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Research Article

COLLECTIONS OF SEEDS AT THE NATIONAL BOTANICAL GARDEN SEED-GENE BANK, NEPAL

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ABSTRACT
This paper aims to highlights the actuality and importance of seed banks in Nepal especially centering on National Botanical Garden Seed Bank (NBG-Seed Bank) belonging to the Department of Plant Resources under Ministry of Forests and Environment. The paper has emphasized the account of seed banks around the globe, history of seed bank in Nepal, community seed banks and the role of different seed banks to conserve biodiversity and genetic resources. Besides this, the paper consumes enumerated and analyzed the seeds collected during the fiscal year 2016 to 2020 by National Botanical Garden, Godavari. A total of seeds of 140 species belong to 59 families and 116 genera are recorded and described. Future's vision and mission of NBG-Seed Bank is also anticipated.

Keywords*: National Botanical Garden, Seed-gene bank, Database, seed drying*

INTRODUCTION
A seed bank is essentially a gene bank for seeds. They are created as a part of the ex-situ conservation and in order to prepare for natural disaster and climate changes and to save genetic resources of local, rare and endangered plant species. By taking seeds from all different plant variations, these banks aim to preserve the biodiversity that the world currently has. There are currently more than one thousand seed banks worldwide [https://science.howstuffworks.com], ranging from the Doomsday Vault (Largest seed bank in Norway) that is capable of withstanding being bombed to the small craft container as community seed banks.

National Biodiversity Strategy and Action Plan (2014-2020) emphasized as a strategy for enhancing conservation of species and genetic diversity priority actions: Strengthening conservation of threatened and rare plant species through network of Botanical Gardens (BGs) and other means. The strategy also focused for the establishment of a gene bank to conserve the genetic resources of wild flora by 2019. To achieve this objective, after the five years of establishment of the National Agricultural Genetic Resources Centre (Gene Bank) in 2010 by Nepal Agricultural Research Council (NARC), The National Botanical Garden, central office of Department of Plant Resources under the Ministry of Forest and Environment initiated another huge Seed bank project at Godavari of Lalitpur District. This seed bank aims to conserve and protect the seeds and DNA materials of all genetic resources belongs to wild plants (Local varieties of cereals, pulses, oilseeds and vegetables are in less concern). In the initial phase, emphasis has been given to collect the seeds of indigenous, endemic, rare, and endangered wild plants reported from Nepal through our yearly programs. We have already collected germ plasm of 20 species of rare and endangered plant species at National Botanical Garden (NBG, 2016). Although the seed bank will be fully prepared for the seed storage until the end of 2020, we have already collected seeds of more than 300 species till date. Of them, seeds collected between 2016 to 2019 A.D. from different parts of the country by National Botanical exploration team are enumerated in this article

Community seed banks were first appeared toward the end of the 1980s, established with the support of international and national non-governmental organizations (Vernooy et al., 2015). Community seed banks in Nepal have a long and rich history spanning more than 25 years. There are over 40 community seed

banks in the country, whose core function is to maintain seeds for local use (Shrestha et al., 2020). There are many attempts for the conservation of local biodiversity and genetic resources. For example, before almost one decade, with a small journey, in which the villagers in Agyauli of Nawalpur District (Then Nawalaparasi District) began to collect and preserve crops and their ancestors. They also began to write about the different varieties of seeds they use, the rainfall and the way it is changing, what they grow now and what has disappeared. For this, they found that the local varieties of rice like Jhinuwa and Ghiupuri had almost disappeared. Today, altogether; their seed bank has conserved 70 local varieties of crops. As experiences of the farmers of Local communities, these practices have taken greater significance in the context of climate change and the introduction of genetically modified crops. Local varieties have some important strength, better nutritional value and are more drought-resistant Therefore, conservation and promotion of locally available seeds and crops is a good adaptation strategy. These traits are not only valuable for the current changing environment but also for future food security. This is what community seed banks around the world are doing — offering storage facilities for good quality seeds and facilitating seed exchange.

