

Distribution Pattern of *Dendrobium* Swartz (Orchidaceae) in Nepal

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Abstract

Altogether 29 species of *Dendrobium* Swartz (Orchidaceae) were recorded from different regions of Nepal. These species are enumerated along with their phytogeographical and altitudinal distribution, flowering period and major host plants.

Key words: *Dendrobium*, Orchidaceae, Distribution, Nepal

INTRODUCTION

Nepal is rich in floral diversity due to its varied climatic conditions and phytogeography having 5856 species of flowering plants (Anonymous 2006). Orchids, i.e. the members of Orchidaceae are dominant in the flora of Nepal. The family is widely distributed in the tropical and subtropical regions of the world and is regarded as one of the largest, most diverse and distinctive families of flowering plants (Garay 1960; Dressler & Dodson 1960; Melchior 1964; Burns-Balogh & Funk 1986; Dressler 1981, 1993). There are about 25000 species of Orchids present in the world (Atwood 1986). Dressler (1993) reported 850 genera and 20000 species of Orchids worldwide. About 850 species of Orchids occur in the Himalayan region (Royal Botanic Gardens, Kew 2003). Nepal harbors about 388 species of orchids, including 12 endemics, belonging to 102 genera (Raskoti 2009).

The history of botanical exploration including orchids in Nepal was started with the collection of different plants from the Kathmandu valley by Francis Buchanan-Hamilton during 1802-1803. This was followed by N. Wallich in 1820. Wallich explored 72 species of orchids from Central Nepal during 1820-1821 (Don 1825). David Don (1821, 1825) studied the Nepalese plants at the Lambert Herbarium (including Wallich collections as well as of Buchanan-Hamilton). The Lambert Herbarium was later acquired by British Museum (BM) and Kew Herbarium (K) (Miller 1970). Since then many botanists had studied the orchid flora in different parts of Nepal. Hara *et al.* (1978) reported 313 species under 89 genera of orchids from Nepal. Press *et al.* (2000) reported 326 species under 86 genera of orchids from Nepal. Rajbhandari and Dahal (2004) enumerated 377 species of orchids under 100 genera from Nepal. In Nepal orchids are distributed from tropical to alpine regions.

Nepal is located between latitudes 26.22° and 30.27° N and longitudes 80.24° and 88.12° E. Stearn (1960) has divided Nepal into 3 phytogeographical regions:

- I. West Nepal : from western boarder to 83. E longitude
- II. Central Nepal : from 83. E to 86.30' E longitude
- III. East Nepal : from 86.30' E longitude to eastern boarder.

On the basis of altitude and different types of climate, 5 types of vegetation zones have been attributed to Nepal (Chaudhary 1998):

- I. Tropical zone : upto 1000 m
- II. Subtropical zone : 1000-2000 m
- III. Temperate zone : 2000-3000 m
- IV. Subalpine zone : 3000-4100 m
- V. Alpine zone : 4100-5500 m.

Dendrobium is a dominant genus of Orchidaceae and was established by Olof Swartz in 1799 (in *Nova Acta Regiae Soc. Sci. Upsal.*, Ser. 2.6: 82). The name has been derived from Greek words *Dendron* ("tree") and *bios* ("life") meaning "one who lives on trees, or essentially epiphyte". Species of *Dendrobium* are mostly epiphytes with some are lithophytes. *Dendrobium* Swartz comes under subtribe Dendrobiinae and it consists of about 900 species worldwide (Dressler 1993). Its species are widely distributed in China, Japan, India, Malaysia, Indonesia to New Guinea, Australia, New Zealand and the Pacific Islands (Garay & Sweet 1974; Seidenfaden 1985; Pearce & Cribb 2002). These are adopted to a wide variety of habitat from high altitude in the Himalayan Mountains to lowland tropical forests and even to dry climate of the Australian desert (Wikipedia.org/wiki/Dendrobium). So far, 29 species of *Dendrobium* have been reported from Nepal (Bajracharya & Shakya 2002). In Nepal they are distributed from tropical to alpine regions. Rajbhandari *et al.* (1999) reported that largest number of epiphytic orchids are found in in the lower temperate regions of Central and Eastern Nepal, in sub-alpine region the epiphytic orchids are found in less number and are almost absent in the alpine region. Hara *et al.* (1978) recorded 26 species of *Dendrobium* from Nepal. Press *et al.* (2000) enumerated 26 species of *Dendrobium* from Nepal. Rokaya *et al.* (2013) enumerated 31 species of *Dendrobium* from Nepal.

