

# Status and Distribution Pattern of Native and Endemic Species in Uttarakhand Western Himalayan Region, India

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## Abstract

Indian western Himalayan Region (IHR) Inhabitants are largely dependent on the biodiversity, which is one of the major source of livelihood. The relationship of the people with their immediate environs and natural resources has evolved over a long period based on necessities and experiences. The present study recorded in 119 species (27 Trees; 34 shrubs; 58 Herbs) were native to the Himalayan region, 30 species (12 Trees; 10 Shrubs; 8 Herbs) were native to the Himalayan region and other biogeographic regions, together whereas 628 species were non- natives representing various biogeographic provinces of the world. Amongst economically important species, 51 species were near endemic. The notable near endemic were *Ainsliaea aptera*, *Bupleurum thompsonii*, *Begonia picta*, *Bauhinia retusa*, *Chaerophyllum villosum*, *Dipsacus inermis*, *Euonymus pendulus*, *Impatiens amphorata*, *Lonicera quinquelocularis*, *Osbeckia stellata*, *Pinus roxburghii*, *Rhaphidophora glauca*, *Swertia angustifolia*, *Tetragymma bracteolatum*, *Ulmus wallichiana*, *Zingiber chrysanthum*, etc. and only 2 species i.e. *Pimpinella acuminata*, and *Pittosporum eriocarpum* were endemic to the Indian Himalayan Region. Occurrence of 69 % non-native species in the study area itself indicates that non- native species are dominant over the native and endemic species. This may lead the extinction of the native and endemic species from the area and proliferation of more hardy non-native species. Therefore, there is a need to assess the populations of the native and endemic species using standard ecological methods.

## 1.1. Introduction

The nativity denotes first record/origin of the species (Anonymous, 1883-1970; Samant *et al.*, 1998a) and endemism denotes the restricted distribution of a species in a particular biogeographic province or a single Island or mountain top or even in a single rock outcrop (Huston, 1994).

The naturalness (nativity) and uniqueness (endemism) of the plant diversity of any biogeographic province denotes the high conservation value of the area. These two attributes help in tracing the evolution. These two attributes play an important role in assessing the conservation value of any habitat, community and ecosystem for making a strategy and action plan for conservation

and management of a particular biogeographic region. High percentage of native and endemic species indicates the high conservation value of that particular area. The increasing human population and decreasing natural resources have created an imbalance in the natural systems. The habitat degradation and over exploitation of economically important native and endemic species has caused rapid depletion of their population from the wild habitats and non-native species have been proliferating fast due to their hardy nature. This has drastically changed the composition of an ecosystem, habitat and community of a particular biogeographic province. It has been seen that introduction of the non-native species has drastically changed the ecosystem property due to direct competition with the native and endemic plant

species or directly alternating the ecosystem properties (Vitousek, 1986). Further, severe exotic disturbances dramatically affected succession and led to exotic annual communities with low native species richness and species diversity of communities (MacArthur 1955, Hurlbert 1971, Peet 1974, Pielou 1975; Magurran 1988, 2004; Schiuter and Ricklefs 1993, Colwell and Coddington 1994; Kerebs1999, Huston, 1994, Stylinski & Allen, 1999). In the Indian Himalayan Region, in general, a very few studies regarding nativity and endemism of the species are available (Dhar & Samant, 1993; Dhar *et al.*, 1996, 1998a&b; Samant *et al.*, 1996a, 1998a&b, 2000, 2001a,b,c, 2002a&b,2006 a&b; Samant & Dhar, 1997; Samant, 1999; Joshi *et al.*, 1999, 2001; Samant & Palni, 2000; Joshi, 2002; Arya, 2002; Samant & Pant, 2003; Samant & Pal, 2003; Samant & Joshi, 2004; Joshi & Samant, 2004; Pant, 2005; Samant & Pant; 2006; etc.), However, in particular, such studies at watershed and catchment levels are not available. Therefore, in this chapter, attempt has been made to study the diversity and distribution pattern of the native and endemic species of the Uttarakhand Western Himalayan Region.

### 1.2. Materials and methods

The nativity of the species has been identified following Anonymous (1883-1970; Samant & Dhar, 1997; Samant *et al.*, 1998a&b, Samant, 1999; and Samant *et al.*, 2000a, 2002a). The species indicating its origin from the Himalayan Region were considered as natives.