However, National Agricultural Genetic Resources; Centre of NARC and all those community seed banks are belong to crop varieties. NBG Seed Bank is the new concept for Nepal to collect and conserve seeds of wild indigenous, endemic, rare and endangered, medicinal and high value timber plants. We have initiated to collect all kinds of wild plants including invasive species (especially for research purpose).

There has been proposed two storage room in the seed bank. For first phase of development, one for short term storage that will store seeds at 5 ^{0}C and 45-50 % relative humidity and can store about 10,000 accessions. In the second phase (near future), for long term preservation of seeds, storage room at -20 ^{0}C will develop inside the first room and that also will have the same accessions number bearing capacity as first room.

Objectives

The foremost aim of this paper is to give the novel information about the seed banks in Nepal Besides that, we have focused mainly the Seed bank of National Botanical Garden (NBG Seed-Bank) which has recently established for the conservation of plants excepts agricultural varieties. Mainly our focus is to collect wild plants including endemic, rare, endangered and threatened plant species with Herbarium specimens and DNA material by the help of which;

- We can conserve the seed and DNA material for many years,
- Can do proper identification, can recognized by molecular work
- Can see the germination percentage and viability of the seeds of different plants in different time interval.

Particularly, in this paper we have also incorporated the seeds collected in NBG Seed-Bank in the recent fiscal years from 2016 to 2020 with detail field information.

MATERIALS AND METHODS

For the History and importance of different kind of seed banks, published literature was reviewed. Seeds collection was carried out in different places of the country based on the program of different fiscals years of NBG, Godawari. Some seeds were collected from National Botanical Garden and surrounding too. Registration of collected seed with scientific name, family, locality, elevation, longitude/latitude (as far as possible), date of collection, collectors, number of seeds belongs to each species was noted. After bringing to the seed bank, the seeds processing was done. Then the selected healthy seeds (at least 200 seeds) were dried in room temperature by hanging in an aired seed bags for one week. After one week, the seeds were packed in a seed envelop and were put in an air tight jar with silica powder for 6-7 weeks depends upon the size of seeds. When the seeds are fully dried, they are changed into another envelop and put inside into the bottle or aluminum pocket with detail information or label. Then, the seeds are ready to put in controlled refrigerator (3 ^{0}C and -19 ^{0}C). Viability of the selected seeds is determined by sowing

the seeds in nursery beds and by chemical process too. These processes are continued. Cold room with controlled temperature and relative humidity are under construction in NBG.

RESULTS AND DISCUSSION

Besides exploration with international team, we have collected and stored 140 accessions of 59 families. Of them, 132 species of 116 genera are reported. About 160 accessions are not included in this article. Fabaceae, Apocynaceae, Solanaceae, Rosaceae, Asteraceae, Lauraceae and Lamiaceae are the top seven families in term of number of accessions (Figure 1). Whereas Fabaceae, Rosaceae, Apocynaceae, Asteraceae, Solanaceae, Lauraceae and Lamiaceae seems greater families in term of larger number of genera (Figure 2). This shows that the different families have different fruiting time. This is just the initiation of the database for the seed of wild plants and need to manage in a systematic and scientific way in the future.

