Journal of Plant Resources Special Issue (2022) **20**(2), 96-113
https://doi.org/10.3126/bdpr.v20i2.56992

# Wild Seed Conservation in National Botanical Garden, Lalitpur, Nepal

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**Abstract**

Seed banks are the important means for the *ex-situ* conservation of plant genetic diversity. Though the seeds of domesticated varieties have been preserved for a long time, wild seed conservation is a noble concept in Nepal. Seed Bank of National Botanical Garden, Godawari, Lalitpur (NBG) is a major initiative for the conservation of wild plant seeds in Nepal. In the present study, a standardized seed banking procedures practiced at the Seed Bank of NBG, from seed collection to storage including germination test has been included. Currently, seeds of 84 wild species belonging to 77 genera of 47 families are preserved in the NBG. Alongside preserving wild genetic resources, NBG Seed Bank also provides materials for restoration, reintroduction and research that supports broader plant conservation goals, as well as contributes to education and public awareness about plant conservation.

**Keywords:** Biodiversity, *Ex-situ*, Extinction, *In-situ*, Protocols, Seed bank

## Introduction

Biological diversity is the base that supports all the life on earth. However, wild areas and biodiversity are diminishing rapidly with current species extinction rate about 1000 times the background rate of species extinction (Pimm et al., 2014). Species extinction is like losing of future opportunity for human innovation, adaptation and resilience. In light of this, Target 8 of Global Strategy for Plant Conservation (GSPC) called for 'By 2020, there should be at least 20% of threatened plant species available for recovery and restoration programs and at least 75% of threatened plant species in *ex-situ* collections, preferably in the country of origin' (Convention on Biological Diversity [CBD], 2010). Indeed, *ex-situ* conservation is the practice of saving part of threatened and endemic species that are in verge of extinction in their natural habitat. Against this background, seed banks can help us to understand and meet the challenge of biodiversity loss and climate change by insuring against the loss of plant species in the wild and by helping humanity to adapt to climate change by restoring habitats (van Slageren, 2003).

Seed bank is the facility for the storage of plant collection in the form of seeds. In fact, majority of plant species survive in the form of seed that holds power to regenerate and remains viable in controlled environment (León-Lobos et al., 2012). Moreover, seeds are the most convenient material for collection and storage. Such traits make seeds particularly desirable for long-term storage in *ex-situ*. However, not all seeds are feasible to store in the seed bank conventionally. It is an orthodox seed (desiccation tolerant) that can be stored in the seed bank, capable to endure drying to very low moisture content (≤3-7% fresh weight) without losing viability. In contrast, there is another set of seeds that cannot tolerate drying below 15 to 20% moisture content (Rao et al., 2006). They are not feasible to store by conventional method of seed banking. In such case, cryopreservation or field gene bank could be a better option (Walters et al., 2013). Therefore, understanding on the seed storage behavior is very crucial before storage.

Preservation of seeds in seed banks is the cost-effective mean of long-term storage of wild genetic diversity under the climate crisis scenario (Breman et al., 2012). In addition, seed banks provide material for research, provide skills and knowledge that support wider plant conservation aims and contribute to education and public awareness about

plant conservation (Schoen et al., 2001). Hence, in an era of depleting natural reserves and biodiversity, we can focus on seed banks to revive and regenerate the planet's treasure. However, it does not mean that we are underestimating the importance of *in-situ* conservation as a complementary approach, which not only preserve genetic diversity but also allow the dynamic evolutionary process (van Slageren, 2003).

Conservation of species is directly associated with human use value. In the sense, preserving seed of crop plants for the next season is the part of human civilization. In Nepal, large numbers of community seed banks and Nepal Agricultural Research Council (NARC) have been involved in the management and conservation of domesticated varieties and many other agricultural genetic resources (Joshi et al., 2020). Nevertheless, the conservation of wild seeds has been less emphasized. And, it is a very miserable fact that people are still unaware about the wild biodiversity that really matters to their livelihood.

Nepal holds tremendous biological diversity despite of its small size (0.03% of total land area on earth), but is currently under threat due to different anthropogenic activities (like habitat loss, over exploitation, land use change, deforestation, unsustainable harvesting, alien invasion and climate change) (Upreti & Upreti, 2002). These elements make Nepal one of the nations, most in need of conservation aid (Giam et al., 2010). Government of Nepal have prioritized conservation and management of wild biodiversity (Ministry of Forests and Soil Conservation [MoFSC], 2014). Therefore, conservation of wild seed is not very new concept, initiated in 2010 with establishment of Himalayan Seed Bank project by Nepal Academy of Science and Technology and aims to collect and preserve the alpine plants of Nepal (Rossi et al., 2012). Meanwhile, establishment of seed banks is an important initiative of botanical gardens worldwide for *ex-situ* conservation of plant genetic resources. Later, National Botanical Garden (NBG) Seed Bank was established in 2019. The NBG is leading governmental body working with an aim of exploring and conserving plant resources for a better future and seed bank is just one example. Basic requirements like well-spaced building, automatic convertible freezer (3°C to -19°C), dehumidifier, and plant growth chamber are available at the NBG Seed Bank. In addition, field gene bank is also proposed for the conservation of species with recalcitrant seeds. Hence, it is going to be an important hub for the plant conservation, education, research, display and recreation. The NBG can serve as a model for conservation through beautification.

The aim of this study was to collect and store the seeds of wild plant species and to study seed characters and germination ecology of some collected seeds. In this paper, detail account on seed banking procedure practiced at the NBG seed bank, from seed collection to storage, including seed germination test is presented. Ultimately, this will be an important documentation of wild seed and germination ecology.

## Materials and Methods

Basic protocols for seed bank operation are almost similar across seed banks except for some specialization with the species or theme of conservation (Figure 1). Millennium Seed Bank Project (MSBP, 2015) protocol was followed with slight modification. And, here the procedure of storing of orthodox seeds especially of wild species in the Seed Bank of National botanical Garden, Godawari, Lalitpur, Nepal is presented. Detail accounts of seed banking procedure are given below:

### *Seed collection*

Seeds were collected from field by the NBG staffs, research interns and volunteers. Seed collection was not limited to any geographic regions, but the collections from the NBG were dominant. The immature seed are not viable so the timing of seed collection is very crucial. Mature seed was collected at the time of natural dispersal. For the collection, nylon-net bags and paper pouch were used which allowed perfect aeration. In addition, fruit color and timing of natural dispersal was used as reliable proxy of seed maturity (Way, 2003). During seed collection, as many seeds as possible were collected from different plants at single site to capture high genetic diversity. Thousand seeds

per accession are very common but not feasible in case of threatened species, so collection of small volume was considered for some threatened species. Herbarium specimens were prepared for every collection for future reference.

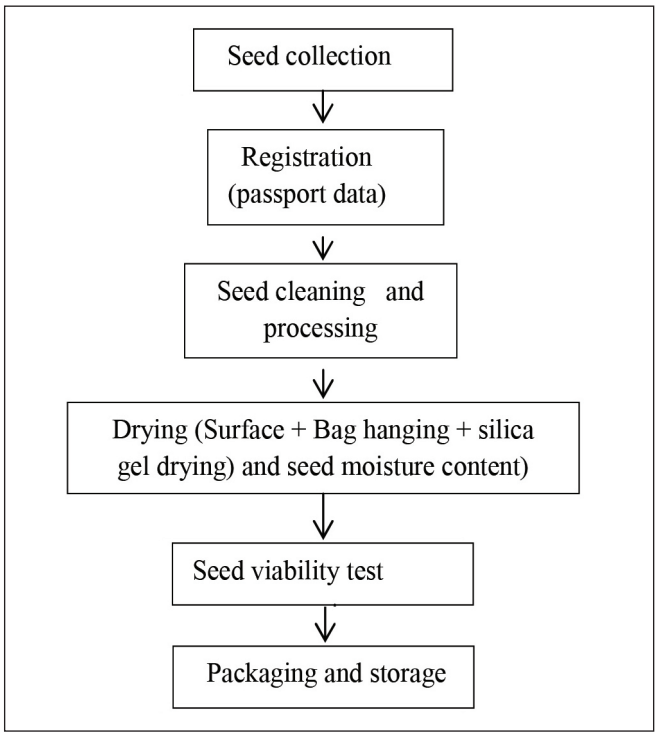


**Figure 1:** Seed banking procedure

### *Registration*

It is an assignment of providing unique accession number to each collection that ultimately helps in distinguishing one sample from another. Registration was done after bringing all the collected seeds samples from field with detail account on species name, collection number, date of collection, locality, collectors and these information were used for making passport data.

### *Seed cleaning and processing*

Seeds were processed mechanically using sieve, manually by hand in most of the cases, except for some fleshy fruits by fermentation (3 to 7 days in 20°C temperature). There is no hard and fast rule about seed processing and it varies with species. Mostly, manual cleaning by hand was preferred for the dry and dehiscent seed, sieving for very small ones and fermentation for the fleshy and pulpy fruit (Rao et al., 2006).

### *Drying and seed moisture content (SMC)*

Seed moisture content signify total amount of water present in the seed which determines longevity of the stored seed (International Seed Testing Association [ISTA], 2006). Here, three phase of seed drying have been followed: surface dry (1 week), bag hanging dry (1 week) and silica gel drying (6-7 weeks). Finally, seed moisture content was recorded on wet-mass basis using formula by Rao et al., (2006).

### *Seed viability test*

Seed viability was tested before the storage of seed. It is one the crucial step in seed banking operation. Seed viability comprises percentage of seed that are capable of growing and reproducing in favorable environmental conditions (Baskin & Baskin, 2014). Therefore, seeds with high initial viability are particularly desirable for the long-term storage. Testing of seed viability before packaging help in exclusion of low quality sample and at regular interval during storage help in detection of accession that require timely regeneration. The most reliable method for the determination of viability is germination test. Another biochemical method (Tetrazolium Test) is also available, but is less accurate and destructive and therefore, it is not preferred in general. Here, we performed germination tests both in the plant growth chamber and in the field, and the tetrazolium test was used only as the backup (i.e. for testing the viability of those seeds that remain intact until termination day).

### *Germination test*

Water, oxygen, light and an appropriate temperature are essential for seed germination (Baskin & Baskin, 2014). No universal set of conditions can ensure the germination of seeds from all species because their needs vary with species. Some species seeds are more resilient and can germinate in a variety of environments, but full germination can only occur in ideal circumstances (Rao et al., 2006). For many crop varieties optimum environmental requirements have already been established but have scarce information regarding wild species. So, we conducted study with broad environmental conditions that are able to include wide range of species (Relative humidity:

75%, Photoperiod: 12hrs., Temperature: 25/15°C). Protrusion of the radicle (> 1 mm) is a clear indication of seed germination. Once germination starts all germinated seeds were counted and removed in one day's intervals. Generally, germination test were terminated after third week of subjection in most cases but vary with species. Finally, at the end of germination, the germination percentage was calculated by using a formula (Baskin & Baskin, 2014).

Substrate and number of seeds used also vary with species, we preferred sterilized sand and 20/30 seeds per plate for large seed (> 1 cm in diameter) while filter paper and 50/100 seeds per plate for smaller seeds (<1 cm) (Rao et al., 2006). In case of wild species, germination percentage ≥ 75% are ideal for storage (Rao et al., 2006). However, it is difficult to get such a high percentage in case of all wild species so depending upon species status, species even with ≤ 50% were also proceeded for storage in the NBG seed bank. During six month period, we carried out germination test of about 80 seed accessions in the plant growth chamber and some in the field for recalcitrant seed (Appendix 3).

### *Seed packaging and storage*

The final stage involves the sealing of the tested and weighed seed sample. Sealable aluminum pockets and glass jars were used for packaging. After packaging, seeds were proceeded for preservation under controlled conditions with detailed information or label. In the National Botanical Garden for now seeds were stored in an auto-convertible freezer at a temperature of 3°C.

### *Germination test of Ardisia macrocarpa*

*Ardisia macrocarpa* Wall. is a small shrub with dark green leaves and bright red berries. So, they are widely grown as an ornamental plant for gardening purpose and their fruits are also edible. They are important component of understory vegetation. But, it is unclear whether light is essential for their germination or not. In addition, seeds are the major source for its propagation but there is scarcity of information on the seed germination ecology. So, germination test were conducted to observe the impact of light and seed coat on germination of *A. macrocarpa*.

Fully ripen seeds were harvested from *A. macrocarpa* plant grown at the NBG on March 6, 2022. Seeds were cleaned and proceed for the germination test. In detail, to determine the effects of light on germination, seeds were germinated in 9 cm petri dish (one set were completely covered with double layered aluminum foil to maintain complete darkness and another set without aluminum foil, five replicates per sample) and seed coat were removed for one set for observing effect of seed coat on germination. The numbers of seed plates were ten and observations were recorded for 30 days.

## Results and Discussion

### *Collection and storage of the seeds*

National Botanical Garden (NBG), Godawari has harbored 93 accessions of 84 species belonging to 77 genera and 47 families till date (Appendix 1). Out of them, according to IUCN red list category, two species [*Cajanus elongatus* (Benth.) Maesen and *Taxus contorta* Griff.] are endangered, one is near threatened [*Nageia nagi* (Thunb.) Kuntze], six are least concern [*Agave americana* L., *Butea monosperma* (Lam.) Kuntze, *Cedrus deodara* (Roxb. ex D.Don) G.Don, *Juglans regia* L., *Persicaria hydropiper* (L.) Delarbre and *Urtica dioica* L.]. Fabaceae was the dominant family with 14 species followed by Rosaceae and Solanaceae with six and five species respectively (Figure 2 and 3). And about 45% of species were medicinal and aromatic plants (Figure 4). Previous study by Pathak et al., 2021 also reported similar result where Fabaceae was the dominant family followed by Rosaceae. According to Pathak et al. (2021), NBG seed bank harbored 140 accessions. But when we conducted germination test of stored seeds periodically and non-viable seeds were discarded, the stored seeds in the NBG seed bank is reduced to 93 accessions. But it is good news, currently about 73 accessions are still under processing with new 48 species belonging to 44 genera and 44 families (Appendix 2). Cold storage room is under construction. After completion, cold storage room will provide both short-term and long-

term storage facilities which will be a milestone in the conservation and management of wild seeds.

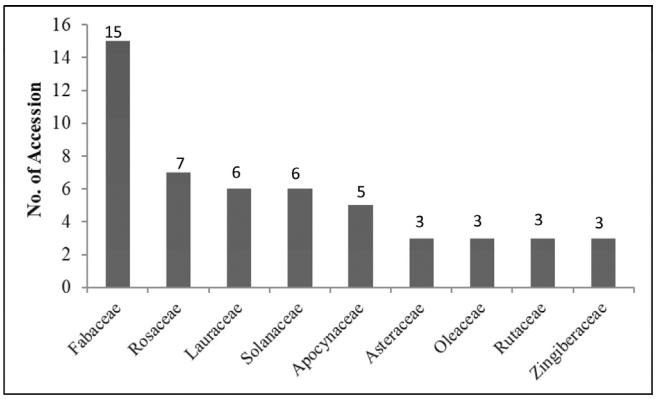


**Figure 2:** Number of accession in dominant families

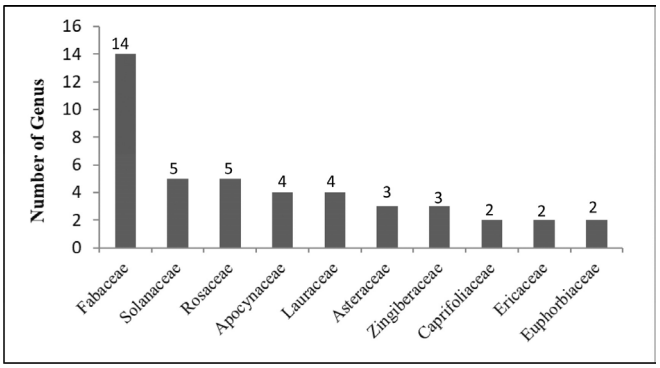


**Figure 3:** Number of genus in dominant families

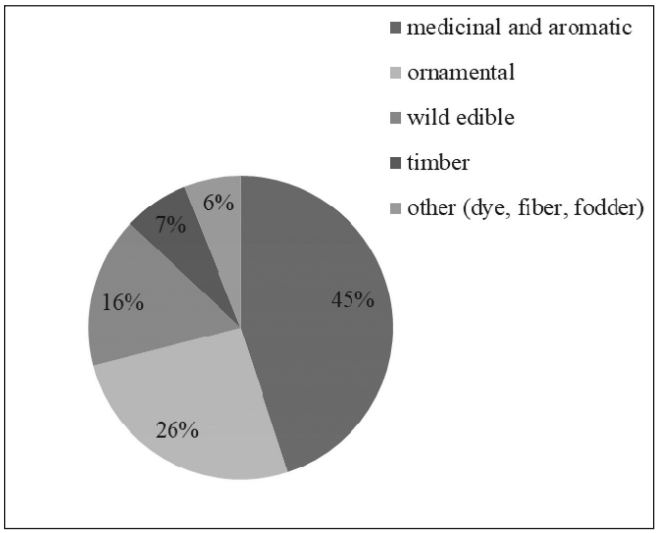


**Figure 4:** Category of seed plant according to use value

### *Effect of light and seed coat in germination of Ardisia macrocarpa*

In light condition, seeds with no seed coat initiated their germination after 8 days of subjection for the test with 90% germination and at dark the germination was recorded to be 100% after 30 days. In addition, seeds with coat revealed delayed germination (14 days after sowing) with just 60% germination at light but 100% germination were recorded in dark condition (Figure 5 and Table 1). Similar results were reported for the *Ardisia crenata* where germination was early in seeds without seed coat (Tezuka et al., 2012). Seed coat might restrict water permeability which might be the reason behind delayed even low germination (Muralidhara et al., 2012). Generally, large seeded species have enough reserve that support seed germination even in the dark which have great ecological significance that can escape natural calamities and stress in exposed environment (Armstrong & Westoby, 1993; Kromer & Gross, 1987; Leishman & Westoby, 1994).

**Table 1:** Seed germination percentage of *Ardisia macrocarpa* in different treatments

| S.N. | Treatment | Germination percentage (%) | |
|---|---|---|---|
| | | With coat | Without coat |
| 1 | Dark | 100[a] | 100[a] |
| 2 | Light | 60[b] | 90[b] |

Mean values followed by a different letter are significantly different ($P < 0.05$)

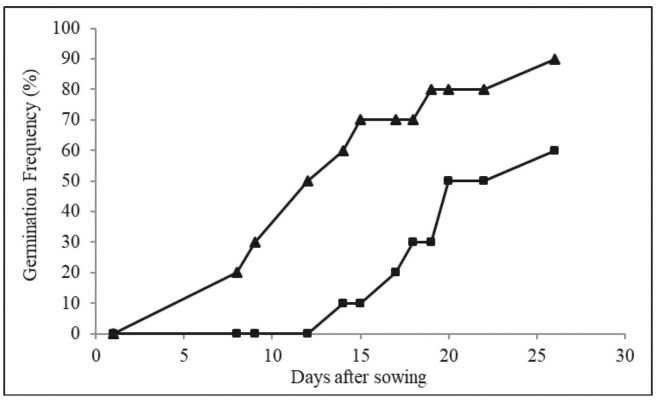


**Figure 5:** Effects of seed coat removal on seed germination in *Ardisia macrocarpa*. Germination frequency of seeds without coat (triangle) and seeds with coat (square)

### *Future goal of National Botanical Garden seed bank*

With limited resources, the NBG started seed banking, and it plans to collaborate with the National Agriculture Genetic Resource Center (NAGRC), NARC, Khumaltar, Nepal in the near future. The NBG has made it a priority to conserve the seeds of Nepalese endemic plant species as well as threatened and wild edible plant species found in Nepal.

## Conclusion

Botanical gardens are crucial for the conservation of wild plant diversity through both living plants and seed collections. In Nepal, the NBG is among the focal institutions in the field of wild seed conservation. Meanwhile, there is still lack of technical knowledge and standard protocols for seed banking operation of wild plants. So, knowledge sharing and collaboration among agencies involved in wild seed conservation at local, regional and global scale is important for the effective management of seed bank. NBG can collaborate with NARC, Central Department Botany (Tribhuvan University), Nepal Academy of Science and Technology and other institutions working on plant conservation. Furthermore, convenient management of genetic resource (maintaining high quality seed) in the seed bank with a limited resource is a big challenge because it demands an extra effort (like regular power supply, temperature and humidity control). So, conservation and management of species in wild is the best option. But, many wild species are threatened in the wild. This study is helpful in building database of wild genetic resources and their effective management in ex-situ for the restoration and research program. In addition, seed herbaria might establish as an ideal tool in plant taxonomy. Finally, it is very urgent to realize that wild biodiversity really matters not only at an institutional but also at local level. So, it is recommended to work more on wild seed biology especially recalcitrant seeds, making reliable gene bank protocols and establishing seed bank with the facility of conserving wild seeds.

In addition, study of factor affecting seed germination is very crucial. In case of *Ardisia macrocarpa*, seeds without coat, performed better in dark condition. Detailed study on seed characteristics and seed germination ecology is recommended for the successful and rapid propagation of *A. macrocarpa* through seeds.

## Author Contributions

DL and GP were involved in concept development. All authors were involved in defining of intellectual content, literature research and seed collection. TC arranged all the data and prepared the manuscript. SN assisted in biochemical test for viability. TC and GP were involved in revision of the manuscript. TC as a corresponding author is the guarantor for this article.

## Acknowledgements

The authors would like to thank all the donors and volunteers who helped in collection of seed samples from different parts of the country.

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**Appendix 1:** List of plant seeds collected before 2022

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| 1 | *Abelmoschus manihot* (L.) Medik. | Malvaceae | Edible hibiscus | Suryabinayak, Bhakatpur | 11/15/2021 | 100 | NBG-SB000115 | SK Kasaju | Medicinal, Wild edible (Young leaves) |
| 2 | *Abrus precatorius* L. | Fabaceae | Ratigedi | Syangja | | | NBG-SB000165 | | Medicinal |
| 3 | *Achyranthes bidentata* Blume | