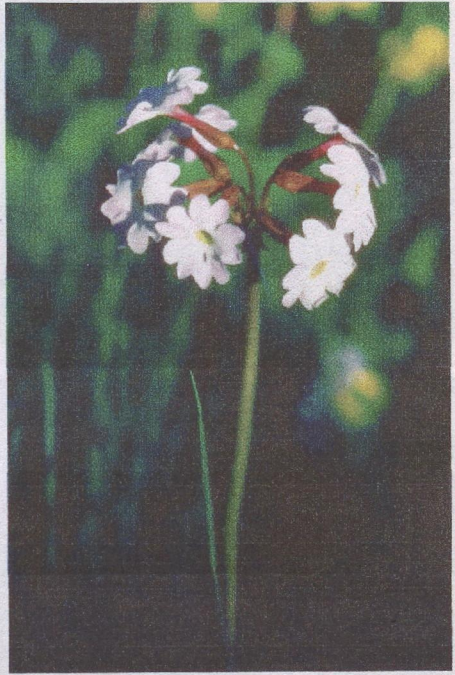
34. *Primula edgeworthii* Pax (Primulaceae)

Among boulders; emerges out as the snow cover melts; cold-temperate; sub-alpine.



The Valley of Flowers

35. *Primula involucrata* Wall. ex Duby (Primulaceae)



An early flowering species; 'Primrose' along snowmelt channels; distributed in Arctic, North America, Europe, East world Himalaya, China, and Northeast Asia; cold-temperate distribution.

36. *Primula reidii* Duthie (Primulaceae)

'Primrose' on open rock faces above timberline; cold-temperate, sub-alpine.

region

2



The Valley of Flowers

37. *Primula siphonantha* W.W. Sm.
(Primulaceae)

'Primrose'; large concentration of species in the sub-alpine cold-temperate zone; introduced in the Gardens of Europe and United Kingdom.



38. *Primula stuartii* Wall.
(Primulaceae)

'Open rocky ground cold-temperate zone'; Afghanistan Eastward into the Himalayan range.



39. *Viburnum grandiflorum* Wall. ex DC. (Adoxaceae)

'Himalayan Viburnum'; a deciduous shrub unfurling its fragrant flowers and, leaf buds in early spring (March); Latin name 'wayfaring'; common in woods; temperate - cold-temperate Himalaya.



The Valley of Flowers

40. *Epilobium latifolium* L. (Onagraceae)

'Dwarf Fireweed or River Beauty Willowherb'; July-August; Greek: 'epe' - upon; 'labos' - a pod position of corolla inserted on long inferior ovary; grows gregariously along icy streams; snowmelt-flooded gravelly areas along rivers, margins of streams and damp slopes; common in temperate regions of North America, Europe, Central & Southwest Asia especially temperate Himalaya; withstands frost.

Temperate zone; along icy streams in the valley.



41. *Bergenia ciliata* (Haw.) Sternb. (Saxifragaceae)

'Frisly Bergenia, Hairy Bergenia or Winter Begonia'; March-July; on wet rocks especially in open crevices; temperate Himalaya.



The Valley of Flowers

42. *Leontopodium jacotianum* Beauverd (Asteraceae)

'Edelweiss, Lion's foot, glacier star, Silver star'; July-August; German: 'edel' means 'noble' and 'weiss' means 'white'. Greek: *Leontopodium* means, 'a lion's foot' - referring to the shape of its downy flower; among rocks in open alpine meadows; Sino-Himalayan temperate zone; also Europe - North America.



43. A view of mixed deciduous forest; early Spring.



On way to Chopta, Central Himalaya, temperate zone; Red-flowered trees are *Rhododendron* along with evergreen Oaks and Conifers.

The Valley of Flowers

44. *Rhododendron arboreum* Sm. and other subspecies, varieties & forms (Ericaceae)

'Tree Rhododendron or [Scarlet rhododendron]; early spring; (scarlet-)red flowers - heralds the dawn of Spring; forests, thickets, slopes; widely distributed on way to the Valley from Bhyundar village onwards temperate - cold-temperate Himalaya; tree Rhododendron is the state tree of Uttarakhand; honey in flowers causes mad-honey poisoning and lowers blood pressure; very popular garden plants in U.K., Europe and America.



The Valley of Flowers

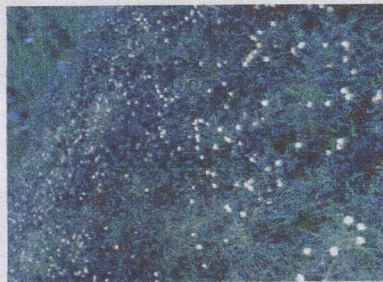
45. *Rhododendron lepidotum* Wall. ex G. Don (Ericaceae)

'Pink Scaly Rhododendron'; June-July; Greek word 'Lepis' - glands on a scale; grassy slopes, rocks; Valley of Flowers; Sino-Himalaya; Western-Central Himalaya, Cold-Temperate zone.



46. *Rhododendron anthopogon* D. Don (Ericaceae)

'Dwarf Rhododendron'; April - June; in glacial valleys, open slopes, hillsides, cliff ledges; distributed in Sino-Himalaya; aromatic leaves mixed with *Juniperus communis* L. sub sp. alpina (Suter) Celak and used as incense in Hindu religious ceremonies as well as Buddhist monasteries; also used in preparation of tea for cold related ailments; cold-temperate - sub-alpine regions; colonizing moraines near glaciers.



The Valley of Flowers

**47. *Rhododendron barbatum* Wall.
ex G. Don (Ericaceae)**

Shrubs – small trees; May – June; Rhododendron thickets; Sino-Himalaya; cold-temperate distribution.



48. *Rhododendron campanulatum* D. Don (Ericaceae)

'Bell Rhododendron'; April-June; forest thickets, stony alpine slopes and ledges; above timberline; distributed in the cold-temperate and sub-alpine Himalayan zone.



491. *Polygonatum verticillatum* (L.) Ali. (Asparagaceae)

Whorled Solemon's seal; May – July; way to valley of flowers 2750 m Sino-Himalaya; temperate zone.

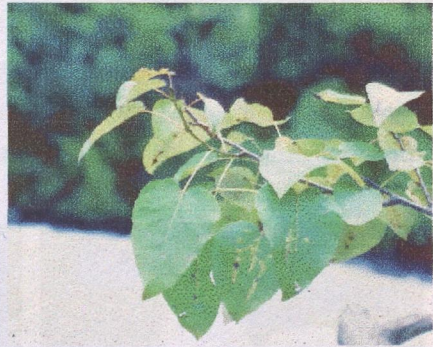


The Valley of Flowers

**50. *Populus ciliata* Wall. ex Royle
(Salicaceae)**

Deciduous tree Native to India and Pakistan. Sino Himalayas upto Myanmar Cold-temperate zone.

'Himalayan Poplar'; August - temperate zone.