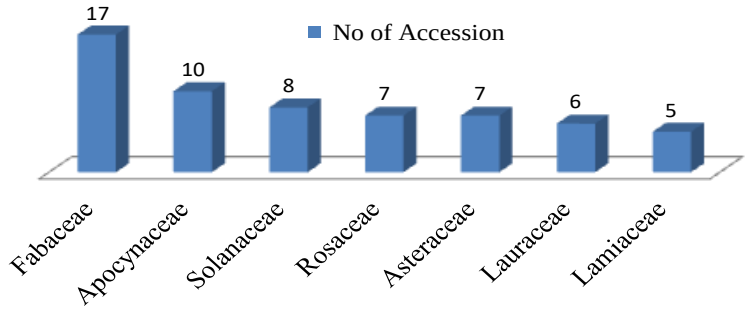

Figure 1: Number of accessions in top seven larger families

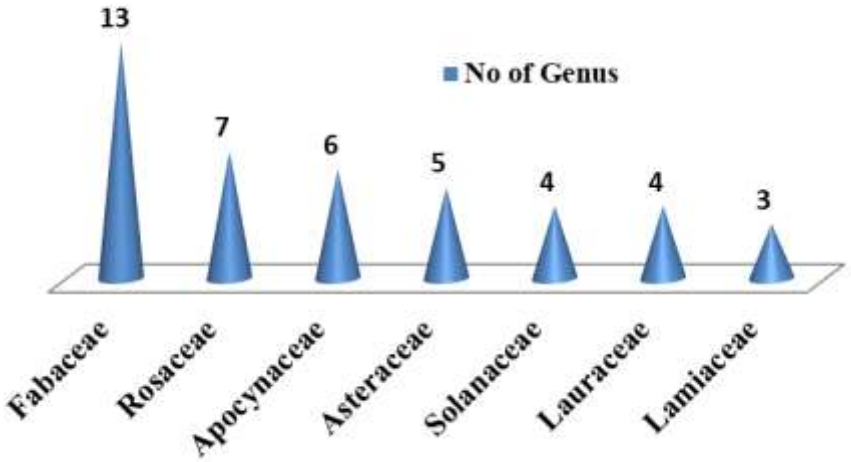

Figure 2: Number of Genera in top seven families

CONCLUSION

It can be concluded that the NBG-Seed bank will be a milestone for the wild plants including rare, endangered, endemic, ornamentals and all other indigenous plants and we all need equal effort to enhance its capacity for future research and conservation.

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Appendix I

S. N.	Scientific Name	Family	Common /Local name	Accession Number	Locality	Collector/s
1	*Abelmoschus manihot* (Linnaeus) Medikus	Malvaceae	Edible hibiscus	NBG-SB-000115	Suryabinayak, Bhaktapur	Mr. S.K. Kasaju
2	*Abies spectabilis* (D. Don) Spach	Pinaceae	Himalayan fir	NBG-SB-000134	Dolakha, Katakuti	Mr. D Lamichhane
3	*Acacia catechu* (L.) Willdenow	Fabaceae	Cutch tree/ Khayar	NBG-SB-000137	Satbariya, Dang	Mr. J Pandey
4	*Achyranthes bidentata* Blume	Amaranthaceae	Ox-knee	NBG-SB-000037	NBG, Godawari	Mrs. S Shah
5	*Aconitum ferox* Wall. ex Ser.	Ranunculaceae	Aconitum	NBG-SB-000077	Daman	Mr. R Tamang
6	*Aconogonum molle* (D. Don) H. Hara	Polygonaceae	Thotne	NBG-SB-000015	NBG, Godawari, Lalitpur	Mr. D Lamichhane, Mrs. S Shah
7	*Aegle marmelos* (Linnaeus) Corrêa	Rutaceae	Golden apple	NBG-SB-000117	Devghat, Chitwan	Dr. M Pathak
8	*Aganosma heynei* (Spreng.) Ined.	Apocynaceae	Malati	NBG-SB-000119	Devghat, Chitwan	Dr. M Pathak
9	*Agave Americana* L.	Asparagaceae	Sentry plant	NBG-SB-000038	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
10	*Apios carnea* (Wallich) Bentham ex Baker in J. D. Hooker	Fabaceae	Carnea	NBG-SB-000091	Nagarkot, Bhaktapur	Mr. S.K. Kasaju
11	*Ardisia macrocarpa* Wall.	Primulaceae	Himalayan Coralberry/ Damai phal	NBG-SB-000001	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
12	*Aristolochia indica* L.	Aristolochiaceae	Aristolochia	NBG-SB-000136	Dhakeri, Banke	Mr. J Pandey
13	*Asparagus racemosus*Willd.	Liliaceae	Asparagus	NBG-SB-000017	NBG, Godawari	Mrs. S Shah
14	*Astilbe rivularis* Buch.-Ham. ex D. Don	Saxifragaceae	False spiraea	NBG-SB-000070	NBG, Godawari	Mrs. S Shah
15	*Begonia sikkimensis* A. Candolle	Begoniaceae	Begonia	NBG-SB-000026	NBG, Godawari	Mrs. S Shah
16	*Berberis aristata* DC	Berberidaceae	Tree turmeric/Chutro	NBG-SB-000082	Dolakha, Katakuti	Mr D Lamichhane
17	*Berberis aristata* DC.	Berberidaceae	Indian barberry	NBG-SB-000039	NBG, Godawari	Mrs. S Shah
18	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae	Hairy Bergenia	NBG-SB-000040	NBG, Godawari	Mrs. S Shah
19	*Butea minor* Buch.-Ham. ex Baker	Fabaceae		NBG-SB-000081	Chitwan, Way to Narayan-	Mr. D lamichhane