This paper provides the distribution pattern of *Dendrobium* Swartz in Nepal along with their altitudinal distribution, flowering period and major host plants.

MATERIALS AND METHODS

Methods used to assess the distribution of different species of *Dendrobium* Swartz along with their flowering time and major host plants in Nepal:

- Major part of the work is based on the survey of Nepal specimens of different species of *Dendrobium* deposited at different herbaria including KATH, TUCH, CAL, K, BM, B and TI.
- Field visits carried out in different parts of Nepal to collect the live specimens. Live specimens were identified by tallying with protologues, type specimens and previously authenticated specimens deposited at KATH, TUCH, CAL, BM, K, P and TI.

Protologues and images of type specimens have been downloaded from different websites, including www.botanicus.org; www.biodiversitylibrary.org; www.plants.jstor.org; www.kew.org and www.nybg.org. Update nomenclature of *Dendrobium* species have been acquired from website World Checklist of Monocotyledons (www.kew.org/wcsp/monocots) and from www.theplantlist.org.

RESULTS AND DISCUSSION

Nepal is rich in orchid diversity comprising 388 species belonging to 102 genera (Raskoti 2009) . There is variance on the exact numbers of species and nomenclature of Nepalese

orchids. The list of species of *Dendrobium* Swartz presented here is expected to solve the nomenclature problems and ambiguity about number of species and provide an update of the list of *Dendrobium* found in Nepal. A total of 29 species of *Dendrobium* have been found. These species were distributed within an altitudinal variation of 150–2900 m in wide range of habitat conditions (Fig. 1). Phylogeographical distribution along with altitudinal range, flowering and host plants of 29 recorded species of *Dendrobium* are enumerated in Annexure - I.