**51. *Swertia cuneata* Wall. ex D. Don
(Gentianaceae)**

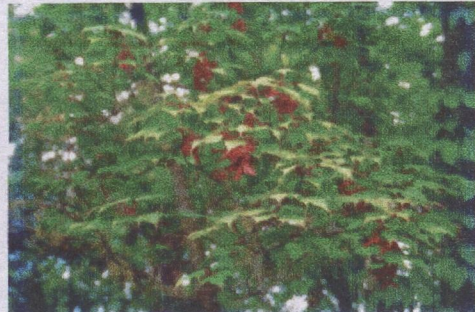
Sino Himalayan Perennial herb - Alpine meadows

August - October;



52. *Acer acuminatum* Wall. ex D. Don (Sapindaceae)

'Tapering Leaf Maple'; early flowering March-April; mixed forests; a graceful middle size tree in fruits on way to Valley of Flowers; distributed throughout the entire Himalayan temperate - cold-temperate zone; makes timberline.



The Valley of Flowers

53. *Anemone rivularis* Buch.- Ham. ex DC. (Ranunculaceae)

'River Anemone, River Windflower'; May - August; populations on way to the valley; on forest margins, along grassy slopes and streamsides; temperate regions; the most interesting part of the plant is its unusual blue anthers.



54. *Anemone rupicola* Cambess. (Ranunculaceae):

'Anemony'; June - August; on open rock faces, stream-sides, stone-cliffs, gravelly-slopes; cold-temperate regions above timberline.



The Valley of Flowers

55. *Anemone demissa* Hook.f. & Thomson (Ranunculaceae):

Anemony; 'wind flower'; population dominates the core zone of the Valley at its peak of flowering season June-July; Greek: 'Anemos' means 'wind'; in meadows, forests, scrub, grassy slopes, stream sides; cold-temperate Himalaya; the core of the flower has a bluish tinge.



56. *Anemone obtusiloba* D. Don (Ranunculaceae):

'Blue Himalayan Anemone or Himalayan Thimbleweed'; May - July; commonest of 'Anemones'; bluish pink flowers; colour variation blue to white.; small population scattered in the core zone of the valley, commonly found in forest margins, shrubberies, open slopes, cold-temperate meadows, grazing grounds and grassy slopes; temperate / cold-temperate zone; roots and seeds possess medicinal properties; seed if taken orally causes vomiting; extracted oil used in rheumatism; plant yield toxic substance.



The Valley of Flowers

57. *Anemone tetrasepala* Royle
(Ranunculaceae):

'Four petal Anemone'; meadows
in the valley spring-summer;
temperate - cold-temperate
regions of Sino-Himalaya.



58. *Anemone narcissiflora* L. subsp.
fasciculata (L.) (Ranunculaceae)

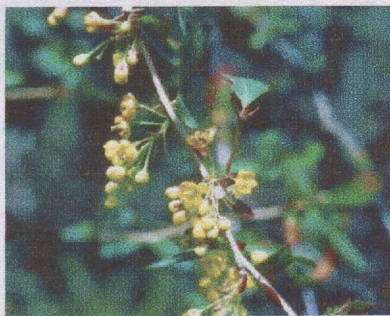
Valley of flowers

Ziman 8c Fedor in meadows and
grassy slopes.



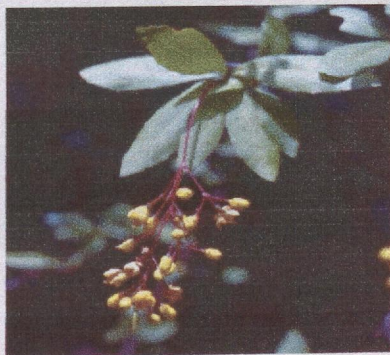
59. *Berberis aristata* DC.
(Berberidaceae)

'Barbery or Indian Berbery or
Tree turmeric'; a spiny shrub,
flowers early spring; March -
April; temperate zone, Garhwal-
Himalaya; used as hedge plant in
temperate countries.



60. *Berberis jaeschkeana* C.K.
Schneid. (Berberidaceae):

Berberis - 'Barberry'; flowering
early spring; temperate zone,
western Himalaya; used as hedge
plant in temperate countries.



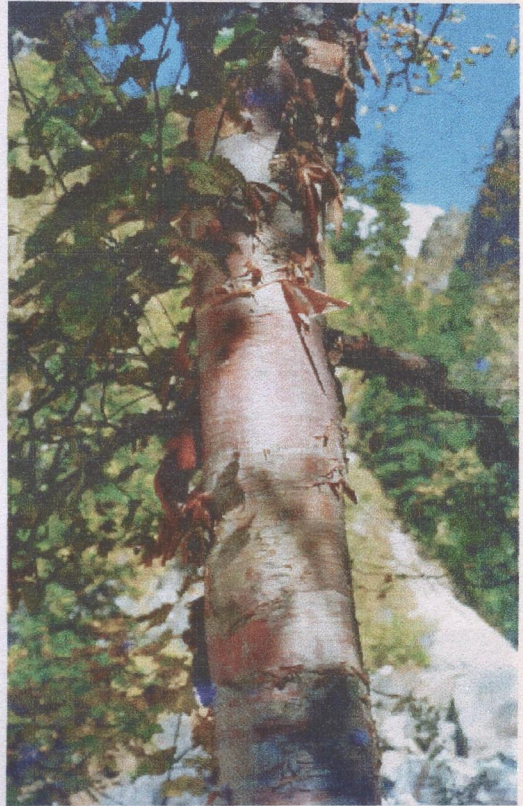
The Valley of Flowers

61. *Betula utilis* D. Don
(Betulaceae):

'Birch Tree' in summer season;
The 'Bhoj Patra' forest on the way
to the Valley of Flowers; paper
thin bark was used for writing
purposes; old scriptures were
written on Bhoj Patra; temperate -
cold-temperate, wide distribution
in the Himalaya.



Birches in Autumn season



Birches in Spring season

The Valley of Flowers

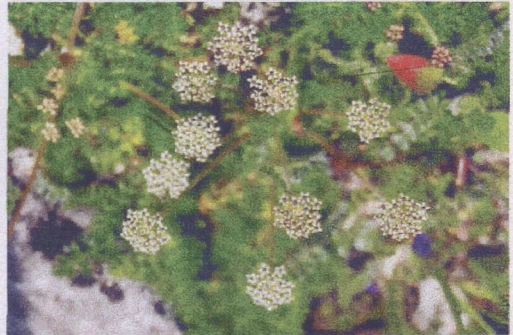
**62. Piptanthus nepalensis (Hook.)
D. Don (Fabaceae)**

Forest, shrubberies; March – May;
temperate zone



**63. Pleurospermum candollei
(Apiaceae)**

Common in the core zone of the
valley; cold-temperate zone.



