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

Gyanu Thapa Magar1, Sujan Chaudhary2*

1Department of Botany, Mahendra Multiple Campus, Tribhuvan University, Banke, Nepal
2Department of Botany, Amrit Campus, Tribhuvan University, Kathmandu, Nepal

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.

Keywords: Floristic composition; Wild habitat; Makwanpur District

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 Pine forest, 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; Hará et al., 1978; Hará and Williams, 1979; Hará 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 K EW, TI, RBGE, and KATH.

Exclusion Criteria
The study of plant species from botanical garden of Daman-Simhbanjyang 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.) and Dennstaedtiaceae (4 spp.) and so on (Fig. 2). In very recent report, 11 Pteridophytes has been reported from Daman-Simhbanjyang 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    | Aspleniacæ     | Asplenium L.                              |
| 2    | Aspleniacæ     | Diplazium caudatum (Cav.) Jermy          |
| 3    | Cyathæace     | Alsophila dealbata C. Presl                |
| 4    | Dennstaedtiaæ  | Dennstaedtia Moore                        |
| 5    | Dennstaedtiaæ  | Microlepia strigose (Thunb.) C. Presl     |
| 6    | Dennstaedtiaæ  | Pteridium aquilinum (L.) Kuhn             |
| 7    | Dennstaedtiaæ  | Pteridium esculentum (Forst.) Nakai       |
| 8    | Dryopteridæ    | Dryopteris Adans.                         |
| 9    | Dryopteridæ    | Polystichum Roth                          |
| 10   | Equisetææ      | Equisetum L.                              |
| 11   | Hypodematiææ  | Leucostegia truncate (D.Don) Fraser-Jenck |
| 12   | Lindsæææ      | Odontosoria chinensis (L.) J.Sm.          |
| 13   | Lycopodiææ     | Huperzia Bernh.                           |
| 14   | Lycopodiææ     | Lycopodium japonicum Thunb. ex Murray     |
| 15   | Nephrolepidæae | Nephrolepis Schott                        |
| 16   | Ophioglossææ  | Botrychium Sw.                            |
| 17   | Polypodiææ     | Aглаomorpha quercifolia (L.) Hovenkamp & S.Linds. |
| 18   | Polypodiææ     | Lepisorus (J.Sm.) Chung                    |
| 19   | Polypodiææ     | Loxogramme (Blume) C.Presl                |
| 20   | Polypodiææ     | Pichisermiïliodes stewartia (Bedd.) Fraser-Jenck |
| 21   | Polypodiææ     | Selliguea capitellata (Wall.) X.C.Zhang & L.J.He |
| 22   | Pteridææ        | Adiantum L.                               |
| 23   | Pteridææ        | Aleuripteris albomarginata (Clarke) Crane  |
| 24   | Pteridææ        | Haplopteris flexuosa (Fée) E.H.Crane      |
| 25   | Pteridææ        | Onychium cryoptogrammoides Christ          |
| 26   | Pteridææ        | Onychium japonicum (Thunb.) Kunze         |
| 27   | Pteridææ        | Pteris ensiformis Burm.                   |
| 28   | Pteridææ        | Pteris wallchichiana C.Agardh             |
| 29   | Selaginellææ   | Selaginella P.Beauv.                      |
| 30   | Tectariææ      | Tectaria trifoliata (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-Simbhanjyang 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.

Table 2: List of bryophytes of the study area

| S.N. | Family           | Name                              |
|------|------------------|-----------------------------------|
| 1    | Anthocerotaceae  | *Anthoceros* L.                   |
| 2    | Aytoniaceae      | *Asterella californica* P.Beauv.   |
| 3    | Aytoniaceae      | *Plagiochasma* Lehms. & Lindens.  |
| 4    | Bryaceae         | *Bryum* Hedw.                     |
| 5    | Calypogeiacae    | *Calypogea* Raddi                 |
| 6    | Dicranaceae      | *Dicranoweisia crispula* Milde    |
| 7    | Dumortieraceae   | *Dumortiera* Nees                |
| 8    | Funariaceae      | *Funaria* Hedw.                   |
| 9    | Haplotrichiaceae | *Haplotrichium* Nees             |
| 10   | Hypnaceae        | *Taxiphyllum* M.Fleisch.          |
| 11   | Marchantiaceae   | *Marchantia polymorpha* L.        |
| 12   | Marchantiaceae   | *Marchantia quadrata* Scop.       |
| 13   | Notothyladaceae  | *Notothyas* Sull.                 |
| 14   | Pallaviciniaceae | *Pallavicinia blytii* (Moerck ex Hornem.) Lindb. |
| 15   | Polytrichaceae   | *Pogonatum* P.Beauv.              |
| 16   | Polytrichaceae   | *Polytrichium commune* Hedwig     |
| 17   | Polytrichaceae   | *Polytrichium juniperinum* Hedwig |
| 18   | Porellaceae      | *Porella* L.                      |
| 19   | Ricciaceae       | *Riccia* L.                       |
| 20   | Ricciaceae       | *Ricciocarpos* Corda              |
| 21   | Targioniaceae    | *Targionia* L.                    |
| 22   | Thuidiaceae      | *Thuidium* Bruch & Schimp.        |

