



Research Article

Wild Floristic Diversity of Daman-Simbhanjyang Area, Makwanpur District, Central Nepal

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Keywords: Floristic composition; Wild habitat; Makwanpur District

Abstract

A floristic study of an area is very crucial to determine the status of plant species of particular area or geographical region, as it reflects the whole plant diversity of that area. Our study aimed at identifying the floristic composition of Daman-Simbhanjyang area which included flowering plants, gymnosperms, pteridophytes and bryophytes at wild habitat. The present study has recorded altogether 189 plant species under 163 genera and 90 families. Out of 189 plant species (114 Dicots and 20 Monocots), 134 phanerogams were recorded under 112 genera and 55 families. Asteraceae was found to be the richest family with 14 species among dicots and Orchidaceae (8 spp.) among monocots. Moreover, 30 species of pteridophytes and 22 species of bryophytes were recorded under 28 genera from 15 families and 20 genera from 17 families respectively. However, only three species of gymnosperm were recorded under 3 genera and 3 families at wild habitat. Therefore, the present study has concluded Daman-Simbhanjyang area to be rich in plant species diversity which encompasses many high valued plant species that needs to be conserved and used in sustainable manner.

Introduction

Nepal has unique geographical feature ranging its elevation from 70 m above sea level (asl) to 8848 m asl, including fertile low lands, warm hills, freezing world's highest mountains, numerous water resources, and miscellaneous biodiversity. It is the transitional region for the floral diversity, with the combination of both eastern and western floristic elements of world division. It stands as major part of Eastern Himalayan hotspot, holding about a third of total species from the entire Himalaya (Myers *et al.*, 2000).

Particularly, it harbors 1001 species of algae (2.5%), 1822 species of fungi (2.6%), 465 species of lichens (2.3% of global diversity), 1,150 species of bryophytes (8.2%), 534 species of pteridophytes (5.1%), 26 species of gymnosperms (5.1%) and 6,973 species of angiosperms (3.2%) (GoN/MoFSC, 2014; Chaudhary *et al.*, 2016).

Daman-Simbhanjyang area lies on Chure hills of Makwanpur district, neighboring to capital city,

Kathmandu. The area encompasses humid climatic feature supporting to the diverse group of species belonging to Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (Chapagain *et al.*, 2016). Being in approximate to capital city, it has been explored as early as initiation of botanical exploration in Nepal. Buchanan-Hamilton initiated the botanical exploration in Nepal and collected 433 plant specimens from Makwanpur-Kathmandu route (Chalise *et al.*, 2020). During 1820-1821 Wallich collected and documented plant specimens from Kathmandu valley and nearby districts (Rajbhandary, 2001; Kunwar and Bussmann, 2008). Further, the exploration was followed by Don (1825) and again by Wallich (1826). Later, area has been explored through several expeditions by national research teams (Joshi, 2014; Bhattarai *et al.*, 2018; Chalise *et al.*, 2020) with addition of many new taxa to its botanical catalog. With changing global climatic conditions, deforestation, urbanization, and over exploitation, biodiversity has been declined and to address them, botanical garden and few plant research centers were established. Although, various expeditions had explored the area and botanical gardens are conserving valuable and endangered species, present wild plant diversity (without monitoring by human) has not been documented yet. This work somehow tried to put some light over present plant diversity in the area at wild state.

Materials and Methods

Study Area

The study was carried out in Daman-Simbhanjyang area of Makwanpur district, Nepal (Fig. 1). Makwanpur district has altitudinal variation from 166m (Hathidhunga) to 2584m

(Simbhanjyang) asl (Chapagain *et al.*, 2016). Daman lies on 27°36'N and 85°5'E at the elevation of 2290 m asl, while Simbhanjyang lies on 27°35'N and 85°4'E at the altitude of 2584m asl. The surrounding area was dominated by moderate to matured Pineforest, Oak- forest and mixed broad-leaved forest. However, majority of the forest in Daman-Simbhanjyang area was dominated by Oak forest where in lower parts it was associated with *Pinus roxburghii*, *Juglans regia* and in upper part it was associated with *Pinus wallichiana*, *Pyrus sp.* (Chalise *et al.*, 2020). The study area has an average annual temperature of 11.5°C and average annual precipitation of 1781 mm. However, the variation of precipitation between the driest and wettest period is 487 mm. The climate is mostly cold with snowfall in winter and warm with rainfall in summer.

Plant Collection and Herbarium Preparation

Plant specimens in a population were collected systematically from the different part of study area with proper photographs. The required field notes were recorded for every specimen. Bryophyte specimens were cleaned with the help of brush, moisture removed using tissue papers and blotting papers. Later well dried bryophyte specimens were kept on paper pockets with label. Pteridophytes, gymnosperm and angiosperm specimens were collected considering ethical issue for collection, and herbarium prepared by pressing them on herbarium press with newspaper, card board and blotting sheets, following method of Bridson and Forman (2014). Later, dried specimens were mounted on herbarium sheet of standard size with the help of glue and labeled then deposited on Amrit Campus Herbarium.