					ghat to Muglin	
20	*Cajanus elongatus* (Benth.) Maesen	Fabaceae	Pigeon pea	NBG-SB-000099	Champadevi, Ktm	Mr. S.K. Kasaju
21	*Callicarpa macrophylla* Vahl.	Lamiaceae		NBG-SB-000076	Makwanpur, BBG	Mr. R Tamang
22	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae	Apple of Sodom	NBG-SB-000009	Dhading, Chhatradeurali	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
23	*Camellia sinensis* (L.) Kuntze	Theaceae	Tea	NBG-SB-000109	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
24	*Carex baccans* Nees.	Cyperaceae	carex	NBG-SB-000041	NBG, Godawari	Mrs. S Shah
25	*Casia occidentalis* L.	Fabaceae	Coffee senna	NBG-SB-000083	Chitwan National Park, buffer zone	Dr. M Pathak
26	*Casia occidentalis* L.	Fabaceae	Coffee senna	NBG-SB-000098	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
27	*Cassia floribunda* (Cav.) H.S.Irwin & Barneby	Fabaceae	Cassia	NBG-SB-000013	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
28	*Cassia laevigata* Willd.	Fabaceae		NBG-SB-000033	Damaitar, Lalitpur	Mr. D Lamichhane
29	*Cassia tora* L.	Fabaceae	Sickle pod	NBG-SB-000128	Chitwan National Park, buffer zone	Dr. M Pathak
30	*Castanopsis indica* (Roxb. ex Lindl.) A.DC.	Fagaceae	Chest-nut	NBG-SB-000006	NBG, Godawari	Mrs. S Shah
31	*Catharanthus roseus* (L.) G.Don	Apocynaceae	Bright eyes	NBG-SB-000042	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
32	*Cautleya spicata* (Sm.) Baker	Zingiberaceae		NBG-SB-000043	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
33	*Cedrus deodara* (Roxb.) G.Don	Pinaceae	Deodar	NBG-SB-000044	NBG, Godawari	Mr. Roshan Tamang
34	*Chlorophytum comosum* (Thunb.) Baker	Asparagaceae	Spider plant	NBG-SB-000130	NBG, Godawari	Mr. D Lamichhane
35	*Choerospondias axillaris* (Roxb.) B.L. Brutt & A.W. Hill	Anacardiaceae	Nepalese hog plum	NBG-SB-000027	NBG, Godawari	Mrs. S Shah
36	*Cinnamomum camphora* (L.) J.Presl	Lauraceae	Camphor	NBG-SB-000029	NBG, Godawari	Mrs. S Shah