**Fig. 2:** Number of pteridophytes according to the families
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   | *Strobilanthes alternata* (Burm.fil) Moylan ex J.R.I. Wood                    | Shrub   |
| 2     | Acanthaceae   | *Strobilanthes pentstemonoides* (Nees) T. Anderson                            | Shrub   |
| 3     | Adoxaceae     | *Sambucus hookeri* Rehder.                                                    | Shrub   |
| 4     | Adoxaceae     | *Viburnum erubescens* Wall.                                                   | Shrub   |
| 5     | Amaranthaceae | *Achyranthes aspera* L.                                                       | Herb    |
| 6     | Amaranthaceae | *Achyranthes bidentata* Blume.                                                | Herb    |
| 7     | Amaranthaceae | *Cyathula capitata* Moq.                                                       | Shrub   |
| 8     | Amaryllidaceae| *Allium wallichii* Kunth.                                                      | Herb    |
| 9     | Anacardiaceae | *Dobinea vulgaris* Buch. -Ham                                                  | Shrub   |
| 10    | Apiaceae      | *Hydrocotyle sibthorpioides* Lam.                                              | Herb    |
| 11    | Apiaceae      | *Bupleurum hamiltonii* Balak                                                  | Herb    |
| 12    | Aquifoliaceae | *Ilex excels* (Wall.) Hook.fil.                                               | Tree    |
| 13    | Araceae       | *Arisaema costatum* (Wall.) Mart.                                             | Herb    |
| 14    | Araliaceae    | *Hedera nepalensis* K.Koch                                                     | Climber |
| 15    | Asparagaceae  | *Chlorophytum nepalense* Baker.                                               | Herb    |
| 16    | Asteraceae    | *Acmella uliginosa* Cass.                                                      | Herb    |
| 17    | Asteraceae    | *Ageratina adenophora* (Spreng.) R.M.King & H.Rob.                            | Herb    |
| 18    | Asteraceae    | *Ainsliaea latifolia* (D. Don) Sch. Bip.                                      | Herb    |
| 19    | Asteraceae    | *Anaphalis contorta* Hook.f.                                                   | Herb    |
| 20    | Asteraceae    | *Anaphalis margaritacea* (L.) Benth. & Hook.f.                                | Herb    |
| 21    | Asteraceae    | *Anaphalis busua* (Buch. -Ham.) Hand. -Mazz.                                  | Herb    |
| 22    | Asteraceae    | *Anaphalis triplinervis* Sims ex C.B. Clarke                                  | Herb    |
| 23    | Asteraceae    | *Artemisia vulgaris* L.                                                        | Herb    |
| 24    | Asteraceae    | *Bidens pilosa* L.                                                            | Herb    |
| 25    | Asteraceae    | *Bidens bipinnata* L.                                                          | Herb    |
| 26    | Asteraceae    | *Bidens ferulifolia* Hems.l.                                                  | Herb    |
| 27    | Asteraceae    | *Dichrocephala integrifolia* Kuntze.                                          | Herb    |
| 28    | Asteraceae    | *Elephantopus scaber* L.                                                       | Herb    |
| 29    | Asteraceae    | *Inula cappa* 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     | *Impatiens racemosa* DC.         | Herb    |