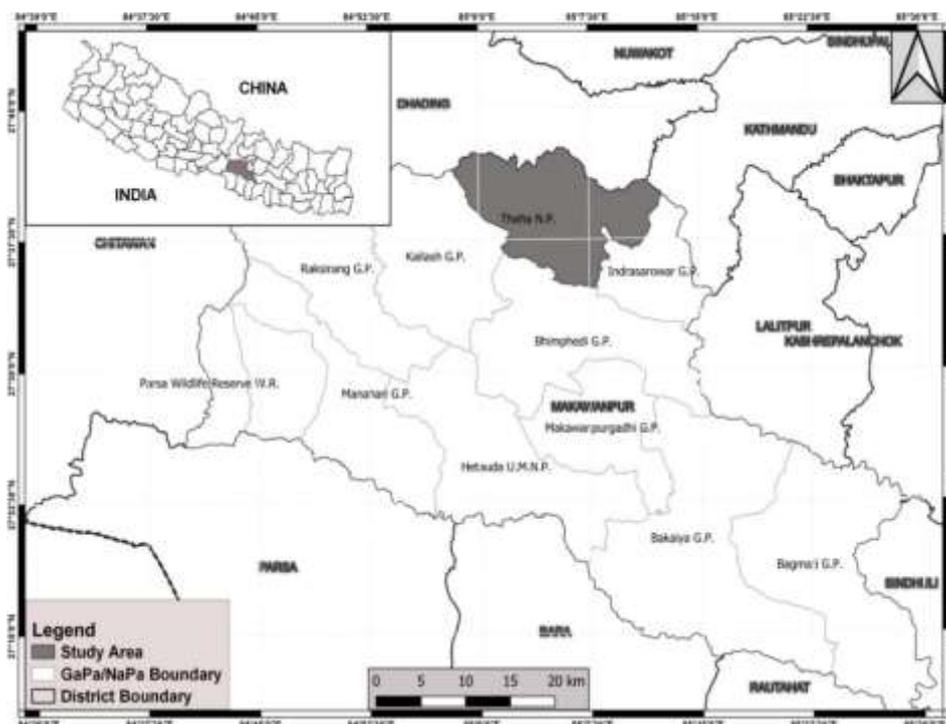


Fig. 1: Map of the study area

Plant Identification

Prepared herbarium specimens were identified in the field by local name, botanical name was known with the help of experts and reliable literatures. Different literatures were referred for identification of bryophytes (Pradhan and Joshi, 2009a; Pradhan and Joshi, 2009b; Karki and Ghimire, 2019), Pteridophytes (Rajbhandari, 2016; Fraser-Jenkins *et al.*, 2015), and angiosperm (Hooker, 1872-1897; Hara *et al.*, 1978; Hara and Williams, 1979; Hara *et al.*, 1982; Polunin and Stainton, 1984; Stainton, 1987 and 1988; Cullen, 1996; Wu *et al.*, 1994-2008; Harris and Harris, 2001; Pearce and Cribb, 2002; Watson *et al.*, 2013). Comparative identification was also made with digital herbaria and images from KEW, TI, RBGE, and KATH.

Exclusion Criteria

The study of plant species from botanical garden of Daman-Simbanjyang area, Makwanpur district were excluded and are not listed in our present study. Moreover, study of algae, fungi and lichen are not included in our work.

Inclusion Criteria

The study of angiosperms, pteridophytes, bryophytes and gymnosperms are included in our work. Moreover,

inclusion of plant species in our study was considered only if they occurred in wild habitat.

Results and Discussion

The present study has documented total 189 species of plants including phanerogams and cryptogams (Pteridophytes and Bryophytes) under 163 genera and 89 families. Out of 189 species, 30 species were Pteridophytes under 28 genera and 14 families (Table 1). Pteridaceae (7 spp.) was found to be dominant with highest number of species followed by Polypodiaceae (5 spp.), Dennstaedtiaceae (4 spp.) and so on (Fig. 2). In very recent report, 11 Pteridophytes has been reported from Daman-Simbanjyang area (Chalise *et al.*, 2020) whereas in present study 30 species has been reported with 17 different species and 8 uncertain species with known genera. Hasan *et al.* (2013) found two species of Pteridophytes (*Cyathea spinose* and *Dryopteris filix-mas*) used for medicine in Daman VDC of Makwanpur district, unfortunately it was not reported from the area in this study.

Table 1. List of Pteridophytes of the study area

S.N.	Family	Name
1	Aspleniaceae	<i>Asplenium</i> L.
2	Aspleniaceae	<i>Diplazium caudatum</i> (Cav.) Jermy
3	Cyatheaceae	<i>Alsophila dealbata</i> C. Presl
4	Dennstaedtiaceae	<i>Dennstaedtia</i> Moore.
5	Dennstaedtiaceae	<i>Microlepia strigose</i> (Thunb.) C. Presl
6	Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn
7	Dennstaedtiaceae	<i>Pteridium esculentum</i> (Forst.) Nakai
8	Dryopteridaceae	<i>Dryopteris</i> Adans.
9	Dryopteridaceae	<i>Polystichum</i> Roth
10	Equisetaceae	<i>Equisetum</i> L.
11	Hypodematiaceae	<i>Leucostegia truncate</i> (D.Don) Fraser-Jenk.
12	Lindsaeaceae	<i>Odontosoria chinensis</i> (L.) J.Sm.
13	Lycopodiaceae	<i>Huperzia</i> Bernh.
14	Lycopodiaceae	<i>Lycopodium japonicum</i> Thunb. ex Murray
15	Nephrolepidaceae	<i>Nephrolepis</i> Schott
16	Ophioglossaceae	<i>Botrychium</i> Sw.
17	Polypodiaceae	<i>Aglaomorpha quercifolia</i> (L.) Hovenkamp & S.Linds.
18	Polypodiaceae	<i>Lepisorus</i> (J.Sm.) Ching
19	Polypodiaceae	<i>Loxogramme</i> (Blume) C.Presl
20	Polypodiaceae	<i>Pichisermollodes stewartia</i> (Bedd.) Fraser-Jenk.
21	Polypodiaceae	<i>Selliguea capitellata</i> (Wall.) X.C.Zhang & L.J.He
22	Pteridaceae	<i>Adiantum</i> L.
23	Pteridaceae	<i>Aleuritopteris albomarginata</i> (Clarke) Ching
24	Pteridaceae	<i>Haplopteris flexuosa</i> (Fée) E.H.Crane
25	Pteridaceae	<i>Onychium cryptogrammoides</i> Christ
26	Pteridaceae	<i>Onychium japonicum</i> (Thunb.) Kunze
27	Pteridaceae	<i>Pteris ensiformis</i> Burm.
28	Pteridaceae	<i>Pteris wallichiana</i> C.Agardh
29	Selaginellaceae	<i>Selaginella</i> P.Beauv.
30	Tectariaceae	<i>Tectaria trifoliata</i> (L.) Cav.

Moreover, 22 species of bryophytes were recorded under 20 genera and 17 families (Table 2). Among 17 families, Polytrichaceae has 3 species, followed by Marchantiaceae and Aytoniaceae with 2 species (Fig. 3). The present study has reported that *Polytrichum commune*, *Marchantia polymorpha*, *Marchantia quadrata*, *Anthoceros* sp. were

found to occur frequently in Daman-Simbanjyang area. Pradhan (2014) has reported 58 species of bryophytes under 39 genera of 27 families from her two years of study along the Chandragiri-Makwanpur border area as first inventory for Bryoflora.