**64. Jurinea dolomiaea Boiss. (Asteraceae)
(Syn. *Jurinea macrocephala* Benth. ex Hook.f.)**

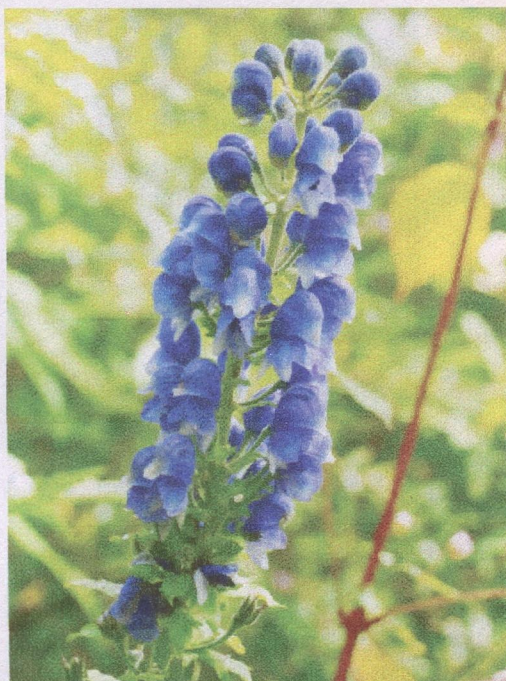
Temperate – cold-temperate; used
in medicine.



The Valley of Flowers

65. *Aconitum balfourii* Stapf.
(Ranunculaceae):

The genus *Aconitum* is known as 'aconite, monkshood, wolfsbane, leopard's bane, women's bane, Devil's helmet or blue rocket'; 'Himalayan spurred Monkshood. "Acone"; appears in meadow during late spring - summer; VISH - a poisonous plant; a related species yield a drug 'aconitine' for heart ailments; cough syrups; an abundance of aconite of great medicinal value.



66. *Aconitum ferox* Wall. ex Ser.
(Ranunculaceae)

Himalayan monkshood, Monk's hood, Indian aconite.

They are distinguished by having one of the five petaloid sepals (the posterior one), called the galea, in the form of a cylindrical helmet; hence the English name monkshood.

Aconitum ferox supply the Indian (Nepal) poison called bikh, bish, or nabee. It contains large quantities of the alkaloid pseudaconitine, which is deadly poisonous.



The Valley of Flowers

**67. *Arenaria glanduligera* Edgew.
(Caryophyllaceae):**

A colonizer of bare areas, In meadows; compact bushy form occurring on rocks; light sandy soil in rain shadow area; Sino-Himalaya; cold-temperate zone.



**68. *Gaultheria nummularioides* D.
Don (Ericaceae):**

July – October; on rocks, rarely epiphytic on trees; c. 3400 m.; Sino-Himalaya to Southeast Asia.



69. *Gaultheria trichophylla* Royle (Ericaceae)

'Himalayan Snowberry, Creeping Snowberry or Snowberry'; on alpine slopes, montane grasslands, rocky places; cold-temperate – sub-alpine zone; Himalayan Snowberry is striking for its beautiful blue berries; fruits in autumn.



The Valley of Flowers

70. *Gaultheria trichophylla* Royle
(Ericaceae)

Growing around a rock piece.



71. *Anaphalis royleana* DC.
(Asteraceae):

'Everlastings'; July-September; grows amongst boulders, glaciers and open meadows; temperate, cold-temperate and alpine Himalayas. The beautiful flowers have greenish yellow central disk and papery white petals.



72. *Androsace delavayi* Franch.
(Primulaceae):

Honey comb like cluster of flowers; in rock crevices, gravelly slopes, dry meadows; cold-temperate Himalayas.



73. *Androsace sarmentosa* Wall.
(Primulaceae):

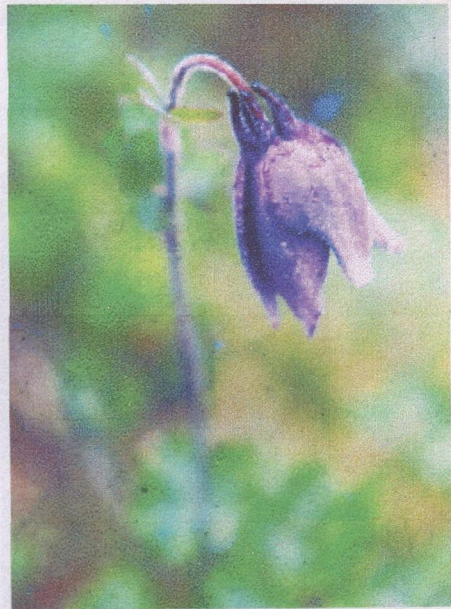
'Common / Primrose Rock Jasmine'; June-August; cold-temperate Himalayas: the cluster of flowers emerge soon after the snowmelt; cold-temperate zone.



The Valley of Flowers

74. *Aquilegia columbiana* Rydb.
(Ranunculaceae)

Latin: 'colalba' origin; inverted flower resembling nest of doves; 'Aquila' referring to the spurs of the flower - resemble claws of eagle; name given by ancient Greeks; in the meadows; temperate - cold-temperate zone.



75. *Aquilegia pubiflora* Wall.
(Ranunculaceae)

Columbine; meadows in the valley; temperate - cold-temperate.



76. *Arisaema flavum* (Forssk.)
Schott (Araceae):

'Yellow Cobra Lily'; 'Arum' en route to the Valley of Flowers; among rocks; warm temperate zone.

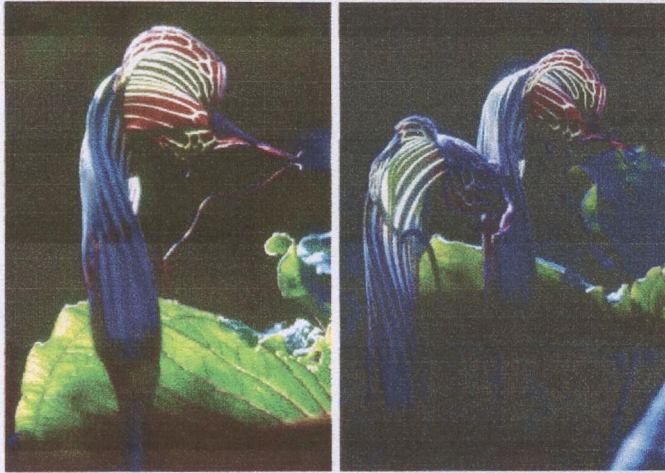


The Valley of Flowers

77. *Arisaema propinquum* Schott (Araceae)

(Syn. = *A. wallichianum* Hook.f.)

Spathe, purple coloured with white veins; mimicking the snake's hood; in populations in meadows; Temperate Zone.



78. *Aster diplostephioides* (DC.)
Benth. ex C.B. Clarke (Asteraceae):

'Creeping Aster'; Greek: 'aster' – a star; meadows; temperate – cold-temperate zone.



79. *Aster falconerii* Hutch.
(Asteraceae):

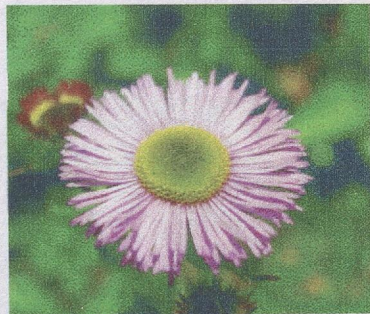
'Aster'; meadows; June-July; temperate – cold-temperate Zone.