| 31    | Begoniaceae       | *Begonia dioica* Buch. -Ham.     | Herb    |
| 32    | Begoniaceae       | *Begonia picta* Sm.             | Herb    |
| 33    | Betulaceae        | *Alnus nepalensis* D.Don         | Tree    |
| 34    | Betulaceae        | *Betula alnoides* Buch. -Ham. ex D. Don | Tree |
| 35    | Brassicaceae      | *Barbarea intermedia* Boreau    | Herb    |
| 36    | Buxaceae          | *Sarcococca coriacea* Sweet.    | Shrub   |
| 37    | Buxaceae          | *Sarcococca hookeriana* Baill.  | Shrub   |
| 38    | Campanulaceae     | *Campanula pallida* Wall.       | Herb    |
| 39    | Campanulaceae     | *Codonopsis viridis* Wall.      | Herb    |
| 40    | Caprifoliaceae    | *Dipsacus inermis* Wall.         | Herb    |
| 41    | Caprifoliaceae    | *Pterocephalus hookeri* (C.B. Clarke) E. Priz | Herb |
| 42    | Caprifoliaceae    | *Valeriana jatamansi* Jones.    | Herb    |
| 43    | Caprifoliaceae    | *Valeriana officinalis* L.      | Herb    |
| 44    | Caprifoliaceae    | *Valeriana hardwickei* Wall.    | Herb    |
| 45    | Caryophyllaceae   | *Stellaria monosperma* Buch. -Ham. ex D. Don | Herb |
| 46    | Commelinaceae     | *Cyanotis vaga* Schult.f.        | Herb    |
| 47    | Convolvulaceae    | *Cuscuta reflexa* Roxb.          | Herb    |
| 48    | Convolvulaceae    | *Ipomoea purpurea* (L.) Roth     | Climber |
| 49    | Crassulaceae      | *Rhodiola sinuata* (Royle ex Edgew.) Fu | Herb |
| 50    | Ericaceae         | *Gaultheria fragrantissima* Wall. | Shrub |
| 51    | Ericaceae         | *Gaultheria nummularioides* D. Don | Herb |
| 52    | Ericaceae         | *Lyonia ovalifolia* (Wall.) Drude. | Tree |
| 53    | Ericaceae         | *Monotropa uniflora* L.          | Herb    |
| 54    | Ericaceae         | *Pieris Formosa* D. Don.         | Tree    |
| 55    | Ericaceae         | *Rhododendron arboreum* Sm.      | Shrub   |
| 56    | Euphorbiaceae     | *Phyllanthus emblica* L.         | Tree    |
| 57    | Fabaceae          | *Butea buteiformis* (Voigt) Grierson | Shrub |
| 58    | Fabaceae          | *Desmodium multiflorum* DC.      | Herb    |
| 59    | Fabaceae          | *Mimosa pudica* L.               | Herb    |
| 60    | Fabaceae          | *Pareochetus communis* Buch-Ham. ex D. Don | Herb |
| 61    | Fabaceae          | *Trifolium repens* L.            | Herb    |
| 62    | Fabaceae          | *Quercus glauca* Thunb.          | Tree    |
| 63    | Fabaceae          | *Quercus lanata* Sm.             | Tree    |
| 64    | Fabaceae          | *Quercus semecarpifolia* Sm.     | Tree    |
| 65    | Gentianaceae      | *Swertia nervosa* (Wall. ex G. Don) C.B.CI | Herb |
| 66    | Gentianaceae      | *Swertia paniculata* Wall.       | Herb    |
| 67    | Geraniaceae       | *Geranium polyanthus* Edgew. & Hook.f. | Herb |
| 68    | Gesneriaceae      | *Aeschynanthus hookeri* C.B.Clarke | Herb |
| 69    | Gesneriaceae      | *Didymocarpous albicalyx* C.B. Clarke | Herb |
| 70    | Hypericaceae      | *Hypericum elodeoides* Choisy.   | Herb    |
| 71    | Lamiaceae         | *Ajuga reptans* L.               | Herb    |
| 72    | Lamiaceae         | *Clverodendrum bracteatum* Wall. Ex Walp. | Herb |
| 73    | Lamiaceae         | *Elshtoltzia flavia* Benth.      | Herb    |
| 74    | Lamiaceae         | *Leucas lanata* Benth.           | Herb    |
| 75    | Lamiaceae         | *Scutellaria discolor* Colebr.   | Shrub   |
| 76    | Lauraceae         | *Cinnamomum tamala* (Buch. -Ham.) Nees & Eberm. | Tree |