37	*Cinnamomum glaucescens* (Nees) Hand.-Mazz.	Lauraceae	Sugandhakokila	NBG-SB-000139	Chillikot, Dang	Mr. J Pandey
38	*Cirsium wallichi* DC.	Asteraceae		NBG-SB-000045	NBG, Godawari	Mrs. S Shah
39	*Cissampelos pareira* L.	Menispermaceae	False pareira	NBG-SB-000008	NBG, Godawari	Mrs. S Shah
40	*Clematis buchananiana* DC.	Ranunculaceae	Clematis	NBG-SB-000075	Makwanpur	Mr. R Tamang
41	*Clitoria ternatea* L.	Fabaceae	Butterfly pea	NBG-SB-000140	Dhakeri, Banke	Mr. J Pandey
42	*Cochlianthus gracilis* Benth.	Fabaceae	Taankee	NBG-SB-000092	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
43	*Dalbergia sissoo* Roxb.	Fabaceae	Sisso	NBG-SB-000078	Chitwan	Mrs. S Shah
44	*Datura metal* L.	Solanaceae	Thornapple/ Dhaturo	NBG-SB-000110	Chitwan	Dr. M Pathak
45	*Delphinum elatum* L.	Ranunculaceae		NBG-SB-000084	Jumla	Mr. R. Basnet
46	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae	Native bryony/Shivalingi	NBG-SB-000141	Dhakeri, Banke	Mr. J Pandey
47	*Dipsacus atratus* Hook. f. & Thomson ex C. B. Clarke	Dipsacaceae		NBG-SB-000071	NBG, Godawari	Mrs. S Shah
48	*Duabanga grandiflora* (Roxb. ex DC.) Walpers	Lythraceae	duabunga	NBG-SB-000010	Syangja, Bhirkot Sundarchaur	Mr. D Lamichhane
49	*Dumasia villosa* DC	Fabaceae	Himalayan dumasia	NBG-SB-000090	Shivapuri National Park, Ktm	Mr. S.K. Kasaju
50	*Duranta repens* L.	Verbenaceae	Sky flower	NBG-SB-000129	NBG, Godawari	Dr. M Pathak
51	*Ehretia acuminata* R.Br.	Boraginaceae	Ehretia	NBG-SB-000113	NBG, Godawari	Dr. M Pathak
52	*Elaeocarpus serratus* L.	Elaeocarpaceae	Utrasum bed tree	NBG-SB-000126	Devghat, Chitwan	Dr. M Pathak
53	*Ephedra gerardiana* Wall.	Ephedraceae	Ephedra	NBG-SB-000072	NBG, Godawari	Mrs. S Shah
54	*Eulaliopsis binata* (Retz.) C.E. Hubbard in Hook.	Poaceae	Sabaigrass/ Babiyo	NBG-SB-000127	Devghat, Chitwan	Dr. M Pathak
55	*Euonymus hamiltonianus* Wall.	Celastraceae	Hamilton's spindle tree	NBG-SB-000003	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
56	*Euonymus tingens* Wall.	Celastraceae	Purple vein spindle tree	NBG-SB-000144	Jumla	Mr. R Basnet

57	*Flemengia strobilifera* (L.) W.T.Aiton.	Fabaceae	Wild hops	NBG-SB-000079	Chitwan	Mr. D lamichhane
58	*Gaultheria fragrantissima* Wallich	Ericaceae	Fragrant wintergreen	NBG-SB-000096	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
59	*Gerbera maxima* (D. Don) Beauverd	Asteraceae	Gerbera	NBG-SB-000089	Latabhangyang, Lalitpur	Mr. S.K. Kasaju
60	*Hedychium aurantiacum* Roscoe	Zingiberaceae	Orange Ginger lily	NBG-SB-000046	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
61	*Hedychium coccineum* Buch.-Ham. ex Sm.	Zingiberaceae	Ginger lily	NBG-SB-000047	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
62	*Hedychium flavescens* Carey ex Roscoe	Zingiberaceae	Yellow ginger lily	NBG-SB-000048	NBG, Godawari	Mrs. S Shah
63	*Holbo ellia latifolia*	Lardizabalaceae	Sausage vine	NBG-SB-000111	NBG, Godawari	Dr. M Pathak
64	*Hosta plantaginea* (Lamarck) Ascherson	Asparagaceae	Plantain Lily /Hosta	NBG-SB-000103	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
66	*Hypericum uralum* Buch.-Ham.ex D. Don	Hypericaceae	St.John's wort	NBG-SB-000028	NBG, Godawari	Mrs. S Shah
65	*Ilex excelsa* (Wall.) Hook.f.	Aquifoliaceae	Ilex/Puwale	NBG-SB-000049	NBG, Godawari	Mrs. S Shah
67	*Ilex excelsa* (Wall.) Hook.f.	Aquifoliaceae	Ilex/Puwale	NBG-SB-000085	Suryabinayak, Bhaktapur	Mr. S.K. Kasaju
68	*Indigofera atropurpurea* Buchanan-Hamilton ex Hornemann	Fabaceae	Deep-Purple indigo	NBG-SB-000088	Hadthok, Palpa	Mr. S.K. Kasaju
69	*Iris domestica* (L.) Goldblatt & Mabb.	Iridaceae	blackberry lily	NBG-SB-000102	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
70	*Juglans regia* L.	Juglandaceae	Walnut	NBG-SB-000018	NBG, Godawari	Mrs. S Shah
71	*Lagerstroema parviflora* Roxb.	Lythraceae		NBG-SB-000080	Chitwan	Mr. D lamichhane
72	*Ligustrum indicum* (Lour.) Merr.	Oleaceae	Indian Privet	NBG-SB-000050	NBG, Godawari	Mrs. S Shah
73	*Lindera neesiana* (Wallich ex Nees) Kurz	Lauraceae	Lindera/Boketimur	NBG-SB-000101	Ilam	Mr J Pandey