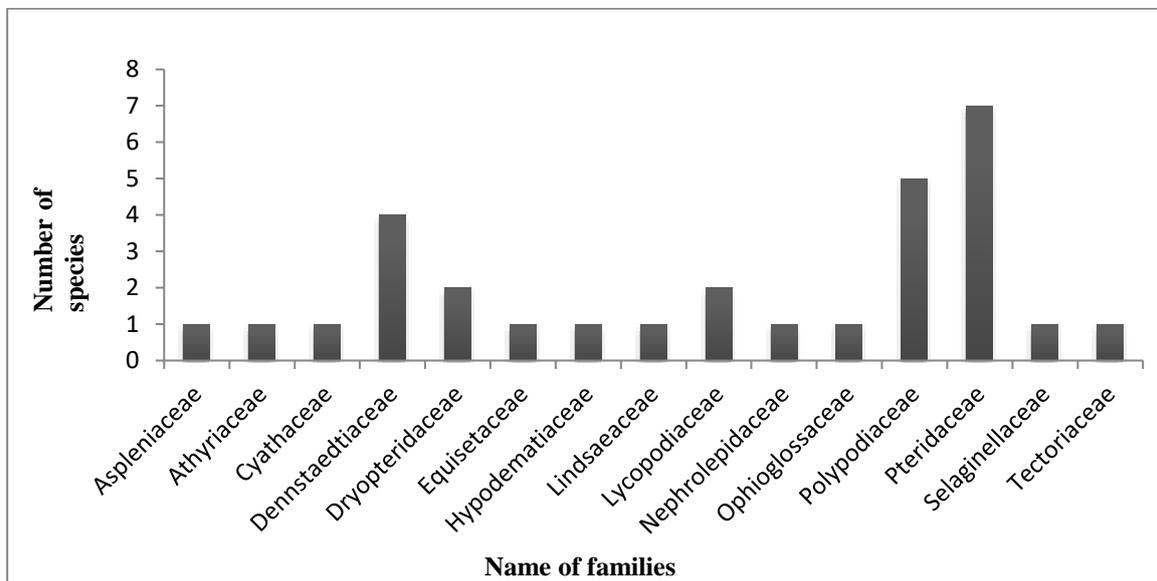


Fig. 2: Number of pteridophytes according to the families

Table 2. List of bryophytes of the study area

S.N.	Family	Name
1	Anthocerotaceae	<i>Anthoceros</i> L.
2	Aytoniaceae	<i>Asterella californica</i> P.Beauv.
3	Aytoniaceae	<i>Plagiochasma</i> Lehm. & Lindenb.
4	Bryaceae	<i>Bryum</i> Hedw.
5	Calypogeiaceae	<i>Calypogeia</i> Raddi
6	Dicranaceae	<i>Dicranoweisia crispula</i> Milde
7	Dumortieraceae	<i>Dumortiera</i> Nees
8	Funariaceae	<i>Funaria</i> Hedw
9	Haplomitriaceae	<i>Haplomitrium</i> Nees
10	Hypnaceae	<i>Taxiphyllum</i> M.Fleisch.
11	Marchantiaceae	<i>Marchantia polymorpha</i> L.
12	Marchantiaceae	<i>Marchantia quadrata</i> Scop.
13	Notothyladaceae	<i>Notothylas</i> Sull.
14	Pallaviciniaceae	<i>Pallavicinia blytii</i> (Moerck ex Hornem.) Lindb.
15	Polytrichaceae	<i>Pogonatum</i> P.Beauv.
16	Polytrichaceae	<i>Polytrichum commune</i> Hedwig
17	Polytrichaceae	<i>Polytrichum juniperinum</i> Hedwig
18	Porellaceae	<i>Porella</i> L.
19	Ricciaceae	<i>Riccia</i> L.
20	Ricciaceae	<i>Ricciocarpos</i> Corda
21	Targioniaceae	<i>Targionia</i> L.
22	Thuidiaceae	<i>Thuidium</i> Bruch & Schimp.