This paper can be downloaded online at [http://ijasbt.org](http://ijasbt.org) & [http://nepjol.info/index.php/IJASBT](http://nepjol.info/index.php/IJASBT)
| S. N. | Family   | Botanical Name                       | Habit       |
|-------|----------|--------------------------------------|-------------|
| 77    | Lauraceae| *Lindera pulcherrima* (Nees) Benth.  | Tree        |
| 78    | Malvaceae| *Pterospermum acerifolium* Willd.    | Tree        |
| 79    | Melastomataceae | *Oxyspora paniculata* DC. | Shrub |
| 80    | Myricaceae| *Morella esculenta* (Buch. -Ham. ex D. Don.) I.M.Turner | Tree |
| 81    | Onagraceae| *Circaea alpina* L.                 | Herb        |
| 82    | Orchidaceae | *Cochleanthes* Raf.                | Herb        |
| 83    | Orchidaceae | *Pleione humilis* (Sm.) D. Don.     | Herb        |
| 84    | Orchidaceae | *Spiranthes sinensis* (Pers.) Ames | Herb |
| 85    | Orchidaceae | *Dendrobium longicornu* Lindl.      | Herb        |
| 86    | Orchidaceae | *Bulbophyllum reptans* (Lindl.) Lindl. ex Wall. | Herb |
| 87    | Orchidaceae | *Coelogyne cristata* Lindl.         | Herb        |
| 88    | Orchidaceae | *Goodyera procera* (Ker Gawl.) Hook | Herb |
| 89    | Orchidaceae | *Goodyera schlechtendaliana* Rchb. | Herb |
| 90    | Papaveraceae | *Corydalis chaerophylla* DC. | Herb |
| 91    | Pentaphylacaceae | *Eurya accuminata* DC. | Shrub |
| 92    | Plantaginaceae | *Hemiphragma heterophyllum* Wall. | Herb |
| 93    | Plantaginaceae | *Plantago major* L. | Herb |
| 94    | Poaceae | *Miscanthus nepalensis* Hack.       | Herb        |
| 95    | Polygalaceae | *Polygala persicariifolia* DC. | Herb |
| 96    | Polygonaceae | *Aconogonum molle* (D. Don) H. Hara | Shrub |
| 97    | Polygonaceae | *Bistorta amplexicaulis* (D. Don) Greene. | Herb |
| 98    | Polygonaceae | *Fagopyrum tataricum* (L.) Gaertn. | Shrub |
| 99    | Polygonaceae | *Persicaria capitata* Buch. -Ham. ex D. Don | Herb |
| 100   | Polygonaceae | *Persicaria nepalensis* (Meisn.) H.Gross | Herb |
| 101   | Polygonaceae | *Persicaria runcinata* Buch. -Ham. ex D. Don | Herb |
| 102   | Polygonaceae | *Polygonum nepalense* Hort.Elden. | Herb |
| 103   | Polygonaceae | *Rumex nepalensis* Spreng. | Herb |
| 104   | Primulaceae | *Primula denticulate* Sm. | Herb |
| 105   | Ranunculaceae | *Aconitum ferox* Wall. ex Seringe | Herb |
| 106   | Ranunculaceae | *Eriocapitella vitifolia* (Buch. -Ham. ex DC.) Nakai | Herb |
| 107   | Ranunculaceae | *Anemone spp.* | Herb |
| 108   | Ranunculaceae | *Clematis Montana* Buch. -Ham. ex DC. | Climber |
| 109   | Ranunculaceae | *Thalictrum foliolosum* DC. | Shrub |
| 110   | Ranunculaceae | *Thalictrum chelidonii* DC. | Shrub |
| 111   | Rosaceae | *Fragaria nubicola* Lindl. | Herb |
| 112   | Rosaceae | *Potentilla fulgens* Wall. ex Hook. | Shrub |
| 113   | Rosaceae | *Potentilla polyphylla* Wall. ex Lehm. | Shrub |
| 114   | Rosaceae | *Pyrus pashia* Buch. -Ham. ex D. Don | Tree |
| 115   | Rosaceae | *Rubus nepalensis* (Hook.fil.) Kuntze | Shrub |
| 116   | Rosaceae | *Rubus rugosus* Sm. | Herb |
| 117   | Rubiaceae | *Galium asperifolium* Wall. | Herb |
| 118   | Rubiaceae | *Rubia manjith* Roxb. | Climber |
| 119   | Rutaceae | *Boenninghausenia albitflora* (Hook.) Meisn. | Herb |
| 120   | Rutaceae | *Zanthoxylum armatum* DC. | Herb |
| 121   | Saxifragaceae | *Astilbe revularis* Buch. -Ham. | Herb |
| 122   | Saxifragaceae | *Bergenia ciliata* (Haw.) Sternb. | Herb |
| 123   | Scrophulariaceae | *Pedicularis gracilis* Wall. ex Benth. | Herb |
Table 3: List of the angiosperms of the study area (Contd.).