The Valley of Flowers

**80. *Aster flaccidus* Bunge
(Asteraceae)**

In the core zone of the valley.



**81. Asteraceae *Senecio nudicaulis*
D. Don**

Temperate zone widely distributed
in the Himalaya.



**82. Asteraceae *cicerbita macrontha*
(C.B. Clarke) Beawv**

3,300-4,300 m; Alpine Meadows;
Himalayan range



**83. *Cremanthodium arnicoides* f.
maxmowezii (Asteraceae)**

In meadows; core zone of the
valley; temperate - cold-temperate
zone.



The Valley of Flowers

84. *Cornus capitata* Wall. (Cornaceae):
(Syn.: *Benthamia capitata* (Wall.) Hara)



'Dog wood'; common in the Himalaya, on way to Bhyundar valley; north temperate distribution extending from northeast Asia to North America.

85. *Polygonum affinis* D. Don
(Polygonaceae):
(Syn.: *Bistorta affinis* (D. Don)
Greene)

'Himalayan Fleece flower'; grows gregariously in the grassy patches along rocks. Cold-temperate Zone.



86. *Cypripedium elegans* Rchb.f. (Orchidaceae):

A miniature 'Lady Slipper'; rare orchid; grassland above timberline; Cold-temperate Himalaya - central Himalaya.



The Valley of Flowers

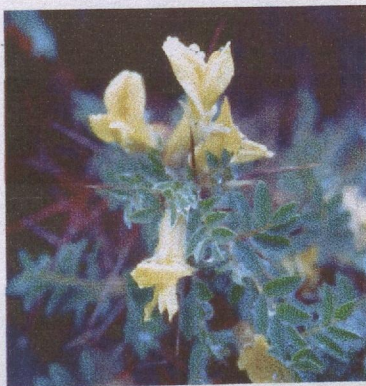
**87. *Campanula latifolia* L.
(Campanulaceae)**

'Bell flower'; common in the entire Himalayan range; a meadow plant appearing from mid June to early August; distribution - North America, Europe, Sino-Himalaya; temperate - cold-temperate zone.



**88. *Caragana gerardiana* Benth.
(Fabaceae)**

May - July; A colonizer in moraines of Tipra glacier; the Valley of Flowers; cold-temperate - alpine zone.



**89. *Cardiocrinum giganteum*
(Wall.) Makino (Liliaceae)**

'Giant Himalayan Lily'; plants high 1.5 to 1.75 meters in woods; flowers scented 3 species in the Sino-Himalayan region; Temperate Zone.



The Valley of Flowers

90. *Cassiope fastigiata* (Wall.) D. Don (Ericaceae)

Named after the wife of Cepheus, King of Ethiopia and mother of Andromeda a constellation named after death; a rock colonizer; distribution circumboreal; cold-temperate, Sub-alpine Himalaya, Europe; used as fuel.



91. *Corydalis cashmeriana* Royle (Papavaraceae)

Blue Corydalis; Resembling Spur of lark; 'Korudales' a lark; meadows among boulders; cold-temperate zone.



92. *Codonopsis viridis* Wall. (Campanulaceae)

Greek word 'Codon' a bell 'Opsi' resemblance to a bell shape flower; meadow in the valley; temperate zone.



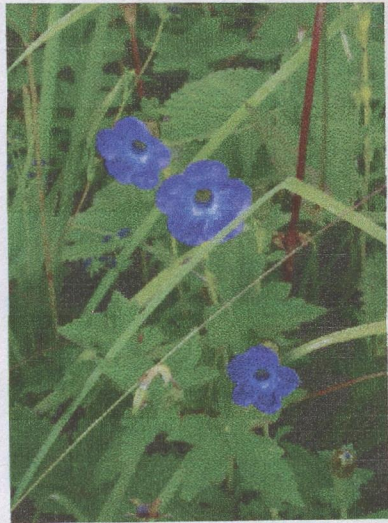
93. *Cimicifuga foetida* L. (Ranunculaceae)

'Cimese' bug and 'fugo' to drive away; 'foetida' a foul smell; Habitat - Fir forest; East Europe Siberia and Himalaya - temperate - cold-temperate zone.

The Valley of Flowers

94. *Cyananthus lobatus* Wall. ex Benth. (Campanulaceae)

'Meadow plant'; a few species cultivated as rock plants; distribution in Europe, Sino-Himalaya; temperate - cold-temperate zone.



95. *Cynoglossum glochidiatum* Wall. ex Benth.

Core zone of the valley; cold-temperate zone.



96. *Cynoglossum wallichii* (Boraginaceae)

'Hounds Tongue'; July; Greek: 'Cyn' a dog, 'Gloss' a tongue - referring to a character of leaves of some species; meadows, the Valley; cold-temperate zone.



The Valley of Flowers

97. *Cypripedium cordigerum*
D. Don (Orchidaceae):

'Lady's Slipper Orchid' under woods; temperate - cold-temperate.



98. *Dactylorhiza hatagirea* (D. Don)
Soó (Orchidaceae):

Himalayan Marsh Orchid; 'Hathi Panja' / 'Hanuman Panja'; a ground orchid; core zone of the valley and also occurring in open grasslands and meadows in cold-temperate zone; Garhwal-Kumaon Himalaya; a medicinal plant.



99. *Danthonia cachemyriana* Jaub.
& Spach (Poaceae)

A tussock grass; grass in the meadow for rearing sheep for wool; flocks of sheep are taken for grazing during summer months; Northwest Himalayas 3300 - 3400 m.



The Valley of Flowers

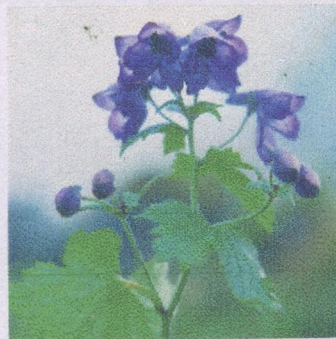
100. *Delphinium* spp.
(Ranunculaceae)

Greek: 'Delphis' - a Dolphin,
Larkspur, entire Himalayan range,
West Tibet, East Tibetan.



101. *Delphinium vestitum*
(Ranunculaceae)

'Clothed Delphinium'; August-
September; Panar, cold-temperate
zone, also in Rudranath.



102. *Epipactis latifolia* (L.) Ali. (Orchidaceae)

A ground orchid; name Greek origin; July August - a woodland species;
distribution - North America, Europe, Himalayan range, North Asia to
Japan; temperate zone.



The Valley of Flowers

103. *Chamerion latifolium* (L.) Holub (Onagraceae)

Fireweed; Sino-Himalayan distribution; meadows in the valley; Poly; cold-temperate zone.



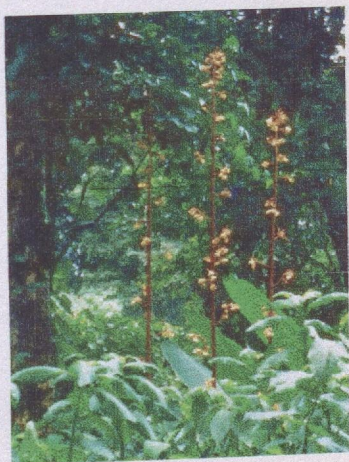
104. *Fritillaria cirrhosa* D. Don. (Lilaceae)

Latin 'fritillus' dice box - chequered character of perianth, (3000-4000 m); meadows in the valley; entire Himalayan range.