The endemism of the species has been identified based on the distribution of the species (Dhar & Samant, 1993; Samant *et al.*, 1996a, 1998a&b,

2000a&b, 2001c, 2002a, 2006; Samant & Dhar, 1997; Dhar *et al.*, 1998b, and Samant, 1999). The species restricted to Indian Himalayan Region has been considered as endemic whereas those with extended distribution to neighboring Countries/States considered as near endemic (Table 3.1).

### 1.3. Results

Of the total 774 species, 119 species (27 Trees; 34 shrubs; 58 Herbs) were native to the Himalayan region, 30 species (12 Trees; 10 shrubs; 8 Herbs) were native to the Himalayan region and other biogeographic regions, together whereas 628 species were non-natives representing various biogeographic provinces of the world (Appendix & Fig. 3.1). The altitudinal distribution of the native species within different life forms has been presented (Fig. 3.2 & 3.3).

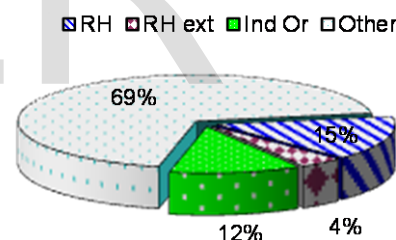


Fig. 3.1. Distribution pattern of the native and non-native species.

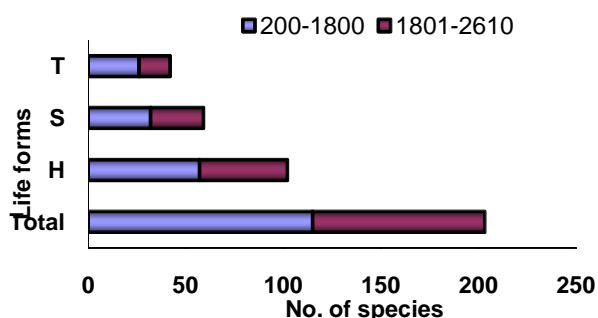


Fig. 3.2. Altitudinal distribution of the Himalayan native species.

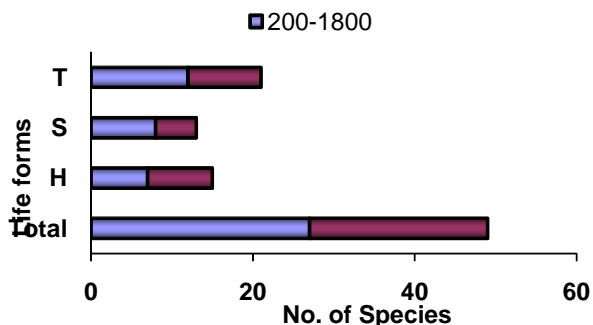


Fig.3.3. Altitudinal distribution of the Himalayan native species together with other biogeographic regions.

Amongst the total economically important species, 51 species were near endemic. The notable near endemic were *Ainsliaea aptera*, *Bupleurum thompsonii*, *Begonia picta*, *Bauhinia retusa*, *Chaerophyllum villosum*, *Dipsacus inermis*, *Euonymus pendulus*, *Impatiens amphorata*, *Lonicera quinquelocularis*, *Osbeckia stellata*, *Pinus roxburghii*, *Rhaphidophora glauca*, *Swertia angustifolia*, *Tetrastigma bracteolatum*, *Ulmus wallichiana*, *Zingiber chrysanthum*, etc. and only 2 species i.e., *Pimpinella acuminata*, and *Pittosporum eriocarpum* were endemic to the Indian Himalayan Region. The altitudinal distribution and utilization pattern of the endemic and near endemic species have been presented (Fig.3.4 & 3.5).

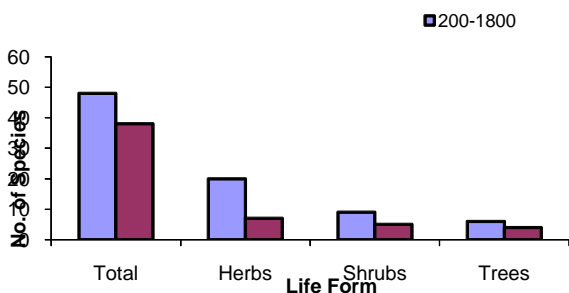


Fig. 3.4. Altitudinal distribution of the Endemic and Near Endemic Plants.