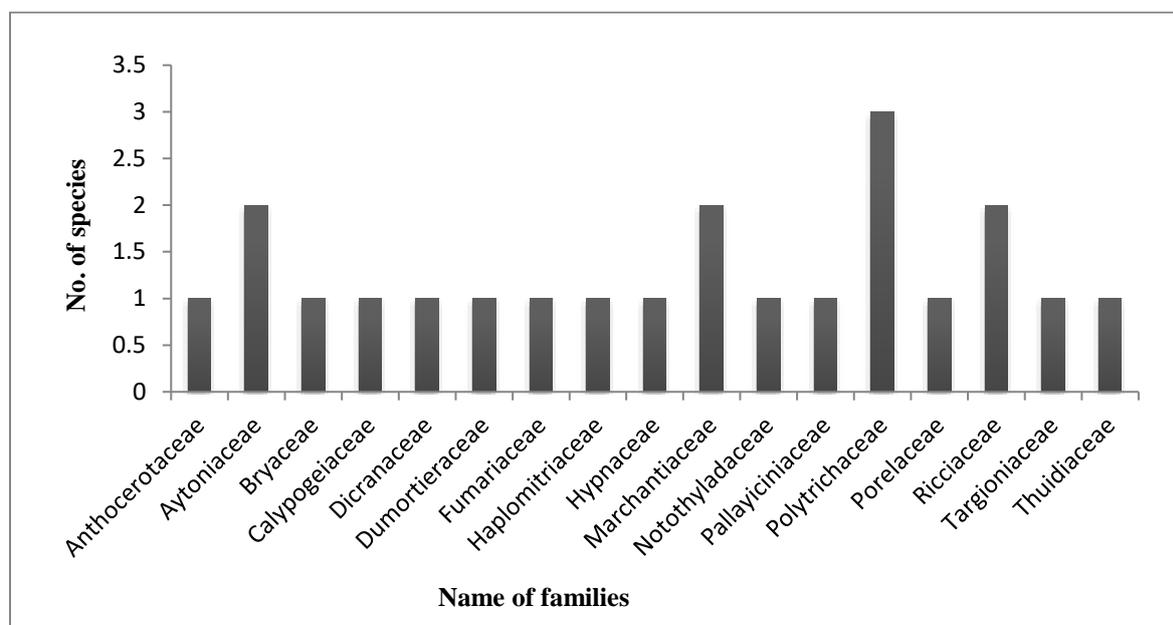


Fig. 3: Number of bryophytes according to the families

Table 3: List of the angiosperms of the study area

S. N.	Family	Botanical Name	Habit
1	Acanthaceae	<i>Strobilanthes alternata</i> (Burm.fil) Moylan ex J.R.I. Wood	Shrub
2	Acanthaceae	<i>Strobilanthes pentstemonoides</i> (Nees) T. Anderson	Shrub
3	Adoxaceae	<i>Sambucus hookeri</i> Rehder.	Shrub
4	Adoxaceae	<i>Viburnum erubescens</i> Wall.	Shrub
5	Amaranthaceae	<i>Achyranthes aspera</i> L.	Herb
6	Amaranthaceae	<i>Achyranthes bidentata</i> Blume.	Herb
7	Amaranthaceae	<i>Cyathula capitata</i> Moq.	Shrub
8	Amarylidaceae	<i>Allium wallichii</i> Kunth.	Herb
9	Anacardiaceae	<i>Dobinea vulgaris</i> Buch. -Ham	Shrub
10	Apiaceae	<i>Hydrocotyle sibthorpioides</i> Lam.	Herb
11	Apiaceae	<i>Bupleurum hamiltonii</i> Balak	Herb
12	Aquifoliaceae	<i>Ilex excels</i> (Wall.) Hook.fil.	Tree
13	Araceae	<i>Arisaema costatum</i> (Wall.) Mart.	Herb
14	Araliaceae	<i>Hedera nepalensis</i> K.Koch	Climber
15	Asparagaceae	<i>Chlorophytum nepalense</i> Baker.	Herb
16	Asteraceae	<i>Acmella uliginosa</i> Cass.	Herb
17	Asteraceae	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H.Rob.	Herb
18	Asteraceae	<i>Ainsliaea latifolia</i> (D. Don) Sch. Bip.	Herb
19	Asteraceae	<i>Anaphalis contorta</i> Hook.f.	Herb
20	Asteraceae	<i>Anaphalis margaritacea</i> (L.) Benth. & Hook.f.	Herb
21	Asteraceae	<i>Anaphalis busua</i> (Buch. -Ham.) Hand. -Mazz.	Herb
22	Asteraceae	<i>Anaphalis triplinervis</i> Sims ex C.B. Clarke	Herb
23	Asteraceae	<i>Artemisia vulgaris</i> L.	Herb
24	Asteraceae	<i>Bidens pilosa</i> L.	Herb
25	Asteraceae	<i>Bidens bipinnata</i> L.	Herb
26	Asteraceae	<i>Bidens ferulifolia</i> Hemsl.	Herb
27	Asteraceae	<i>Dichrocephala integrifolia</i> Kuntze.	Herb
28	Asteraceae	<i>Elephantopus scaber</i> L.	Herb
29	Asteraceae	<i>Inula cappa</i> Buch. -Ham. ex D.Don.	Shrub

Table 3: List of the angiosperms of the study area (Contd.).

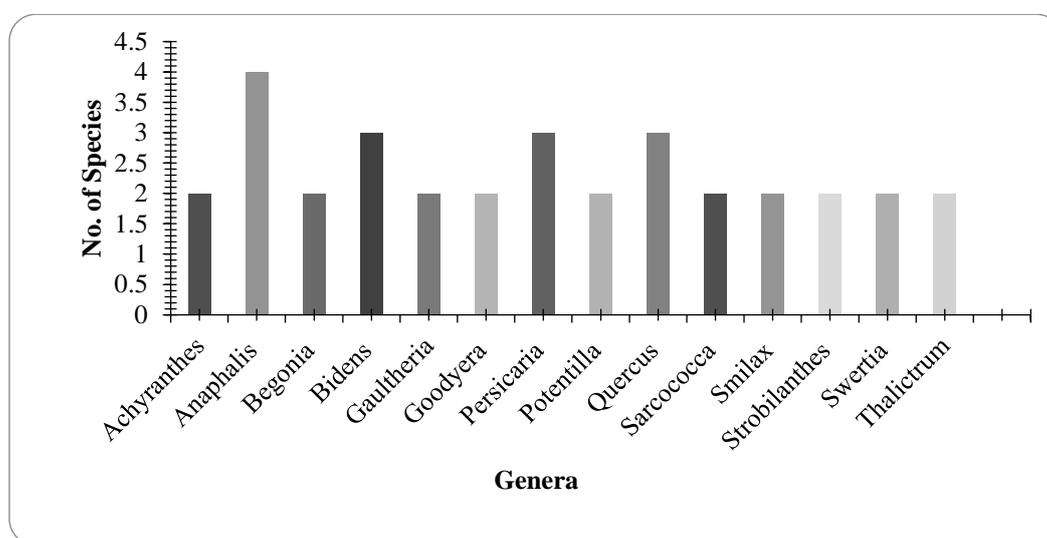
S. N.	Family	Botanical Name	Habit
30	Balsaminaceae	<i>Impatiens racemosa</i> DC.	Herb
31	Begoniaceae	<i>Begonia dioica</i> Buch. -Ham.	Herb
32	Begoniaceae	<i>Begonia picta</i> Sm.	Herb
33	Betulaceae	<i>Alnus nepalensis</i> D. Don	Tree
34	Betulaceae	<i>Betula alnoides</i> Buch. -Ham. ex D. Don	Tree
35	Brassicaceae	<i>Barbarea intermedia</i> Boreau	Herb
36	Buxaceae	<i>Sarcococca coriacea</i> Sweet.	Shrub
37	Buxaceae	<i>Sarcococca hookeriana</i> Baill.	Shrub
38	Campanulaceae	<i>Campanula pallida</i> Wall.	Herb
39	Campanulaceae	<i>Codonopsis viridis</i> Wall.	Herb
40	Caprifoliaceae	<i>Dipsacus inermis</i> Wall.	Herb
41	Caprifoliaceae	<i>Pterocephalus hookeri</i> (C.B. Clarke) E. Prtiz	Herb
42	Caprifoliaceae	<i>Valeriana jatamansi</i> Jones.	Herb
43	Caprifoliaceae	<i>Valeriana officinalis</i> L.	Herb
44	Caprifoliaceae	<i>Valeriana hardwickei</i> Wall.	Herb
45	Caryophyllaceae	<i>Stellaria monosperma</i> Buch. -Ham. ex D. Don	Herb
46	Commelinaceae	<i>Cyanotis vaga</i> Schult.f.	Herb
47	Convolvulaceae	<i>Cuscuta reflexa</i> Roxb.	Herb
48	Convolvulaceae	<i>Ipomoea purpurea</i> (L.) Roth	Climber
49	Crassulaceae	<i>Rhodiola sinuata</i> (Royle ex Edgew.) Fu	Herb
50	Ericaceae	<i>Gaultheria fragrantissima</i> Wall.	Shrub
51	Ericaceae	<i>Gaultheria nummularioides</i> D. Don	Herb
52	Ericaceae	<i>Lyonia ovalifolia</i> (Wall.) Drude.	Tree
53	Ericaceae	<i>Monotropa uniflora</i> L.	Herb
54	Ericaceae	<i>Pieris Formosa</i> D. Don.	Tree
55	Ericaceae	<i>Rhododendron arboreum</i> Sm.	Shrub
56	Euphorbiaceae	<i>Phyllanthus emblica</i> L.	Tree
57	Fabaceae	<i>Butea buteiformis</i> (Voigt) Grierson	Shrub
58	Fabaceae	<i>Desmodium multiflorum</i> DC.	Herb
59	Fabaceae	<i>Mimosa pudica</i> L.	Herb
60	Fabaceae	<i>Parochetus communis</i> Buch-Ham. ex D. Don	Herb
61	Fabaceae	<i>Trifolium repens</i> L.	Herb
62	Fagaceae	<i>Quercus glauca</i> Thunb.	Tree
63	Fagaceae	<i>Quercus lanata</i> Sm.	Tree
64	Fagaceae	<i>Quercus semecarpifolia</i> Sm.	Tree
65	Gentianaceae	<i>Swertia nervosa</i> (Wall. ex G. -Don) C.B.CI	Herb
66	Gentianaceae	<i>Swertia paniculata</i> Wall.	Herb
67	Geraniaceae	<i>Geranium polyanthus</i> Edgew. & Hook.f.	Herb
68	Gesneriaceae	<i>Aeschynanthus hookeri</i> C.B. Clarke	Herb
69	Gesneriaceae	<i>Didymocarpous albicalyx</i> C.B. Clarke	Herb
70	Hypericaceae	<i>Hypericum elodeoides</i> Choisy.	Herb
71	Lamiaceae	<i>Ajuga reptans</i> L.	Herb
72	Lamiaceae	<i>Clerodendrum bracteatum</i> Wall. Ex Walp.	Herb
73	Lamiaceae	<i>Elsholtzia flava</i> Benth.	Herb
74	Lamiaceae	<i>Leucas lanata</i> Benth.	Herb
75	Lamiaceae	<i>Scutellaria discolor</i> Colebr.	Shrub
76	Lauraceae	<i>Cinnamomum tamala</i> (Buch. -Ham.) Nees & Eberm.	Tree

Table 3: List of the angiosperms of the study area (Contd.)

S. N.	Family	Botanical Name	Habit
77	Lauraceae	<i>Lindera pulcherrima</i> (Nees) Benth.	Tree
78	Malvaceae	<i>Pterospermum acerifolium</i> Willd.	Tree
79	Melastomataceae	<i>Oxyspora paniculata</i> DC.	Shrub
80	Myricaceae	<i>Morella esculenta</i> (Buch. -Ham. ex D. Don.) I.M.Turner	Tree
81	Onagraceae	<i>Circaea alpina</i> L.	Herb
82	Orchidaceae	<i>Cochleanthes</i> Raf.	Herb
83	Orchidaceae	<i>Pleione humilis</i> (Sm.) D. Don.	Herb
84	Orchidaceae	<i>Spiranthes sinensis</i> (Pers.) Ames	Herb
85	Orchidaceae	<i>Dendrobium longicornu</i> Lindl.	Herb
86	Orchidaceae	<i>Bulbophyllum reptans</i> (Lindl.) Lindl. ex Wall.	Herb
87	Orchidaceae	<i>Coelogyne cristata</i> Lindl.	Herb
88	Orchidaceae	<i>Goodyera procera</i> (Ker Gawl.) Hook	Herb
89	Orchidaceae	<i>Goodyera schlechtendaliana</i> Rchb.	Herb
90	Papaveraceae	<i>Corydalis chaerophylla</i> DC.	Herb
91	Pentaphragaceae	<i>Eurya acuminate</i> DC.	Shrub
92	Plantaginaceae	<i>Hemiphragma heterophyllum</i> Wall.	Herb
93	Plantaginaceae	<i>Plantago major</i> L.	Herb
94	Poaceae	<i>Miscanthus nepalensis</i> Hack.	Herb
95	Polygalaceae	<i>Polygala persicariifolia</i> DC.	Herb
96	Polygonaceae	<i>Aconogonum molle</i> (D. Don) H. Hara	Shrub
97	Polygonaceae	<i>Bistorta amplexicaulis</i> (D. Don) Greene.	Herb
98	Polygonaceae	<i>Fagopyrum tataricum</i> (L.) Gaertn.	Shrub
99	Polygonaceae	<i>Persicaria capitata</i> Buch. -Ham. ex D. Don	Herb
100	Polygonaceae	<i>Persicaria nepalensis</i> (Meisn.) H.Gross	Herb
101	Polygonaceae	<i>Persicaria runcinata</i> Buch. -Ham. ex D. Don	Herb
102	Polygonaceae	<i>Polygonum nepalense</i> Hort.Elden.	Herb
103	Polygonaceae	<i>Rumex nepalensis</i> Spreng.	Herb
104	Primulaceae	<i>Primula denticulate</i> Sm.	Herb
105	Ranunculaceae	<i>Aconitum ferox</i> Wall. ex Seringe	Herb
106	Ranunculaceae	<i>Eriocapitella vitifolia</i> (Buch. -Ham. ex DC.) Nakai	Herb
107	Ranunculaceae	<i>Anemone</i> spp.	Herb
108	Ranunculaceae	<i>Clematis Montana</i> Buch. -Ham. ex.DC	Climber
109	Ranunculaceae	<i>Thalictrum foliolosum</i> DC.	Shrub
110	Ranunculaceae	<i>Thalictrum chelidonii</i> DC.	Shrub
111	Rosaceae	<i>Fragaria nubicola</i> Lindl.	Herb
112	Rosaceae	<i>Potentilla fulgens</i> Wall. ex Hook.	Shrub
113	Rosaceae	<i>Potentilla polyphylla</i> Wall. ex Lehm.	Shrub
114	Rosaceae	<i>Pyrus pashia</i> Buch. -Ham. ex D. Don	Tree
115	Rosaceae	<i>Rubus nepalensis</i> (Hook.fil.) Kuntze	Shrub
116	Rosaceae	<i>Rubus rugosus</i> Sm.	Climber
117	Rubiaceae	<i>Galiium asperifolium</i> Wall.	Herb
118	Rubiaceae	<i>Rubia manjith</i> Roxb.	Climber
119	Rutaceae	<i>Boenninghausenia albiflora</i> (Hook.) Meisn.	Herb
120	Rutaceae	<i>Zanthoxylum armatum</i> DC.	Shrub
121	Saxifragaceae	<i>Astilbe revularis</i> Buch. -Ham.	Herb
122	Saxifragaceae	<i>Bergenia ciliata</i> (Haw.) Sternb.	Herb
123	Scrophulariaceae	<i>Pedicularis gracilis</i> Wall. ex Benth.	Herb

Table 3: List of the angiosperms of the study area (Contd.).

S. N.	Family	Botanical Name	Habit
124	Smilacaceae	<i>Smilax aspera</i> L.	Shrub
125	Smilacaceae	<i>Smilax ovalifolia</i> Roxb. ex D. Don	Shrub
126	Thymelaeaceae	<i>Wikstroemia canescens</i> Meisn.	Shrub
127	Urticaceae	<i>Laportea terminalis</i> Wight	Herb
128	Urticaceae	<i>Urtica dioica</i> L.	Shrub
129	Vitaceae	<i>Tetrastigma serrulatum</i> (Roxb.) Planch.	Climber
130	Zingiberaceae	<i>Cautleya spicata</i> Baker.	Herb
131	Zingiberaceae	<i>Hedychium ellipticum</i> Sm.	Herb
132	Zingiberaceae	<i>Roscoea alpine</i> Royle.	Herb
133	Zingiberaceae	<i>Roscoea purpurea</i> Sm.	Herb
134	Zingiberaceae	<i>Zingiber officinale</i> Roscoe.	Herb

**Fig. 4:** Number of the genera with higher number of species

The present study has reported 134 species of flowering plants under 112 genera of 55 families (Table 3). Out of 112 genera, *Anaphalis* was the dominant genera with 4 species followed by *Bidens* (3 spp.), *Quercus* (3 spp.) and *Persicaria* (3 spp.) (Fig. 4). Among total species, 114 species were dicotyledons and 20 species of monocotyledons. Among 55 families, Asteraceae was found richest family with 14 species followed by Orchidaceae (8 spp.), Polygonaceae (8 spp.), Ranunculaceae (6 spp.), Ericaceae (6 spp.), Rosaceae (6 spp.), Caprifoliaceae (5 spp.), Fabaceae (5 spp.), and Lamiaceae (5 spp.) (Fig. 5). Plant species has been reported on different habits where most of the species were herbs (87 spp.) followed by shrubs (27 spp.), trees (14 spp.) and climber (6 spp.) (Fig. 6). Herbs are found abundantly in the nature in comparison to other habits (Shrestha and Dhillion, 2003; Chaudhary *et al.*, 2020; Mallik *et al.*, 2020; Ojha Khatri *et al.*, 2021; Bhaila *et al.*, 2022; Magar *et al.*, 2022; Dulal *et al.*, 2022). However, Chapagain *et al.* (2016) has listed 1068 species of flowering plants consisting of 210 tree species, 211 species of shrubs and 647 species of herbs from the Makwanpur district. Previous study revealed

tropical to temperate forest of Makwanpur district dominated by *Rhododendron arboreum*, *Morella esculenta*, *Lyonia ovalifolia*, and *Quercus lanata* (Bhattarai *et al.*, 2018). In the present study temperate forest has reported *Pieris formosa* as additionally dominating tree along with *Myrica esculenta* and *Rhododendron arboretum*. Previous study of Chalise *et al.* (2020) has reported 98 angiosperm species from the Daman and adjoining areas with Rosaceae as largest family among dicot families that differs with present finding, might due to different collection time and Orchidaceae among monocot families which shows similarity with present one. However, Joshi (2014) has also supported the dominance of Orchidaceae among monocots. Also, the present study has recorded 77 different additional species of angiosperms from wild habitat than that of Chalise *et al.* (2020). Tamang and Chapagain (2016) has recorded 510 plant species belonging to 391 genera and 130 families from three botanical garden of Makwanpur district including 190 species from Daman Botanical Garden. Joshi (2014) found 695 species belonging to 472 genera and 124 families, where, Fabaceae was the dominant family with 60 species and 33 genera.

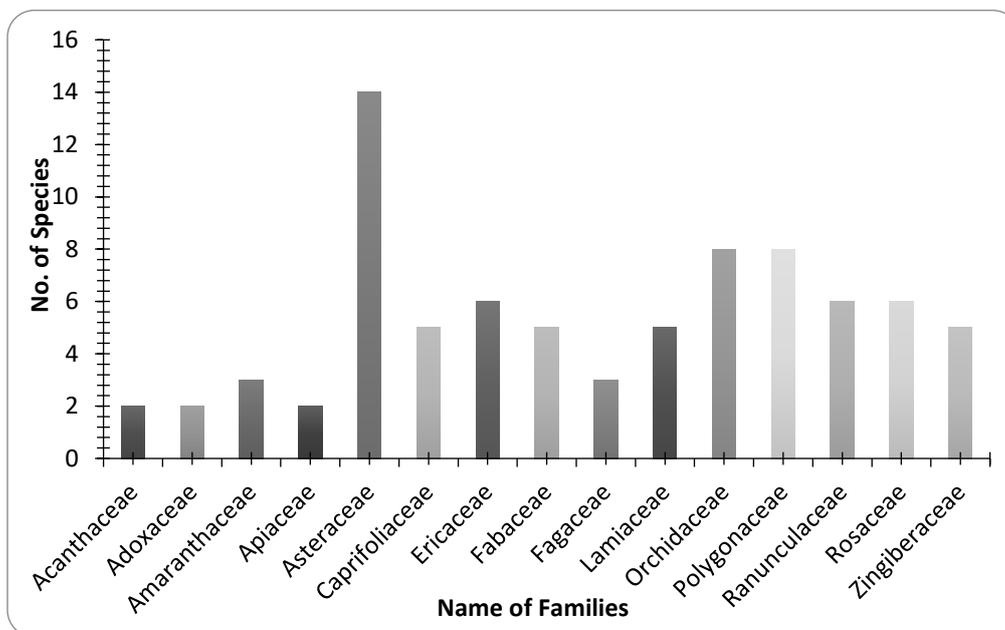


Fig 5: Number of families with higher number of species

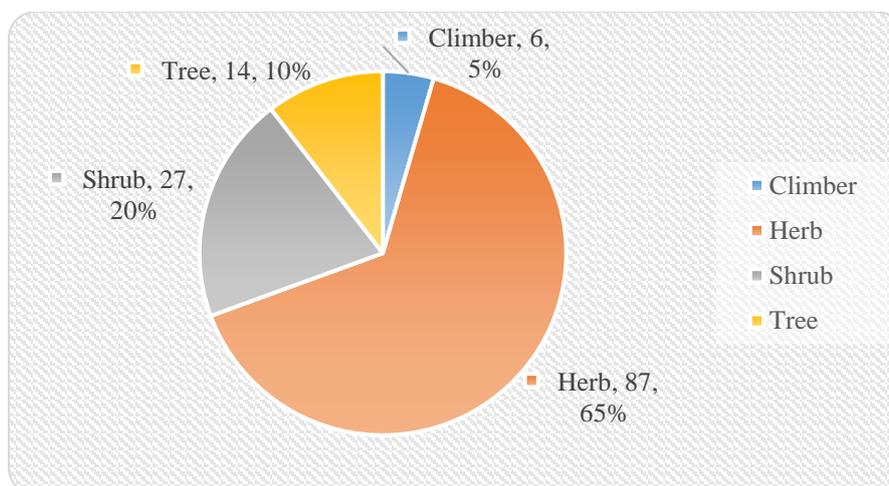


Fig 6: Number of species according to habit of angiosperms

Table 4. List of gymnosperms recorded in the present study

S.N.	Family	Name
1	Araucariaceae	<i>Araucaria bidwili</i> Hook.
2	Cupressaceae	<i>Thuja orientalis</i> L.
3	Pinaceae	<i>Pinus wallichiana</i> A. B. Jacks

Our study has recorded three gymnosperms viz. *Araucaria bidwili*, *Thuja orientalis* and *Pinus wallichiana* under 3 genera and 3 different families (Table 4). According to Bista (2006) the number of Gymnosperms found in Nepal are 26 that represent 5.1% of total known gymnosperm in World. Bhattarai *et al.* (2018) found one species of gymnosperm,

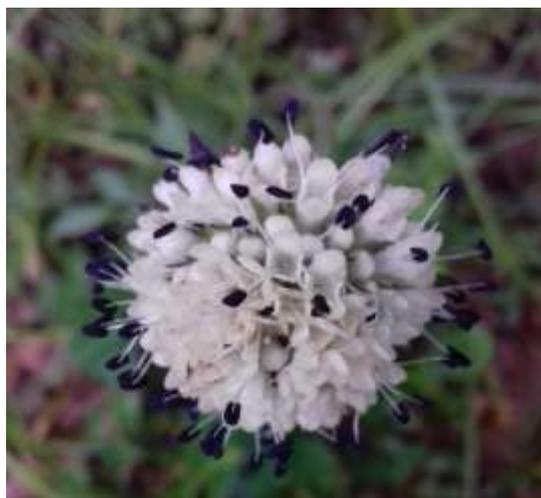
Pinus roxburghii as dominating tree species in forest of Sub-tropical region of Makwanpur district, which coincides with present finding and additionally, *Araucaria* and *Thuja* species has been reported from the study site.

Conclusions

Daman-Simbhanjyang area being near to Kathmandu city has been explored frequently and present study has lighted on recent wild plant diversity in the area away from Botanical Gardens and nurseries. Various species of bryophytes, pteridophytes, gymnosperms and many more angiosperms have been reported. A unique geographical and micro climatic condition along the different parts of area has supported a huge plant diversity of different habit with respect to its area.



Pallavicinia blytii (Moerck ex Hornem.) Lindb



Dipsacus inermis Wall.



Rhodiola sinuata (Royle ex Edgew.) Fu



Rubus nepalensis (Hook.fil.) Kuntze



Laportea terminalis Wight



Eriocapitella vitifolia (Buch.-Ham. ex DC) Nakai

Fig. 7: Some bryophytes and angiosperms species recorded in wild habitat

Authors' Contribution

Both authors contributed equally at all stages of research and manuscript preparation. Final form of manuscript was approved by all authors.

Conflict of Interest

The authors declare to have no any conflict of interest.

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References

- Bhaila A, Shakya S, Kunwar B, Baral B, Chaudhary S and Munankarmi NN (2022) Ethnomedicinal exploration of plants utilized by the people of Suryabinayak Municipality in Bhaktapur district, Nepal. *Vegetos* **35**. DOI: [10.1007/s42535-021-00339-2](https://doi.org/10.1007/s42535-021-00339-2)
- Bhattarai S, Bhatta B and Tamang R (2018) Distribution pattern of tree species from tropical to temperate regions in Makawanpur district, central Nepal. *Banko Janakari* **28**(1): 20-25. DOI: [10.3126/banko.v28i1.21452](https://doi.org/10.3126/banko.v28i1.21452)
- Bista M (2006) Gymnosperms of Nepal. In: Jha PK, Chaudhary RP, Karmacharya SB and Prasad V (Eds) *Environment and Plants: Glimpses of Research in South Asia*. Ecological Society, Kathmandu.
- Bridson D and Forman L (2014) *Herbarium Handbook* Third Edition. Royal Botanic Gardens, Kew: United Kingdom.
- Chalise P, Paneru YR, Dhakal S and Tharu LR (2020) Floristic Diversity of Vascular Plants in Daman and Adjoining Areas, Makawanpur District, Central Nepal. *Journal of Plant Resource* **18**(1): 116-123.
- Chapagain NH, Pandit RK and Tamang R (2016) Flowering Plants of Makwanpur. District Plant Resource Office, Makwanpur, Nepal.
- Chaudhary RP, Uprety Y and Joshi SP (2016) Plant Biodiversity. In: Nepal: Conservation and Legal Status. *Frontiers of Botany*. Central Department of Botany (CDB), Tribhuvan University, Kathmandu, Nepal. pp. 224-68.
- Chaudhary S, Magar GT, Sah SN and Parajuli S (2020) Ethnic Plants of Tharu Community of Eastern Nepal. *Int J Appl Sci Biotechnol* **8**(2): 223-230. DOI: [10.3126/ijasbt.v8i2.28325](https://doi.org/10.3126/ijasbt.v8i2.28325)
- Cullen J (1996) *The Identification of Flowering Plant Families*. Cambridge University Press: Edinburgh.
- Don D (1825) *Prodromus Florae Nepalensis*, London.
- Dulal K, Chaudhary S, Uprety Y, Shrestha N, Shakya S and Munankarmi N (2022) Ethnomedicinal plants used by the local people of Changunarayan Municipality, central Nepal. *Ethnobotany Research and Applications* **23**: 1-27.
- Fraser-Jenkins CR, Kandel DR and Pariyar S (2015) Ferns and fern-allies of Nepal. *The Indian Fern Journal* **36**: 342-346.
- GoN/MoFSC (2014) Nepal National Biodiversity Strategy and Action Plan: 2014- 2020. Ministry of Forests and Soil Conservation, Government of Nepal, Kathmandu.
- Hara H and Williams LHJ (1979) *An Enumeration of the Flowering Plants of Nepal*. Vol 2. London: The British Museum (Natural History).
- Hara H, Chater AO and Williams LHJ (1982) *An Enumeration of the Flowering Plants of Nepal*. Vol 3. London: The British Museum (Natural History).
- Hara H, Stearn WT and Williams LHJ (1978) *An Enumeration of the Flowering Plants of Nepal*. Vol 1. London: The British Museum (Natural History).
- Harris JG and Harris MW (2001) *Plant identification terminology: An illustrated glossary* (2nd ed.). Spring Lake Publishing: Spring Lake, Utah.
- Hasan MK, Gatto P and Jha PK (2013) Traditional uses of wild medicinal plants and their management practices in Nepal-A study in Makawanpur district. *International Journal of Medicinal and Aromatic Plants* **3**(1): 102-112.
- Hooker JD (1892-1897) *The Flora of British India*. Vol 7. London: Reeve.
- Joshi N (2014) Utilization pattern and conservation status of plant resources of Makawanpur district, central Nepal. PhD thesis. Central Department of Botany, Tribhuvan University, Nepal.
- Karki S and Ghimire SK (2019) Bryophytes of Suspa-Kshamawoti, Dolakha District, Central Nepal. *Journal of Plant Resource* **17**(1): 21-28. DOI: [10.3126/banko.v29i2.28097](https://doi.org/10.3126/banko.v29i2.28097)
- Kunwar RM and Bussmann RW (2008) Ethnobotany in the Nepal Himalaya. *J Ethnobiol Ethnomedicine* **4**:24. DOI: [10.1186/1746-4269-4-24](https://doi.org/10.1186/1746-4269-4-24)
- Magar RA, Mallik AR, Chaudhary S and Parajuli S (2022) Ethnomedicinal plants used by the people of Dharan, Eastern Nepal. *Indian Journal of Traditional Knowledge* **21**(1):72-80.
- Mallik AR, Chaudhary S and Shrestha S (2020) Useful Valuable Plants of Maithili Community in Eastern Nepal: An Ethnobotanical Study. *Bangladesh Journal of Plant Taxonomy* **27**(2): 439-446. DOI: [10.3329/bjpt.v27i2.50678](https://doi.org/10.3329/bjpt.v27i2.50678)
- Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca GA Kent J (2000) Biodiversity hotspots for conservation priorities. *Nature* **403**(6772): 853-858. DOI: [10.1038/35002501](https://doi.org/10.1038/35002501)
- Ojha Khatri S, Chaudhary S, Shrestha N and Munankarmi NN (2021) Ethnomedicinal study and phytochemical screening of selected plants in Jhule, Dolakha District, Nepal. *Vegetos* **34**(4): 834-846. DOI: [10.1007/s42535-021-00266-2](https://doi.org/10.1007/s42535-021-00266-2)
- Pearce NR and Cribb PJ (2002) *Flora of Bhutan*. Vol 3. Royal Botanic Garden: Edinburgh.
- Polunin O and Stainton A (1984) *Flowers of the Himalaya*. Oxford Press: London.
- Pradhan N (2014) Altitudinal Distribution of Bryoflora at Chandragiri Mountain Forest of Kathmandu District,

- Central Nepal. *J Nat Hist Mus* **28**: 81-92. DOI: [10.3126/jnhm.v28i0.14184](https://doi.org/10.3126/jnhm.v28i0.14184)
- Pradhan N and Joshi S (2009a) A Diversity Account of Bryaceae (Bryophyta: Musci) of Nepal. *J Nat Hist Mus* **23**: 19-26. DOI: [10.3126/jnhm.v23i0.1836](https://doi.org/10.3126/jnhm.v23i0.1836)
- Pradhan N and Joshi SD (2009b) Liverworts and hornworts Nepal: a synopsis. *Botanica Orientalis- Journal of Plant Science* **6**: 69-75. DOI: [10.3126/botor.v6i0.2913](https://doi.org/10.3126/botor.v6i0.2913)
- Rajbhandari KR (2001) Ethnobotany of Nepal. Ethnobotanical Society of Nepal, Kathmandu.
- Rajbhandary S (2016) Fern and fern allies of Nepal. In: Jha PK, Siwakoti M and Rajbhandary S (Eds).
- Shrestha PM and Dhillion SS (2003) Medicinal plants diversity and use in the high lands of Dolakha district, Nepal. *J Ethnopharmacol* **86**(1): 81-96. DOI: [10.1016/S0378-8741\(03\)00051-5](https://doi.org/10.1016/S0378-8741(03)00051-5)
- Stainton A (1987-88) Flowers of the Himalaya- a Supplement. Oxford Press: London.
- Tamang R and Chapagain NH (2016) Documentation of Plant diversity Conserved in Botanical Gardens of Makwanpur, Nepal. *Plant Resources* **38**: 30-41.
- Wallich N (1826) Tentamen Flora Nepalensis Fascicle 1. Bishen Singh Mahendra Pal Singh, India.
- Watson MF, Ikeda H, Rajbhandari KR, Akiyama S, Pendry CA and Shrestha KK (2011) Flora of Nepal. Vol 3. Nepal edition 2013. Central Department of Botany, Tribhuvan University, Kirtipur, Nepal., NAST, Khumaltar, Lalitpur., Department of Plant Resources and Ministry of Forest and Soil Conservation, Nepal.
- Wu Z, Raven PH and Hong D (1994-2008) Flora of China. Vol 2, 4, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 25. Science Press (Beijing) and Missouri Botanical Garden Press (St. Louis).