74	*Litsea chartacea* Hook.f.	Lauraceae	Litsea	NBG-SB-000094	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
75	*Lonicera glabrata* Wall.	Caprifoliaceae	Himalayan honeysuckle	NBG-SB-000097	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
91	*Machilus duthiei* King.	Lauraceae	Duthie's Bay Tree	NBG-SB-000093	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
76	*Machilus duthiei* King.	Lauraceae	Duthie's Bay Tree	NBG-SB-000055	NBG, Godawari	Mrs. S Shah
77	*Maclura cochinchinensis* (Lour.) Corner	Moraceae		NBG-SB-000035	NBG, Godawari	Mrs. S Shah
78	*Mahonia napaulensis* DC.	Berberidaceae	Jamaneman dro	NBG-SB-000051	NBG, Godawari	Mrs. S Shah
79	*Mallotus philippensis* (Lam.) Muell.Arg.	Euphorbiaceae	Kumkum tree	NBG-SB-000052	NBG, Godawari	Mrs. S Shah
80	*Matricaria chamomilla* L.	Asteraceae	Camomile	NBG-SB-000131	Tamaghadi, Bara	Mr. D Lamichhane
81	*Melia azadirachta* L.	Meliaceae	China-berry	NBG-SB-000069	Chitwan	Mrs. S Shah
82	*Murraya koenigii* (L.) Spreng.	Rutaceae	Curry leaf tree	NBG-SB-000019	NBG, Godawari	Mrs. S Shah
83	*Nerium oleander* L.	Apocynaceae	Oleander	NBG-SB-000116	Devghat, Chitwan	Dr. M Pathak
84	*Nyctanthes arbor-tristis* L.	Oleaceae	Night-flowering jasmine	NBG-SB-000036	NBG, Godawari	Mrs. S Shah
85	*Ocimum basilicum* L.	Lamiaceae	Sweet basil	NBG-SB-000118	Devghat, Chitwan	Dr. M Pathak
86	*Ocimum basilicum* L.	Lamiaceae	Great basil	NBG-SB-000133	Tamaghadi, Bara	Mr. D Lamichhane
87	*Ocimum sanctum* L.	Lamiaceae	Holi basil/Tulasi	NBG-SB-000120	Devghat, Chitwan	Dr. M Pathak
88	*Ophiopogon intermedius* D.Don	Liliaceae		NBG-SB-000053	NBG, Godawari	Mrs. S Shah
89	*Osmanthus fragrans* Lour	Oleaceae	Sweet olive/ Siringe	NBG-SB-000002	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah and Mrs. S dhakal
90	*Paris polyphylla* Sm.	Melanthiaceae	Herb Paris	NBG-SB-000054	NBG, Godawari	Mr. D Lamichhane
91	*Persicaria hydropiper* (L.) Delarbre	Polygonaceae	Joint weed	NBG-SB-000073	NBG, Godawari	Mrs. S Shah
92	*Physalis peruviana* L.	Solanaceae	Cape gooseberry	NBG-SB-000020	NBG, Godawari	Mrs. S Shah