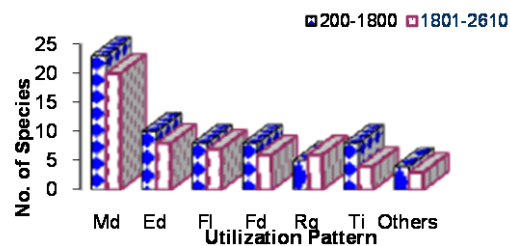


Fig.3.5. Utilization pattern of the endemic and near endemic Plants along an altitudinal gradient.

#### 1.4. Discussion

The decreasing population of the native and endemic species due to invasion of non-natives in the tropical, sub-tropical and temperate zones of the globe is a great concern which is causing the negative impacts on the entire ecosystems. The past studies have proved that non-natives affect the hydrology and nutrient cycles of entire ecosystems (Vistousek, 1986). Such impact may lead the extinctions of the native and endemic species from the ecosystem. In general, invasions potentially lead to an increase in species richness, as the invading species are added to the existing species pool. However, they have negative effects on the native species leading even to the extinctions therefore, decreasing net diversity of the area (Huston, 1994). Presence of non-natives in India and the Himalaya is known (Maheshwari, 1962), which is largely attributed to migration over geological time periods (Saxena, 1991).

Although, the non-natives are relatively hardy species compared to natives and capable of spreading far beyond their native places yet, there are some limitations, which restrict the invasion of non-natives particularly in the mountainous regions and Islands. Topography and climate are the major barriers to restrict the gene flow and thus, allow

speciation to occur (Samant *et al.*, 2002, Joshi, 2002). The altitude, longitude and latitude play an important role in the speciation of the species (Khoshoo, 1992). In the Uttarakhand Western Himalayan Region, the human habitations are located mostly in the sub-tropical and temperate zones. The forests of these regions are facing high pressures due to heavy lopping, felling, causing habitat degradation and over exploitation of the species, and the native species are decreasing at an accelerating rate due the invasion of non-native species. Similar trends have been also reported from other parts of the Indian Himalayan Region (Dhar *et al.*, 1997 and Samant *et al.*, 1998b, 2000, 2002a, 2006). The conflict between the natural resource and inhabitants of the Uttarakhand Western Himalayan Region is a well known fact (Samant *et al.*, 1993).

The topography and mild climatic conditions of the area supports a large number of human settlements. Further, dependence of the population residing outside the catchment is also prevalent. Hence, the degree of anthropogenic pressure is very high compared to the sub alpine and alpine zones of the Indian Himalayan Region. This has lead decrease in the population of native and endemic species. Occurrence of 69 % non-native species in the study area itself indicates that non-native species are dominant over the native and endemic species. This may lead the extinction of the native and endemic species from the area and proliferation of more hardy non-native species. Therefore, there is a need to assess the populations of the native and endemic species using standard ecological methods. This would help in the conservation planning of these species.

**Table 3.1. Distribution pattern of the native and endemic species in the Uttarakhand Western Himalayan Region**

| Family/Taxa                                 | Local Name    | Altitudinal range (m) | LF | Nativity  | Endemism |
|---|---------------|-----------------------|----|-----------|----------|
| <b>Apiaceae</b>                             |               |                       |    |           |          |
| <i>Buplerum thompsonii</i> Cl.              | Jangali-Jeera | 1500-2500             | H  | Reg Himal | NE       |
| <i>Chaerophyllum villosum</i> Wall.         | Kinzari       | 1800-2200             | H  | Reg Himal | NE       |
| <i>Pimpinella acuminata</i> (Edgew.) Cl.    | Raulee        | 800-2600              | H  | Reg Himal | E        |
| <i>Selinium tenuifolium</i> DC.             | Bhutkeshi     | 1800-2600             | H  | Reg Himal | NE       |
| <b>Arecaceae</b>                            |               |                       |    |           |          |
| <i>Rhaphidophora glauca</i> (Wall.) Schott. |               | 800-1500              | Sh | Reg Himal | NE       |
| <b>Asteraceae</b>                           |               |                       |    |           |          |
| <i>Ainsliaea aptera</i> DC.                 | Karu-buti     | 1500-2500             | H  | Reg Himal | NE       |
| <i>Circium wallichii</i> DC.                | Kandaru       | 1700-2600             | H  | Reg Himal | NE       |
| <i>C. argyranthus</i> DC.                   | Kaniakan      | 1000-2000             | H  | Reg Himal | NE       |
| <i>Gerbera gossypina</i> (Royle) Beauv.     | Kapasi        | 1300-2000             | H  | Reg Himal | NE       |
| <b>Balsaminaceae</b>                        |               |                       |    |           |          |
| <i>Impatiens amphorata</i> Edgew.           | Phyktuli      | 1200-2600             | H  | Reg Himal | NE       |
| <i>I. racemosa</i> Hk.f.                    | Chunchuni     | 1500-2500             | H  | Reg Himal | NE       |
| <i>I. scabrida</i> DC.                      | Namcho        | 1000-2200             | H  | Reg Himal | NE       |