| S. N. | Family            | Botanical Name                     | Habit         |
|-------|-------------------|-----------------------------------|---------------|
| 124   | Smilacaceae       | *Smilax aspera* L.                | Shrub         |
| 125   | Smilacaceae       | *Smilax ovalifolia* Roxb. ex D. Don | Shrub         |
| 126   | Thymelaeaceae     | *Wikstroemia canescens* Meisn.    | Shrub         |
| 127   | Urticaceae        | *Laportea terminalis* Wight       | Herb          |
| 128   | Urticaceae        | *Urtica dioica* L.                | Shrub         |
| 129   | Vitaceae          | *Tetrastigma serrulatum* (Roxb.) Planch. | Climber     |
| 130   | Zingiberaceae     | *Cauleya spicata* Baker.          | Herb          |
| 131   | Zingiberaceae     | *Hedychium ellipticum* Sm.        | Herb          |
| 132   | Zingiberaceae     | *Roscoea alpina* Royle.           | Herb          |
| 133   | Zingiberaceae     | *Roscoea purpurea* Sm.            | Herb          |
| 134   | Zingiberaceae     | *Zingiber officinale* 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 arboreum*. 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.
Our study has recorded three gymnosperms viz. *Araucaria bidwilli*, *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.

### Table 4. List of gymnosperms recorded in the present study

| S.N. | Family      | Name                             |
|------|-------------|----------------------------------|
| 1    | Araucariaceae | *Araucaria bidwilli* Hook.       |
| 2    | Cupressaceae  | *Thuja orientalis* L.            |
| 3    | Pinaceae     | *Pinus wallichiana* A. B. Jacks  |

**Conclusions**

Daman-Simshbanjyang 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.
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.

Acknowledgements
We would like to thank all the experts who helped us to identify the unknown specimens. We are also thankful to...
Mr. Saroj Shah for helping us to make a map of the study area. We express our sincere gratitude to Prof. Dr. Mukesh Kumar Chhetri for helping us in the data collection and bryophyte identification. Moreover, we would like to express our gratitude to all the researchers who have studied in the realm of floristic diversity of Makwanpur District and made our work easier.

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

Bhattarai S, Bhatta B and Tamang R (2018) Distribution pattern of tree species from tropical to temperate regions in Makawanpur district, central Nepal. Banko Janakarti 28(1): 20-25. DOI: 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 Makawanpur. District Plant Resource Office, Makawanpur, Nepal.

Chaudhary RP, Upreti Y and Joshi SP (2016) Plant Biodiversity. In: Nepal: Conservation and Legal Status. Frontiers of Botany. Central Department of Botany (CDB), Tribhuvan University, Kathmandu. 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

Cullen J (1996) The Identification of Flowering Plant Families. Cambridge University Press: Edinburgh.

Don D (1825) Prodromus Florae Nepalesinis. London.

Dulal K, Chaudhary S, Upreti 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 LHI (1979) An Enumeration of the Flowering Plants of Nepal. Vol 2. London: The British Museum (Natural History).

Hara H, Chater AO and Williams LHI (1982) An Enumeration of the Flowering Plants of Nepal. Vol 3. London: The British Museum (Natural History).

Hara H, Stearn WT and Williams LHI (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

Kunwar RM and Bussmann RW (2008) Ethnobotany in the Nepal Himalaya. J Ethnobiol Ethnomedicine 4:24. DOI: 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.v27i2.50679

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

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

Pearce NR and Cribb PJ (2002) Flora of Bhutan. Vol 3. Royal Botanic Garden: Edinburgh.

Pulonin 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, Nepal: Conservation and Legal Status. Frontiers of Ethnobotany Research and Applications 23: 346.

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, Nepal: Conservation and Legal Status. Frontiers of Ethnobotany Research and Applications 23: 346.
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

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

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

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 Nepelensis 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).