93	*Phytolaca acinosa* Roxb.	Phytolaccaceae	Poker weed	NBG-SB-000021	NBG, Godawari	Mrs. S Shah
94	*Podocarpus nagi* (Thunb.) Zoll. et Mor. ex Zoll	Podocarpaceae	Asian bayberry	NBG-SB-000012	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
95	*Podophyllum hexandrum* Royle	Berberidaceae		NBG-SB-000056	NBG, Godawari	Mrs. S Shah
96	*Porana grandiflora* Wall.	Convolvulaceae		NBG-SB-000057	Daman, Makawanpur	Mr. R Tamang
97	*Potentilla lineata* Trevir.	Rosaceae	Silver leaf	NBG-SB-000030	NBG, Godawari	Mrs. S Shah
98	*Prunus cerasoides* Buch.-Ham. ex d. Don	Rosaceae	Wild himalayan cherry	NBG-SB-000058	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
99	*Pyracantha crenulata* (Roxb. ex D.Don) M.Roem.	Rosaceae	Nepalese firethorn/ Ghangaru	NBG-SB-000100	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
100	*Pyrus pashia* Buch.-Ham. ex D.Don	Rosaceae	Wild Himalayan pear	NBG-SB-000124	NBG, Godawari	Mr. D Lamichhane
101	*Rauvolfia serpentina* (L.) Benth. ex Kruz	Apocynaceae	Serpentine	NBG-SB-000014	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
102	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Snakeroot	NBG-SB-000132	Tamagadhi, Bara	Mr. D Lamichhane
103	*Rauvolfia verticillata* (Lour.) Baill.	Apocynaceae	Snakeguard	NBG-SB-000004	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
104	*Rauwolfia tetraphylla* L.	Apocyanaceae	Snakeguard	NBG-SB-000138	Dhakeri, Banke	Mr. J Pandey
105	*Rhododendron arboreum* Sm.	Ericacae	Rhododendron	NBG-SB-000059	NBG, Godawari	Mrs. S Shah
106	*Rhus parviflora* Roxb.	Anacardiaceae		NBG-SB-000060	Chitwan	Mr. D lamichhane
107	*Ricinus communis* L.	Euphorbiaceae	Castor oil plant	NBG-SB-000005	NBG, Godawari	Mrs. S Shah
108	*Ricinus communis L.*	Euphorbiceae	Castor oil plant	NBG-SB-000107	Devghat, Chitwan	Mr D Lamichhane, Dr.M Pathak,
109	*Rosa* X *hybrida*	Rosaceae	Rose	NBG-SB-000105	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
110	*Rubia manjith* Roxb. ex Fleming	Rubiaceae	Majitho	NBG-SB-000061	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
110	*Rubus ellipticus* Sm.	Rosaceae	golden evergreen raspberry	NBG-SB-000062	NBG, Godawari	Mrs. S Shah
11	*Salvia nubicola* Wall. ex Sweet	Lamiaceae		NBG-SB-000034	Manang	Mrs. S Shah