105. *Galeola lindleyana* (Hook. f. & J.W. Thomson) Rchb.f. (Orchidaceae)

'Yellow Himalayan Fritillary' - a saprophytic ground orchid; May-July; under forest cover, found in alpine thickets, meadows, woodlands and moist places all along the Himalayas; temperate zone



The Valley of Flowers

106. *Geum elatum* Wall. ex D. Don
(Rosaceae)

'High Avens'; roots aromatic, faint odour of clove, astringent, Eugenol and a glucoside; used as tonic; meadows; temperate - cold-temperate to sub alpine - alpine zone in the Himalaya.



107. *Gagea lutea* (L.) Ker Gawl.
(Lilaceae)

'Yellow Star of Bethlehem'; berries are food for Himalayan wood cock temperate zone.



The Valley of Flowers

108. Gentiana L. (Gentianaceae)

King Gentius of Illyria in the Adriatic second century AD. Credited with the name, curative properties of the bitter roots of *Gentiana lutea*. Curative properties of gentians, it's mentioned into a prescription on papyrus found with Theban mummy. Also the King of Hungary Ladislaus, prayed shot an arrow in the air with hope that almighty should guide it to some herb which will cure suffering of his plague-stricken people. The arrow feels on a change him. It is that resists to poisons, putrefaction, and the pestilence and has the power to help biting of mad dogs and venomous beasts. 'Helping digestion a drink Suze is popular in France and Switzerland.

Gentians was favourites of plant explorer like Kingdom^m-Ward and Farrer in also of poets like Byron, D. H. Lawrence who also fascinated by the flower and expresses.

"Tell me; is the gentian savage, at the top of its coarse stem? Oh what in you can answer to this blueness?"

The American poet Emily Dickenson also as had written poems,

God made a little Gentian

*It tried to be a Rose-And failed-and all the Summer Laught-
But Just before the snow there rose a purple creature.*

That ravished all the Hill-

And Summer hid her Fore-head-

And Mockery-was still

The Frost were her condition-

The Tyrian would not come

until the North-invoke it

Creator-Shall I bloom ?

-Emily Dickenson

Gentians have wide geographic distribution occurring in the temperate and sub-alpine region of the western hemisphere. Throughout in Asia distribution from Sino-Himalayan region to North East Asia and north America. Some Gentians also occur in Australia and New Zealand, The prominent colour is blue with varying to violet and rose and also wheat. The different gentian species collected from Sino-Himalayan region for the most beautiful of varying shades of blue. The *Gentiana* species occur in open grass land and High Mountain passes in the Sino-Himalayan region.

The Valley of Flowers

109. *Gentiana argentea* Royle ex D. Don (Gentianaceae)

Famous medicine man 'Dioscorides' first discover medicinal properties of the species. Species *argentea* derives the name from Latin 'argentum' - 'silver'.



110. *Gentiana algida* Pall. (Gentianaceae)

'Gentian'; open patches of grasslands; meadows, high mountain passes; cold-temperate zone.



111. *Gentiana carinata* Griesb. (Gentianaceae)

'Dark Blue Gentian'; May-June; 'Gentian' on open grassy slopes; meadows; temperate zone.



The Valley of Flowers

112. *Geranium wallichianum* D. Don ex Sweet (Geraniaceae)

'Wallich Geranium or Wallich's - crane-bill'; Greek: 'Geranos' - crane, a bird with a long neck - referring to the long beaked fruit.

Dispersal of seed - adaptation of its fruit for the disposal of its seeds, lower portion of the fruit thickens into five lobes each with one seed, upper portion is a long tapering beak, split into five valves, coil elastically from base upwards, hurling the seeds to save distance from the plant.



113. *Geranium pratense* L. (Geraniaceae)

August.



114. *Geranium* sp. (Geraniaceae)

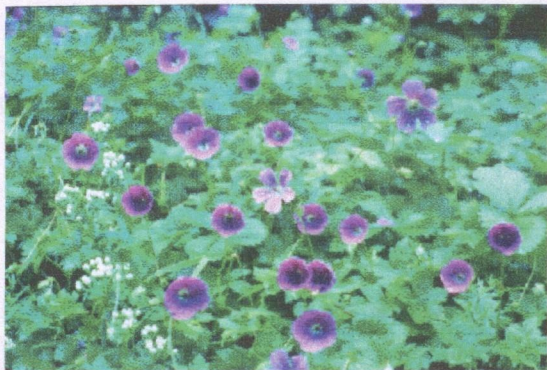
Rudranath.



The Valley of Flowers

115. *Geranium collinum* Stephan ex Willd. (Geraniaceae)

'Gerenium'; Meadows in the Valley of Flowers; cold-temperate zone.



116. *Habenaria intermedia* D. Don
(Orchidaceae)

'Intermediate Habenaria'; an uncommon ground orchid at the edge of the woods; distributed in the Himalayan range; warm temperate - temperate zone.



117. *Hackelia glochidiata* (A. DC.)
Brand. (Boraginaceae)

'Stickseed'; On way to valley of flower near Bhuyndar.



The Valley of Flowers

118. *Hackelia uncinata* (Benth.)
C.E.C. Fisch. (Boraginaceae)

'Hooked Stickseed, Forget Me Not'; June - July; in meadows; temperate - cold-temperate zone.



119. *Hemiphragma heterophylla*
Wall. (Plantaginaceae)

'Nash Jhaar'; the creeping stems grow up to 1-2 ft long; valley floor



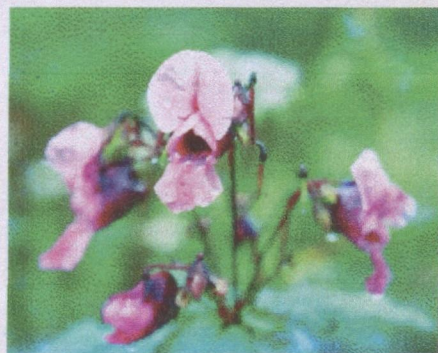
120. *Iris kemaonensis* Wall. ex
Royle (Iridaceae)

'Iris' the Greek name for rainbow; the flowers colours of different species so varying colour range from deep blue to pink white and shades of white flower during the month of May-June; in temperate and cold-temperate region (3000-3500 m).



121. *Impatiens sulcata* Wall.
(Balsaminaceae)

'Himalayan Balsam'; valley floor; distributed in Garhwal-Kumaon Himalaya; cold temperate zone.



The Valley of Flowers

122. *Impatiens* sp. (Balsaminaceae)

August.



123. *Juniperus Communis* L. subsp. *alpina* (Suter) celak var. *alpina*

'Black Juniper'; Juniper a spreading shrub; resinous, above timber line; wood fragrant; a rock colonizer, close to tipra glacier moraines; cold temperate alpine zone.