| Family/Taxa                               | Local Name      | Altitudinal range (m) | LF | Nativity            | Endemism |
|---|-----------------|-----------------------|----|---------------------|----------|
| <b>Begoniaceae</b>                        |                 |                       |    |                     |          |
| <i>Begonia picta</i> Sm.                  | Latpatte, Pat   | 600-2600              | H  | Reg Himal           | NE       |
| <b>Berberidaceae</b>                      |                 |                       |    |                     |          |
| <i>Berberis aristata</i> DC.              | Daru Haldi      | 1500-2600             | Sh | Ind Or              | NE       |
| <b>Caesalpiniaceae</b>                    |                 |                       |    |                     |          |
| <i>Bauhinia retusa</i> Roxb.              | Simala, Kandalb | 1200-1500             | T  | Reg Himal           | NE       |
| <b>Caprifoliaceae</b>                     |                 |                       |    |                     |          |
| <i>Lonicera quinquocularis</i> Royle      | Bhatkura        | 300-2400              | Sh | Reg Himal           | NE       |
| <b>Caryophyllaceae</b>                    |                 |                       |    |                     |          |
| <i>Cerastium cerastioides</i> (L.) Britt. | Pangian         | 1500-2500             | H  | Reg Himal           | NE       |
| <b>Celasteraceae</b>                      |                 |                       |    |                     |          |
| <i>Euonymus pendulus</i> Wall.            | Bhemela         | 1800-2600             | T  | Reg Himal           | NE       |
| <b>Combretaceae</b>                       |                 |                       |    |                     |          |
| <i>Combretum nanum</i> Don                | Vatmani         | 200-600               | Sh | Reg Himal           | NE       |
| <b>Dipsacaceae</b>                        |                 |                       |    |                     |          |
| <i>Dipsacus inermis</i> Wall.             | Wopal Hakh      | 1600-2600             | H  | Reg Himal Nepal Pak | NE       |
| <b>Euphorbiaceae</b>                      |                 |                       |    |                     |          |
| <i>Euphorbia royleana</i> Boiss.          | Syun            | 1000-1500             | Sh | Reg Himal           | NE       |
| <b>Fabaceae</b>                           |                 |                       |    |                     |          |
| <i>Flemingia procumbens</i>               | Ajhar           | 200-2200              | H  | Reg Himal           | NE       |

| Family/Taxa                                   | Local Name      | Altitudinal range (m) | LF | Nativity            | Endemism |
|---|-----------------|-----------------------|----|---------------------|----------|
| Roxb.   |                 |                       |    |                     |          |
| <i>Indigofera pulchella</i> Roxb.             |                 | 800-1500              | Sh | Reg Himal           | NE       |
| <i>Pueraria tuberosa</i> (Willd.) DC.         | Vidari kand     | 300-1500              | Sh | Ind Or Malaya China | NE       |
| <b>Gentianaceae</b>                           |                 |                       |    |                     |          |
| <i>Swertia angustifolia</i> Buch.-Ham.        | Chirayata       | 600-2600              | H  | Reg Himal           | NE       |
| <i>S. cordata</i> Cl.                         | Chirayata       | 1600-2500             | H  | Reg Himal           | NE       |
| <b>Geraniaceae</b>                            |                 |                       |    |                     |          |
| <i>Geranium wallichianum</i> Don ex Sw.       | Role            | 2000-2600             | H  | Reg Himal           | NE       |
| <b>Gesneriaceae</b>                           |                 |                       |    |                     |          |
| <i>Didymocarpus pedicellata</i> N.F.          | Pather long     | 500-2500              | H  | Reg Himal           | NE       |
| <b>Hippocastanaceae</b>                       |                 |                       |    |                     |          |
| <i>Aesculus indica</i> Colebr. ex Camb.       | Panger          | 1500-2500             | T  | Reg Himal           | NE       |
| <b>Juglandaceae</b>                           |                 |                       |    |                     |          |
| <i>Juglans regia</i> L.                       | Akhrot          | 1000-2600             | T  | Reg Himal As Occ    | NE       |
| <b>Lamiaceae</b>                              |                 |                       |    |                     |          |
| <i>Ajuga parviflora</i> Benth.                | Bugle           | 600-1500              | H  | Reg Himal           | NE       |
| <b>Lauraceae</b>                              |                 |                       |    |                     |          |
| <i>Cinnamomum tamala</i> L.                   | Tejpat Kirkiria | 400-2000              | T  | Reg Himal           | NE       |
| <i>Persea gamblei</i> (King ex Hk.f.) Kosterm | Ongtat          | 700-1100              | T  | Reg Himal           | NE       |