112	*Sambucus javanica* Blume	Adoxaceae	American Alder	NBG-SB-000022	NBG, Godawari	Mrs. S Shah
113	*Sapindus mukorossi* Gaertn.	Sapindaceae	Washnut	NBG-SB-000011	Dhading, Chhatradeurali	Mr. D Lamichhane, Mrs. S Shah
114	*Sarcococca coriacea* (Hook.) Sweet	Buxaceae	Sarcococca	NBG-SB-000074	NBG, Godawari	Mrs. S Shah
115	*Sassurea lappa* (Falc.) Lipsch.	Asteraceae		NBG-SB-000063	Phulchoki	Mr. R Tamang
116	*Saussurea lappa* (Falc.) Lipsch.	Asteraceae	Kust/Kuth	NBG-SB-000125	NBG, Godawari	Mr. D Lamichhane
117	*Sesbania bispinosa* (Jacq.) W.Wight	Fabaceae	Prickly sesban/Dhaicha	NBG-SB-000121	Chitwan National Park, buffer zone	Dr. M Pathak
118	*Smilax aspera* L.	Smilacaceae	Common smilax	NBG-SB-000064	NBG, Godawari	Mrs. S Shah
119	*Solanum americanum* Mill.	Solanaceae	Black nightshade	NBG-SB-000023	NBG, Godawari	Mrs. S Shah
120	*Solanum pseudocapsicum* L.	Solanaceae	Jerusalem cherry	NBG-SB-000024	NBG, Godawari	Mrs. S Shah
121	*Solanum surattense* Brum. f	Solanaceae	Yellow fruit nightshade	NBG-SB-000025	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
122	*Solanum torvum* Sw.	Solanaceae	turkey berry	NBG-SB-000065	NBG, Godawari	Mrs. S Shah
123	*Spathodea campanulata* P.Beauv.	Bignoniaceae	African tulip tree	NBG-SB-000104	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
124	*Spiraea bella* Sims.	Rosaceae	Pretty Spirea	NBG-SB-000066	NBG, Godawari	Mrs. S Shah
125	*Swertia chirayita* (Roxb.) Buch.-Ham. ex C.B.Clarke	Gentianaceae	Chiretta	NBG-SB-000143	Dolakha, Katakuti	Mr. D Lamichhane
126	*Symplocos pyrifolia* Wall. ex G. Don	Symplocacee	Symplocos	NBG-SB-000095	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak, Mr. K Nepali
127	*Tagetes erecta* L.	Asteraceae	African marigold	NBG-SB-000122	NBG, Godawari	Mr. D Lamichhane
128	*Tagetes minuta* L.	Asteraceae	Wild marigold	NBG-SB-000031	Makwanpur	Mr. Roshan Tamang
129	*Taxus contorta* Griff.	Taxaceae	Westhimalayan yew	NBG-SB-000032	Rara, Mugu	Mrs. S Shah
130	*Terminalia chebula* Retz.	Combrataceae	Chebulic myrobalan/ Harro	NBG-SB-000142	DBG, Banke	Mr. J Pandey
131	*Terminalia elliptica* Willd.	Combretaceae	Indian laurel	NBG-SB-000123	Devghat, Chitwan	Dr. M Pathak
132	*Viburnum punctatum* Buch.-Ham. ex D. Don	Adoxaceae	Dotted viburnum	NBG-SB-000086	Sundarijal, Ktm	Mr. S.K. Kasaju

133	*Viburumm erebescens* Wallich ex Dc.	Adoxaceae	Viburnum	NBG-SB-000114	Phulchoki, Lalitpur	Mr D Lamichhane, Dr.M Pathak,
134	*Vincetoxicum canescens* (Willd.) Decne.	Apocynaceae	Vincetoxicum	NBG-SB-000087	Latabhangyang, Lalitpur	Mr. S.K. Kasaju
135	*Wisteria sinensis* (Sims) Sweet	Fabaceae		NBG-SB-000112	NBG, Godawari	Dr. M Pathak
136	*Withania somnifera* (L.) Dunal	Solanaceae	Indian ginseng	NBG-SB-000016	NBG, Godawari	Mr. D Lamichhane, Mrs. S Shah
137	*Xylosma controversum* Clos	Flacourtiaceae		NBG-SB-000067	NBG, Godawari	Mrs. S Shah
138	*Zanthoxylu armatum* DC.	Rutaceae	Prickly ash/Timur	NBG-SB-000135	Kapurkot, Salyan	Mr. J Pandey
139	*Zanthoxylum armatum* DC.	Rutaceae	Winged Prickly Ash/ Timur	NBG-SB-000108	NBG, Godawari	Mr D Lamichhane, Dr.M Pathak,
140	*Ziziphus incurva* Roxb.	Rhamnaceae	Jujube	NBG-SB-000068	NBG, Godawari	Mr. D Lamichhane