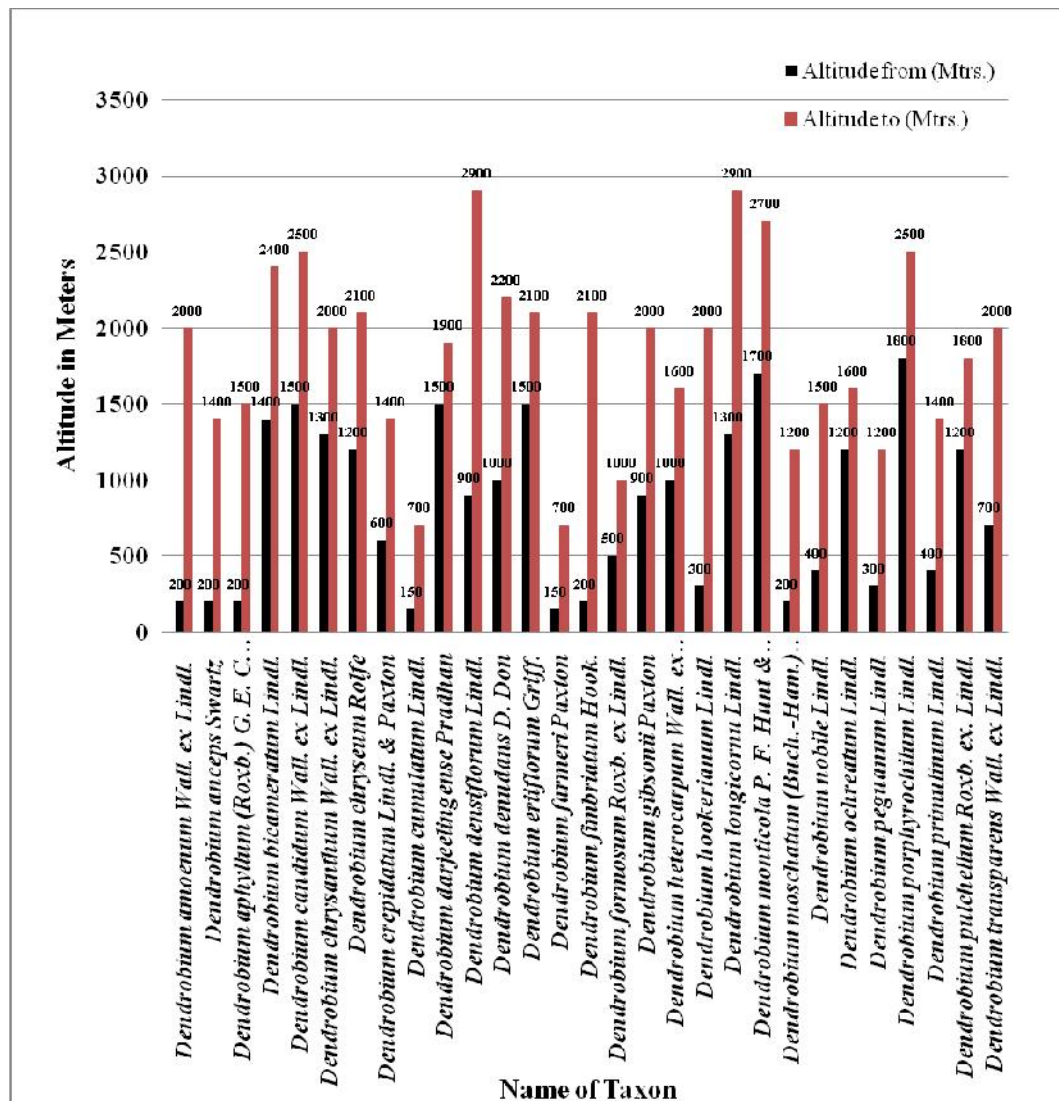


Figure 1: Altitudinal range of distribution of *Dendrobium* species in Nepal

According to phylogeographical distribution, 11 species of *Dendrobium* (*D. amoenum*, *D. aphyllum*, *D. candidum*, *D. chrysanthum*, *D. densiflorum*, *D. eriiflorum*, *D. fimbriatum*, *D. formosum*, *D. longicornu*, *D. nobile*, *D. porphyrochilum*) are found distributed in Central and Eastern Nepal; 7 species (*D. chryseum*, *D. crepidatum*, *D. darjeelingense*, *D. heterocarpum*, *D. monticola*, *D. moschatum*, *D. primulinum*) in Central Nepal; 7 species (*D. anceps*, *D. cumulatum*, *D. farmeri*, *D. gibsonii*, *D. hookerianum*, *D.*

ochreatum, *D. pulchellum*) in Eastern Nepal and 2 species (*D. bicameratum*, *D. peguanum*) in West and Central Nepal. Only 2 species (*D. denudans*, *D. transparens*) are distributed throughout the country from West to East Nepal (Fig. 2). Central and East Nepal hosts the largest number of species. The number of species is gradually decreasing towards West mainly because of climatic factors. The presence of high relative humidity in the atmosphere almost round the year in Central and Eastern Nepal is the one of the important factors for the high concentration of orchids in those areas.