The Valley of Flowers

124. *Lilium polyphyllum* D. Don (Liliaceae)

'White Himalayan Lily, Many-leaved lily'; Greek: 'Leirion' - *Lilium*; distributed from western temperate region to Himalaya and woodland species occur in temperate zone.



125. *Leontopodium jacotianum* Beauverd (Asteraceae):

'Edelweiss', Lion's foot, glacier star, Silver star; temperate zone, Europe-North America, Sino-Himalayan.

In the comic book *Asterix in Switzerland*, the druid Getafix sends off Asterix and Obelix to Alpien mountains in search of a flower called Silver star, which was to be an important ingredient of his potion. This flower, Edelweiss, is that revered silver star. Edelweiss is the symbol of the Alps. It usually grows in inaccessible places, at high altitudes in the mountains of Europe, Asia, and South America. That is why it is associated in Slovenia with mountaineering. Its white colour is considered in Switzerland a symbol of purity and due to its beauty.



The Valley of Flowers

126. *Ligularia amplexicaulis* DC.
(Asteraceae):

'Ragwort' or Stem Claspig Ligularia, Ligularia'; July-September; meadows in the valley, 3500 m; Leopard plant; in the open grassy patches; grown as ornamental; Eurasia, China, Japan; Cold temperate; valley floor.



127. *Lloydia serotina* (L.) Salisb. ex Rchb. (Liliaceae)

Grows along rocks. Wide distribution N. America, Europe, Sino-Himalaya, Alpine



128. *Lilium nanum* Klotzsch & Garcke (Liliaceae)

(Syn.: *Nomocharis nana* (Klotzsch & Garcke) E.H. Wilson)

'Tiny Lily, Dwarf Lily'; June - July; Tiny Lily is found in the shrubberies and mountain slopes of Himalayas, in meadows, also in alpine grasslands; Pindari glacier valley; Garhwal-Kumaon Himalaya; cold temperate zone.



The Valley of Flowers

129. *Nomocharis oxypetala* (Royle)
E.H. Wilson)

'Lily flower'; a close up - meadows; cold-temperate. *Nomocharis oxypetala* : a population growing along with *Osmunda claytoniana* - a fern of temperate region.



130. *Meconopsis aculeata* Royle
(Papaveraceae):

'Blue poppy'; bell-shaped flowers, to ward off rain drops; greek word resembling poppy roots are consider to posses narcotic properties and are considered poisonous; in Himalaya at an elevation of 3000-3200 m; cold-temperate region.

Flowers closes after a drizzle.



The Valley of Flowers

131. *Monotropastrum humile*
(D. Don) H. Hara (Ericaceae)

Monotropa is split to
Monotropastrum monotropa
humilium is synonym

'Dutchman's pipe'; a total
saprophyte; growing under shade,
on leaf litter; Garhwal-Kumaon
Himalaya; warm temperate -
temperate zone.



132. *Morina longifolia* Wall. ex DC. (Caprifoliaceae)

Name given in order of 17th century French botanist Morin; meadows,
open grasslands in Valley near Rudranath temple area; temperate zone;
distribution Balkan's to Sino-Himalaya; seeds eaten like rice and oil used
in cosmetics.



The Valley of Flowers

133. *Osmunda claytoniana* L.
(Osmundaceae)

A fern - frond making a crosier unfolding; wide distribution from North America to East Asia; temperate - cold-temperate zone.



134. *Oxygraphis endlicheri*
(Walp.) Bennet & Sumer Chandra
(Ranunculaceae)

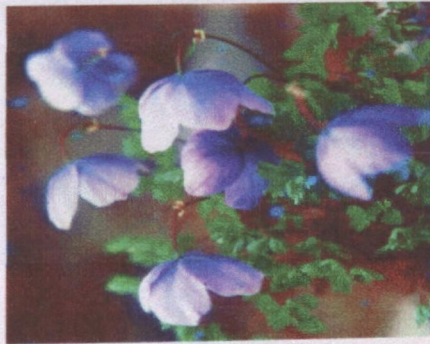
(Syn: *Oxygraphis polypetala*)

Greek: 'Tropis' - a Keel, referring to the sharp pointed Keel of the flower; meadows in valley floor; temperate - sub alpine zone.



135. *Paraquilegia anemonoides*
(Willd.) O.E. Ulbr. (Ranunculaceae)

A rare plant in alpine grassland near the glaciers; western end of valley of flower (4000-4500 m). Iran - Himalaya, Southwest China.



The Valley of Flowers

136. *Paraquilegia microphylla*
(Royle) J.R. Drumm. & Hutch.
(Ranunculaceae)

A rare plant in alpine grassland near glacier; Garhwal - Kumaon Himalaya; distribution west Iran-Himalaya - west China (4000-4500 m).



137. *Pedicularis pectinata* Prain
(Scrophulariaceae)

'Lousewort'; occurs in valley floor, marshy places; temperate zone.



138. *Polemonium caeruleum* L.
(Polemoniaceae):

'Jacob's ladder'; Latin: 'Caerulens' - blue like sky; long ladder like leaves; meadows in the Valley; Garhwal to Kumaon; also wide distributed in cold temperate - alpine zone over North America, Eurasia, Mexico, parts of South America (Chile); north and central Asia.



The Valley of Flowers

139. *Polygonum alpinum* All.
(Polygonaceae)

Greek: 'polus' – 'gonu', knee like nodes, bent on nodes; meadow in the valley; temperate zone.



140. *Bistorta affinis* (D. Don) Greene
(*Polygonum affine* D. Don)

Meadows, open grassland; valley floor; temperate – cold-temperate zone.



141. *Potentilla atrosanguinea* Raf.
(Rosaceae):

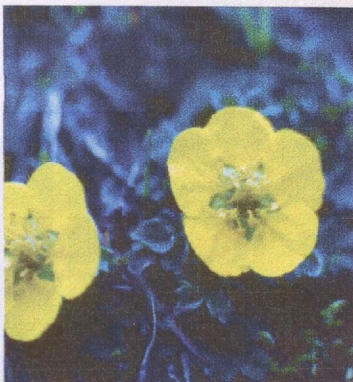
Late July – early August; the name of the genus is drawn from 'Potens' a powerful medicinal property; a meadow plant; growing along rocks; valley floor; temperate – cold-temperate zone.



The Valley of Flowers

142. *Potentilla argyrophylla* Wall. ex Lehm. (Rosaceae)

July - August; Beautiful perennial with long petioles leaf-3 lobed; bright colour variation from bright yellow to red flower; meadow in the valley; common in western and central Himalayans; temperate - cold temperate region.



143. *Potentilla cuneata* Wall. ex Lehm. (Rosaceae)

North temperate, boreal; dried rhizome, used as medicine; temperate - cold-temperate.



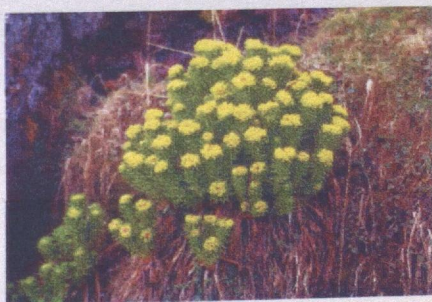
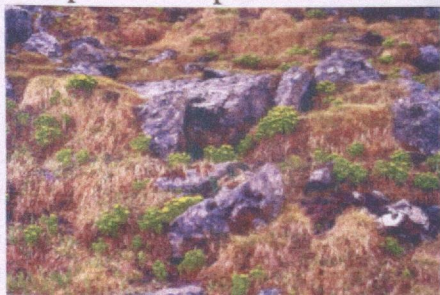
144. *Potentilla sericea* L. (Rosaceae):

Dried rhizome, used as medicine; temperate cold-temperate; North temperate boreal.



145. *Rhodiola wallichiana* (Hook.) S.H. Fu (Crassulaceae)

^{Girque} Frost colonization near Girque; rock plant growing above timber line cold temperate - alpine zone.



The Valley of Flowers

146. *Rosa macrophylla* Lindl. (Rosaceae)

'A wild rose'; shrub with spines common in the entire Himalayan range; cold-temperate zone.



147. *Selenia* sp. (Brassicaceae):

A colonizer of boulders above timber line along with *Bistorta affinis* (D. Don) Greene (*Polygonum affine* D. Don), with some yellow flowers growing around the bolder.



148. *Saussurea simpsoniana* Fielding & Gardner) Lipsch. (Asteraceae):

'Yogmudra', 'Yogi Padshah', Phen Kamal'; Photographed on grassy slopes over Rudranath shrine; cold-temperate to sub-alpine; The India Post had released a postal stamp (1994); distribution Garhwal-Kumaon Himalaya. It is a saying that a person should not collect more than seven plant. The eight one wood cause sudden death.

The Valley of Flowers



149. *Saussurea obvallata* (DC.)
Edgew. (Asteraceae):

'Brahma Kamal'; open rocky slopes above timber line; flowers are offered at religious shrines of Badrinath & Panch Kedar temples; cold-temperate to sub-alpine zone.



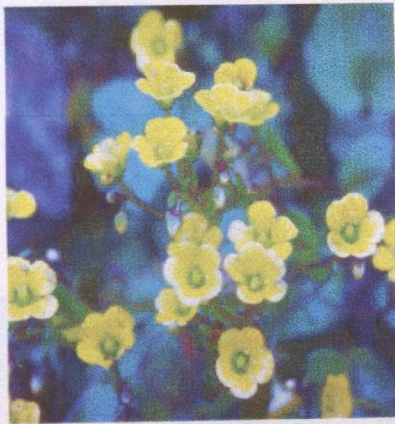
The Valley of Flowers

150. *Saussurea taraxacifolia* Wall.
(Asteraceae)

In the meadow of the Valley; cold-temperate zone.

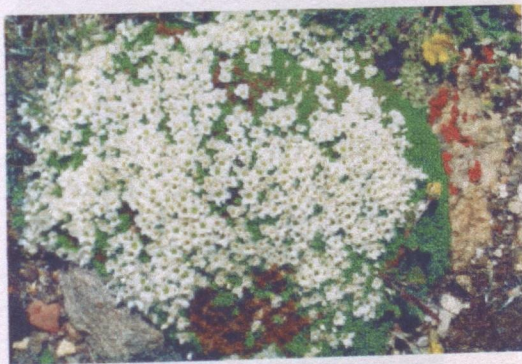


151. *Saxifraga* sp. (Saxifragaceae)



Saxifraga (rockfoil) – Latin 'saxum' and 'frango' to break – growing on rocks and splitting them by the penetration of their stout woody rootstocks into the rock crevices; local name 'pattarmar' meaning to break rocks; North America, rocky mountains, North Asia, Arctic ring, alpine

'Saxifrages'; in meadows, in rock foils; a few species cushion forming, eaten as salad; distribution Europe, Ethiopia, Himalaya, East-Asia, North-West America, Arctic regione Himalaya.



The Valley of Flowers

152. *Scutellaria prostrata* Jacq. ex Benth. (Labiatae)

A colonizer of bare areas; screees open slopes; forming loose mats; temperate-cold-temperate; cosmopolitan.



153. *Sedum* sp. (Crassulaceae)

Sedum (stone crop) - Greek: 'sedere', to sit. Referring to succulent leaves arranged in a rosette close to the ground; A Dwarf rock plant growing above timber line cold temperate alpine zone.



154. *Senecio laetus* Edgew. (Asteraceae)

Latin 'senex' - an old man - white hair like pappus on the fruits. Common name is 'ragwort'.



The Valley of Flowers

155. *Spiraea bella* Sims. (Rosaceae)

A shrub with arching branches; wide distribution – Mexico; South-East Europe to Siberia; Himalaya; Temperate zone.



156. *Swertia petiolata* Royle (Gentianaceae):

Swertia petiolata, *royale* (Gentianaceae) – named in honour of a dutch botanist Emanuel Swert of 17th century; Distribution - cold temperate – sub alpine zone.



157. *Thermopsis barbata* Benth. (Fabaceae)

'Black pea'; May-July; 'Bearded' – long hairs on all parts of the plants; a meadow plant.



The Valley of Flowers

158. *Verbascum thapsus* L.
(Scrophulariaceae)

Aaron's Rod', 'Flannel Plant';
Hattu Peak, Western Himalaya;
also widely distributed in North
and South America, Greece and
Turkey; used in making cigarettes
for asthmatic; temperate-cod
temperate zone.



AUTUMN

159. Autumn view of the valley
Valley in October.



160. An autumn scene
A deciduous forest; cold temperate
zone.



The Valley of Flowers

161. *Acer acuminatum* Wall. ex D. Don (Sapindaceae)

'Tapering Leaf Maple'; Maple tree during Autumn season.



162. *Betula utilis* D. Don (Betulaceae):

'Birch Tree'; in the foreground leaf less with white bark in the Autumn.

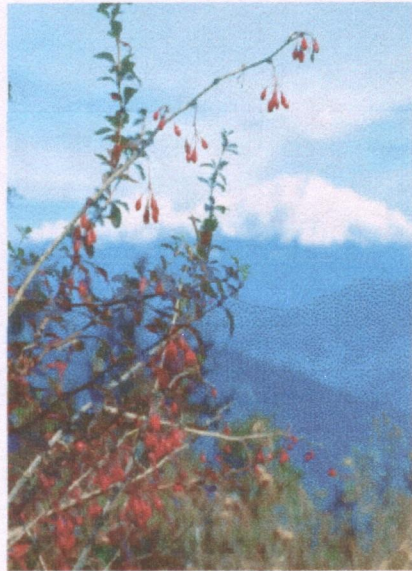


The Valley of Flowers

163. *Berberis jaeschkeana* C.K. Schneid. (Berberidaceae):

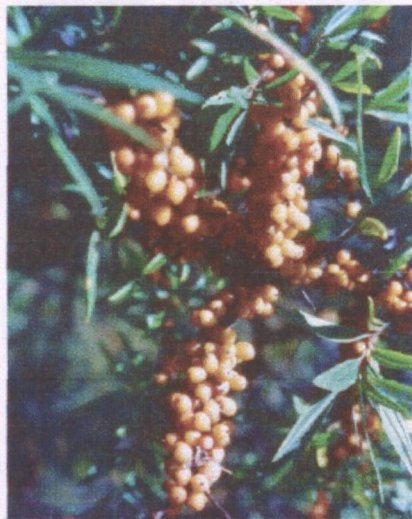
Berberis - 'Barberry'

Red, mature fruits; temperate climatic zone common in Himalaya.