| Family/Taxa                                  | Local Name | Altitudinal range (m) | LF | Nativity  | Endemism |
|--|------------|-----------------------|----|-----------|----------|
| <b>Liliaceae</b>                             |            |                       |    |           |          |
| <i>Lilium polyphyllum</i> Don                | Kandmool   | 1500-2200             | H  | Reg Himal | NE       |
| <b>Melastomaceae</b>                         |            |                       |    |           |          |
| <i>Osbeckia stellata</i> Buch.-Ham.          |            | 1200-2600             | Sh | Reg Himal | NE       |
| <b>Pittosporaceae</b>                        |            |                       |    |           |          |
| <i>Pittosporum eriocarpum</i> Royle          | Raduthia   | 600-1400              | T  | Reg Himal | E        |
| <b>Pinaceae</b>                              |            |                       |    |           |          |
| <i>Cedrus deodara</i> (Roxb.) Loud.          | Devdar     | 1500-2500             | T  | Reg Himal | NE       |
| <i>Pinus roxburghii</i> Sarg.                | Cheer      | 1100-2200             | T  | Reg Himal | NE       |
| <b>Polygonaceae</b>                          |            |                       |    |           |          |
| <i>Polygonum recumbens</i> Royle ex Bab.     |            | 1800-2500             | H  | Reg Himal | NE       |
| <b>Ranunculaceae</b>                         |            |                       |    |           |          |
| <i>Delphinium denudatum</i> Royle            | Nirbis     | 1500-2500             | H  | Reg Himal | NE       |
| <b>Rhamnaceae</b>                            |            |                       |    |           |          |
| <i>Rhamnus triqueter</i> (Wall.) Brandis     | Gonta      | 1500-2100             | T  | Reg Himal | NE       |
| <i>R. purpureus</i> Edgew.                   | Gaunta     | 1500-2600             | Sh | Reg Himal | NE       |
| <b>Rosaceae</b>                              |            |                       |    |           |          |
| <i>Cotoneaster bacillaris</i> Wall.ex Lindl. | Ruins      | 1800-2500             | Sh | Reg Himal | NE       |
| <i>Potentilla fulgens</i> Wall.ex Hk.f.      | Bajradanti | 1600-2600             | H  | Reg Himal | NE       |

| Family/Taxa                                    | Local Name | Altitudinal range (m) | LF | Nativity  | Endemism |
|--|------------|-----------------------|----|-----------|----------|
| <i>Rubus paniculatus</i> Sm.                   | Taptara    | 1600-2600             | Sh | Reg Himal | NE       |
| <b>Saxifragaceae</b>                           |            |                       |    |           |          |
| <i>Bergenia ligulata</i> (Wall.) Engl.         | Silphor    | 1200-2200             | H  | Reg Himal | NE       |
| <b>Schizandraceae</b>                          |            |                       |    |           |          |
| <i>Schisandra grandiflora</i> (Wall.)Hk.f.&Th. | Ageli      | 1800-2500             | Sh | Reg Himal | NE       |
| <b>Thymelaeaceae</b>                           |            |                       |    |           |          |
| <i>Daphne papyracea</i> Wall.                  | Satpura    | 1600-2300             | Sh | Reg Himal | NE       |
| <b>Tiliaceae</b>                               |            |                       |    |           |          |
| <i>Grewia oppositifolia</i> Roxb. ex Mast.     | Bhimal     | 150-1800              | T  | Reg Himal | NE       |
| <b>Ulmaceae</b>                                |            |                       |    |           |          |
| <i>Ulmus wallichiana</i> Planch.               | Mairu      | 2000-2600             | T  | Reg Himal | NE       |
| <b>Verbenaceae</b>                             |            |                       |    |           |          |
| <i>Premna barbata</i> Wall. ex Schau.          | Gingdari   | 700-1500              | Sh | Reg Himal | NE       |
| <b>Vitaceae</b>                                |            |                       |    |           |          |
| <i>Tetrastigma bracteolatum</i> Planch.        |            | 1000-1600             | Sh | Reg Himal | NE       |
| <b>Zingiberaceae</b>                           |            |                       |    |           |          |
| <i>Hedychium spicatum</i> Ham. ex Sm.          | Ban-Haldi  | 1000-2000             | H  | Reg Himal | NE       |
| <i>Zingiber chrysanthum</i>                    |            | 1200-1600             | H  | Reg Himal | NE       |

| Family/Taxa | Local Name | Altitudinal range (m) | LF | Nativity | Endemism |
|-------------|------------|-----------------------|----|----------|----------|
| Rosc.       |            |                       |    |          |          |

**Abbreviations used:** LF= Life form; H=Herb; T=Tree;

Sh=Shrub; NE=near endemic; E=Endemic; Reg

Himal= Himalayan region; As=Asia; Trop= Tropical;

Ind Or=Indian Oriental; Amer= America;

Trop=Tropical

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## Reference

- Anonymous 1883-1970. *Index Kewensis Plantarum Phanerogamarum* Vol. 1-2 (1883- 1885) and 15 Suppl. (1886-1970). Clarendon Press, Oxford.
- Dhar, U. & Samant, S.S. 1993. Endemic diversity of Indian Himalaya I. *Ranunculaceae* and II. *Paeoniaceae*. *Journal of Biogeography*, **20**: 659-668.
- Dhar, U., Rawal, R.S. & Samant, S.S. 1996. Endemic plant diversity in Indian Himalaya III: Brassicaceae. *Biogeographica*, **72(1)**: 19-32.
- Dhar, U., Rawal, R.S. & Samant, S.S. 1997a. Structural diversity and representativeness of forest vegetation in a protected area of Kumaun Himalaya, India: implications for conservation. *Biodiversity & Conservation*, **6**: 1045 -1062.
- Dhar, U. 2002. Conservation implications of plant endemism in high altitude Himalaya. *Current Science*, **82 (2)**: 181-152.
- Huston, M.A. 1994. *Biological Diversity: The coexistence of species on changing landscapes*. Cambridge University Press, USA.
- Hurlbert S.H.1971. *The non-concepts of species diversity :A critique and alternative parameters;* *Ecology*,**52**:577-586.
- Krebs C.J. 1999. *Ecological methodology* (Menlo Park,CA: Wesley Longman)
- Magurran A.E. 2004. *Measuring biological diversity* (Oxford: Blackwell)
- Peet, R.K. 1974. *The measurement of species diversity;* *Annu.Rev.Ecol.Syst.***5**: 285-307.
- Pielou, E.C. 1975. Species diversity and pattern diversity in the study of ecological succession; *J. Theor. Biol.* **10**: 370-383
- Samant, S.S., Dhar, U. & Rawal, R.S. 1996a. Natural resource use by some natives within Nanda Devi Biosphere Reserve in west Himalaya. *Ethnobotany*, **8**: 40-50.
- Samant, S.S., Dhar, U. & Rawal, R.S. 1996b. Conservation of rare endangered plants: The context of Nanda Devi Biosphere Reserve. In: P.S. Ramakrishnan, A.N. Purohit, K.G. Saxena, K.S. Rao & R.K. Maikhuri (eds.), *Conservation and Management of Biological Resources in Himalaya*. Oxford & IBH Publishing Company Private Limited, New Delhi. pp. 521-545.
- Samant, S.S. & Dhar, U. 1997. Diversity, endemism and economic potential of wild edible plants of Indian Himalaya. *International Journal of Sustainable Development & World Ecology*, **4**: 179-191.
- Samant, S.S. 1999. Diversity, nativity and endemism of vascular plants in a part of Nanda Devi Biosphere Reserve in west Himalaya I. *Himalayan Biosphere Reserves (Biannual Bulletin)*, **1(1&2)**: 1-28.
- Samant, S.S., Joshi, H.C. & Arya, S.C. 2000a. Diversity, nativity and endemism of vascular plants in Pindari area of Nanda Devi Biosphere Reserve-II. *Himalayan Biosphere Reserves*, **2(1&2)**: 1-29.



Stebbins, G.L. & Mahjor, J. 1965. Endemism and speciation in the California flora. *Ecological Monographs*, **35**: 1-36.

p. 163-176. In Mooney, H.A., and J. Drake (eds.), *Biological Invasions of North America and Hawaii*. Springer-Verlag.

Vitousek, P.M. 1986. Biological invasions of ecosystem properties: can species make a difference?

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