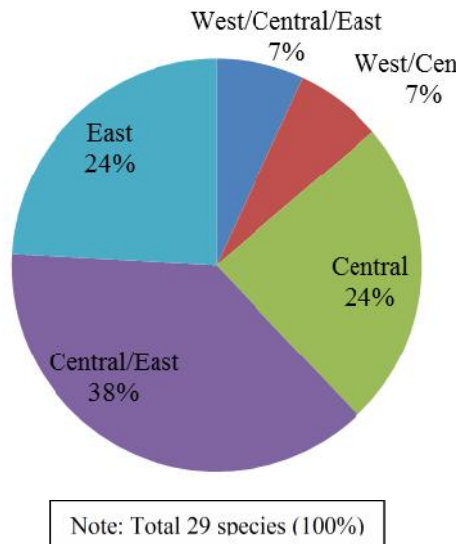


Figure 2: Region wise percentage distribution of *Dendrobium* species in Nepal

The largest numbers of 12 species of *Dendrobium* (*D. amoenum*, *D. anceps*, *D. aphyllum*, *D. crepidatum*, *D. gibsonii*, *D. heterocarpum*, *D. hookerianum*, *D. moschatum*, *D. nobile*, *D. peguanum*, *D. primulinum*, *D. transparens*) are distributed in tropical to subtropical regions (200 – 2000 m) of Nepal. Similarly 3 species (*D. cumulatum*, *D. farmeri*, *D. formosum*) are found only in tropical region (upto 1000 m), 4 species (*D. chrysanthum*, *D. darjeelingense*, *D. ochreatum*, *D. pulchellum*) in subtropical region (1200 – 2000 m), 3 species (*D. densiflorum*, *D. denudans*, *D. fimbriatum*) in tropical to temperate region (200 – 2900 m) and 7 species (*D. bicameratum*, *D. candidum*, *D. chryseum*, *D. eriiflorum*, *D. longicornu*, *D. monticola*, *D. porphyrochilum*) in subtropical to temperate region (1200 – 2900 m). Thus tropical, subtropical and temperate regions represent the suitable regions preferred by majority of the species of *Dendrobium* in Nepal. However, no species of *Dendrobium* is recorded from the subalpine (3000 – 4100 m) and alpine (above 4100 m) regions in Nepal (Fig. 3).

The flowering period of 29 species of *Dendrobium* in Nepal flora were also recorded. Each species has its own time to bloom. The largest numbers of 10 species (*D. amoenum*, *D. anceps*, *D. crepidatum*, *D. densiflorum*, *D. farmeri*, *D. fimbriatum*, *D. gibsonii*, *D. heterocarpum*, *D. nobile* and *D. primulinum*) are found blooming only in spring (i.e. March – May). 5 species (*D. bicameratum*, *D. cumulatum*, *D. hookerianum*, *D. monticola* and *D. pulchellum*) bloom in summer (June – August), 7 species (*D. aphyllum*, *D. chryseum*, *D. formosum*, *D. moschatum*, *D. ochreatum*, *D. porphyrochilum* and *D. transparens*) are found blooming during spring – summer (March – August), 4 species (*D. candidum*, *D. darjeelingense*, *D. eriiflorum* and *D. longicornu*) are found blooming in autumn (September – November), 2 species (*D. chrysanthum* and *D. denudans*) bloom during summer – autumn (June – November) and only *D. peguanum* is found blooming during autumn – winter (November – January) (Fig. 4). There is no record of flowering of any species of *Dendrobium* in winter (February). From above observations it is revealed that high temperature, heavy rainfall and high humidity favor the blooming of different species of *Dendrobium*.



PLATE – I: Photographs of some species of *Dendrobium* Swartz: **Fig. 1.** *D. longicornu* Lindley, Godavari, Lalitpur (C. Nepal, 1525 m); **Fig. 2.** *D. moschatum* (Buchanan-Hamilton) Swartz, Godak, Ilam (E. Nepal, 579 m); **Fig. 3.** *D. formosum* Roxburgh ex Lindley, Hetauda, Makawanpur (C. Nepal, 600 m); **Fig. 4.** *D. chrysanthum* Wallich ex Lindley, Hanspokhari, Ilam (East Nepal, 1596 m); **Fig. 5.** Type specimen No. E00267514 of *D. chrysanthum* Wallich ex Lindley **Fig. 6.** Type specimen No. BM000958077 of *D. moschatum* (Buchanan-Hamilton) Swartz; **Fig. 7.** Holotype No. BM000505677 of *D. formosum* Roxburgh ex Lindley; **Fig. 8.** Wallich No. 1997, K000718656 of *D. longicornu* Lindley