164. *Hippophae salicifolia* D. Don (Elaeagnaceae)

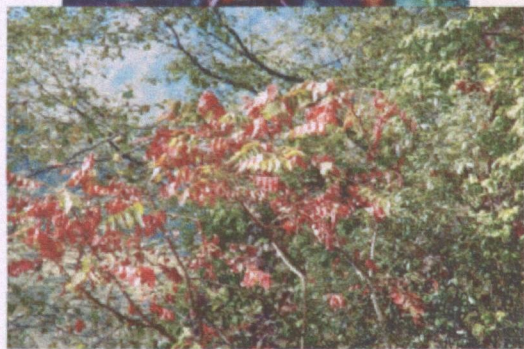
On way to valley; very common in western Himalaya, Ladkh; temperate zone; the berries are used in making sherbet; used as a medicine.



165. *Rhus javanica* L. (Anacardiaceae)

(Syn.: *Rhus semialata* Murray)

August - September; a small tree; temperate zone; autumn colour; wide distribution; on way the Valley of flowers.



The Valley of Flowers

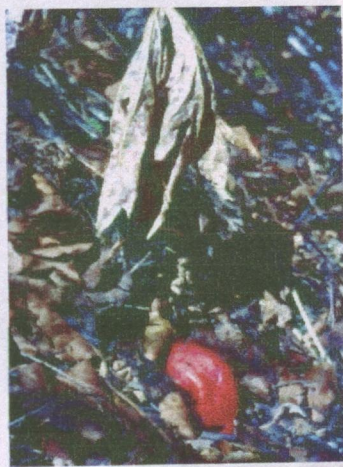
166. *Sorbus sp. quadrangularis*
(Willd.) Müll. Arg.?
(Phyllanthaceae)

Cold-temperate zone.



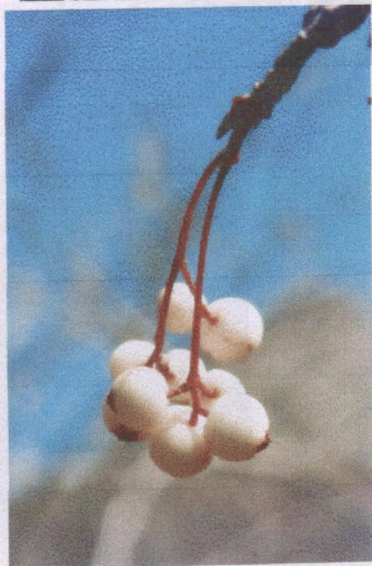
167. *Sinopodophyllum hexandrum*
(Royle) T.S. Ying (Berberidaceae)

In woods with lot of leaf litter, single flower and a berry which turns red used in medicines; eating by bears; picture representation of autumn.



168. *Sorbus foliolosa* Spach.
(Rosaceae)

A small trees, with spreading branches, just above timber line; edge of the Valley of Flowers; cold-temperate zone; bears are fond of eating the ripe berries in autumn.



The Valley of Flowers

169. *Vitis lanata* Roxb. (Vitaceae)

A woody liane spreading on the branches with black fruits; it heralds arrival of autumn season, like unfurling the bright red leaves on a mast.



170. *Vitis lanata*. (Vitaceae)

A woody climber heralds the arrival of autumn in the temperate Himalaya.



171. *Rosa macrophylla* Lindl. (Rosaceae)

'A wild rose'; shrub with spines common in the entire Himalayan range; cold-temperate zone.

Mature fruits of *Berberis* *sps.* in autumn - temperate zone; wide distribution in the Himalaya.



The Valley of Flowers

WINTER

172. *Acer acuminatum* Wall. ex D. Don (Sapindaceae)

'Tapering Leaf Maple'; Maple buds during winter-spring season.



173. The day the snow came.

Rhododendron campanulatum D. Don (Ericaceae)



174. *Allium wallichii* Kunth (Amaryllidaceae):

Late autumn; forest margins, meadows, stream banks; Cold Temperate zone; seeds used in culinary by local people; meadow in the Valley of Flowers.



The Valley of Flowers

175. *Allium humile* Kunth.
(Amaryllidaceae)



176. *Alnus nepalensis* D. Don
(Betulaceae):

'Himalayan alder or Indian Alder'; October-December; Indian Alder is found in woods en-route the Valley of Flowers; often forming pure stands on riverbanks; teperate Himalayas: a deciduous tree with dark green bark which can become silvery-grey in the open; planted to prevent landslides; the wood is light and soft and is used for making inexpensive furniture and boxes.



177. *Aconogonon* sps. (*Polygonum* sps.)

In winter covered with early snow.



The Valley of Flowers

**178. *Quercus semecarpifolia* Sm.
(Fagaceae)**

Himalayan Oak; temperate zone; a prominent tree of north temperate, tropical Malaya and Columbia fruit acorn a multipurpose plant of economic important; *Quercus rubra* L. produces bark providing bottle-corks.



**179. *Rhododendron campanulatum*
D. Don (Ericaceae):**

leaves with fresh snow fall



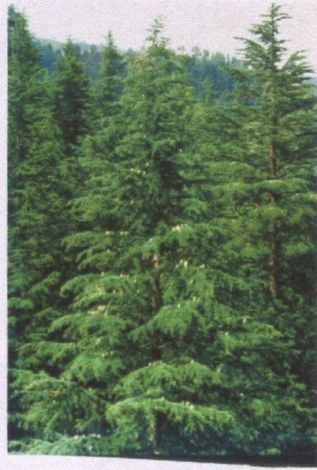
**180. *Trillidium govanianum* Kunth.
(Liliaceae)**

'Wood Lily'; with red colour berry, maturing in the autumn season; distribution in north temperate zone.



The Valley of Flowers

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



'Devdar'; distribution in Lebanon and Himalaya; a conifer tree of Lebanese origin; a valuable soft wood; temperate Himalaya.

182. *Engelhardtia spicata* (Kurz) A.J.C. Grierson & D.G. Long (Juglandaceae)

'Mawa'; False walnut.



183. *Lyonia ovalifolia* (Wall.) Drude (Ericaceae):

'Oval Leaved Lyonia'; April-June; A medium size tree; in woods on way to the Valley of Flowers; Sino-Himalaya; in temperate zone.

The Valley of Flowers



**184. *Taxus wallichiana* Zucc.
(Taxaceae)**

Himalayan Yew; a middle size tree; timber very strong; used for making beams in the houses long lasting. Leaves and barks are used in obtaining a drug 'Taxole'; used in treating ovarian cancer. Common throughout Himalaya, extending to North-East Asia and along the west coast of North America; Temperate zones.