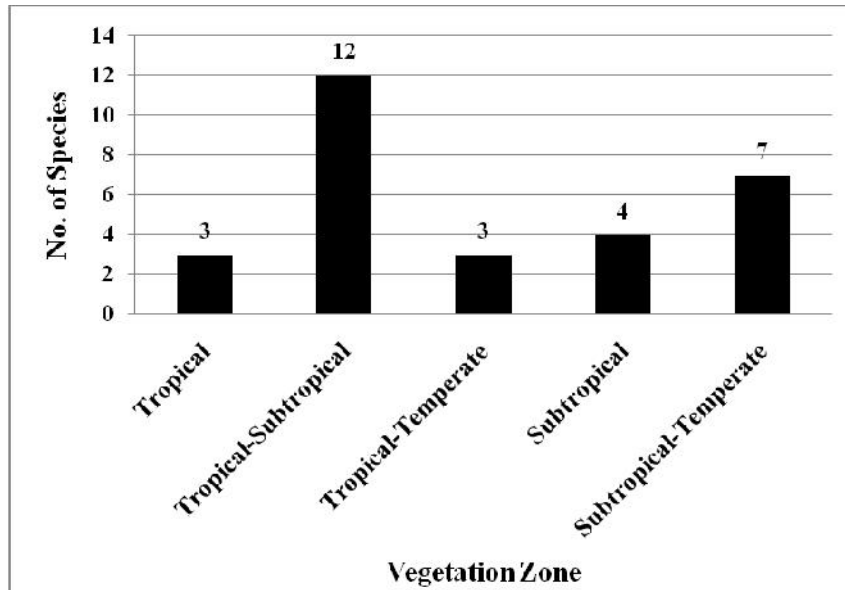


Figure 3: Distribution of *Dendrobium* species in different vegetation zones

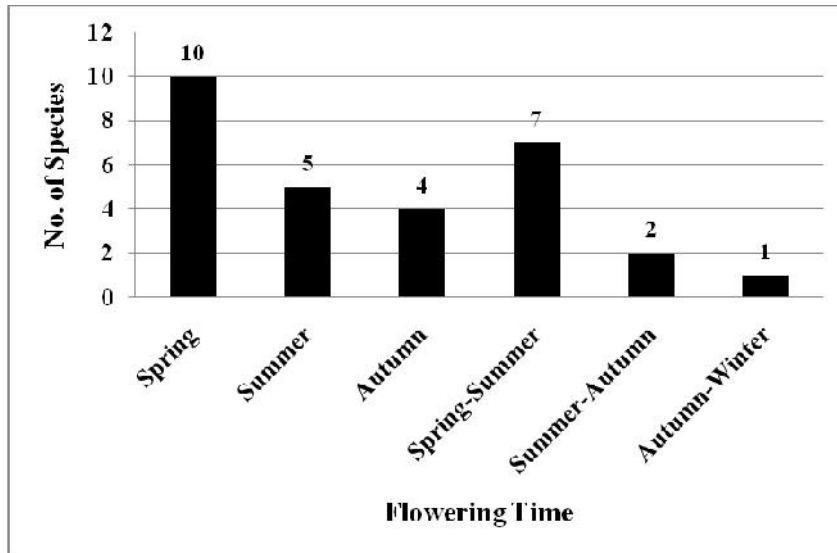


Figure 4: Distribution of flowering time of different species *Dendrobium* in Nepal

This study also reveals the host plants as *Dendrobium* species are epiphytic plants. Out of 29 species, 10 species (*D. anceps*, *D. bicameratum*, *D. candidum*, *D. densiflorum*, *D. denudans*, *D. fimbriatum*, *D. gibsonii*, *D. hookerianum*, *D. moschatum* and *D. nobile*) prefer *Schima wallichii* as their host plant. Eight species (*D. crepidatum*, *D. cumulatum*, *D. darjeelingense*, *D. farmeri*, *D. formosum*, *D. peguanum*, *D. primulinum* and *D. transparens*) prefer to grow on *Shorea robusta*; two species (*D. heterocarpum* and *D. longicornu*) prefer *Quercus glauca*; 3 species (*D. aphyllum*, *D. chrysanthum* and *D. chryseum*) likes *Castanopsis indica*; two species (*D. amoenum* and *D. monticola*) on *Alnus nepalensis*; one species each on *Berberis asiatica* (*Dendrobium eriiflorum*), *Dalbergia sissoo* (*Dendrobium pulchellum*), *Semecarpus anacardium* (*Dendrobium*

ochreatum), and on *Rhododendron arboreum* (*Dendrobium porphyrochilum*) as their host trees. However, larger number of species of *Dendrobium* prefer *Schima wallichii* and *Shorea robusta* as their hosts (Fig. 5).

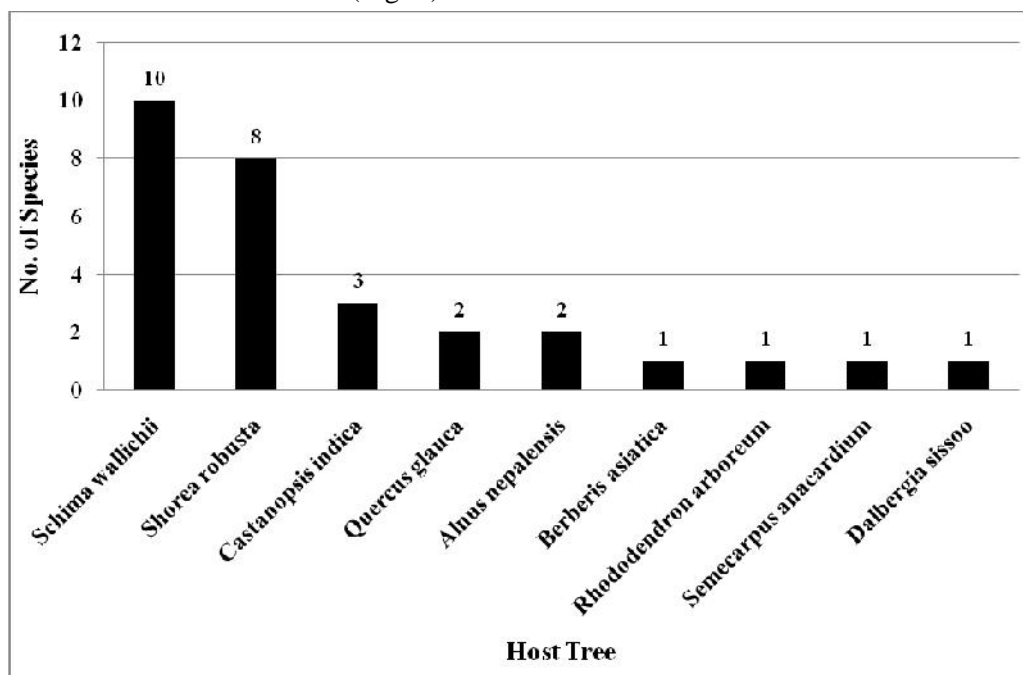


Figure 5: Numerical distribution of *Dendrobium* species grow on different host trees in Nepal

Orchidaceae comes under the Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna). Many *Dendrobium* species with high ornamental and medicinal values are extracted day by day in large amount and are exported. So, there should be strict control measure for preventing illegal collection of orchids from their natural habitat in large amount.

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ANNEXURE - I

Species of *Dendrobium* Swartz in Nepal

Taxa	Region	Altitude range in m	Preferred Host Plant	Flowering Time
<i>Dendrobium amoenum</i> Wallich ex Lindley	C./E. Nepal	200 - 2000	<i>Alnus nepalensis</i>	May
<i>Dendrobium anceps</i> Swartz	E. Nepal	200 - 1400	<i>Schima wallichii</i>	April – May
<i>Dendrobium aphyllum</i> (Roxburgh) G.E.C. Fischer	C./E. Nepal	200 - 1500	<i>Castanopsis indica</i>	April – June
<i>Dendrobium bicameratum</i> Lindley	W./C. Nepal	1400 - 2400	<i>Schima wallichii</i>	July – August
<i>Dendrobium candidum</i> Wallich ex Lindley	C./E. Nepal	1500 - 2500	<i>Schima wallichii</i>	September – October
<i>Dendrobium chrysanthum</i> Wallich ex Lindley	C./E. Nepal	1300-2000	<i>Castanopsis indica</i>	August – October
<i>Dendrobium chryseum</i> Rolfe	C. Nepal	1200-2100	<i>Castanopsis indica</i>	May – June
<i>Dendrobium crepidatum</i> Lindley & Paxton	C. Nepal	600-1400	<i>Shorea robusta</i>	April – May
<i>Dendrobium cumulatum</i> Lindley	E. Nepal	150-700	<i>Shorea robusta</i>	June – July
<i>Dendrobium darjeelingense</i> Pradhan	C. Nepal	1500-1900	<i>Shorea robusta</i>	October – November
<i>Dendrobium densiflorum</i> Lindley	C./E. Nepal	900-2900	<i>Schima wallichii</i>	April – May
<i>Dendrobium denudans</i> D. Don	W./C./E. Nepal	1000-2200	<i>Schima wallichii</i>	August – September
<i>Dendrobium eriiflorum</i> Griffith	C./E. Nepal	1500-2100	<i>Berberis asiatica</i>	September – October
<i>Dendrobium farmeri</i> Paxton	E. Nepal	150-700	<i>Shorea robusta</i>	April – May
<i>Dendrobium fimbriatum</i> Hooker	C./E. Nepal	200-2100	<i>Schima wallichii</i>	April – May
<i>Dendrobium formosum</i> Roxburgh ex Lindley	C./E. Nepal	500-1000	<i>Shorea robusta</i>	May – June
<i>Dendrobium gibsonii</i> Paxton	E. Nepal	900-2000	<i>Schima wallichii</i>	April – May
<i>Dendrobium heterocarpum</i> Wallich ex Lindley	C. Nepal	1000-1600	<i>Quercus glauca</i>	April – May
<i>Dendrobium hookerianum</i> Lindley	E. Nepal	300-2000	<i>Schima wallichii</i>	June – July
<i>Dendrobium longicornu</i> Lindley	C./E. Nepal	1300-2900	<i>Quercus glauca</i>	September – November
<i>Dendrobium monticola</i> P.F. Hunt & Summerhayes	C. Nepal	1700-2700	<i>Alnus nepalensis</i>	July – August
<i>Dendrobium moschatum</i> (Buchanan-Hamilton) Swartz	C. Nepal	200-1200	<i>Schima wallichii</i>	May – July
<i>Dendrobium nobile</i> Lindley	C./E. Nepal	400-1500	<i>Schima wallichii</i>	April – May
<i>Dendrobium ochreatum</i> Lindley	E. Nepal	1200-1600	<i>Semecarpus anacardium</i>	May – June
<i>Dendrobium peguanum</i> Lindley	W./C. Nepal	300-1200	<i>Shorea robusta</i>	November – January
<i>Dendrobium porphyrochilum</i> Lindley	C./E. Nepal	1800-2500	<i>Rhododendron arboreum</i>	May – August
<i>Dendrobium primulinum</i> Lindley	C. Nepal	400-1400	<i>Shorea robusta</i>	April – May
<i>Dendrobium pulchellum</i> Roxburgh ex Lindley	E. Nepal	1200-1800	<i>Dalbergia sissoo</i>	July – August
<i>Dendrobium transparens</i> Wallich ex Lindley	W./C./E. Nepal	700-2000	<i>Shorea robusta</i>	May – June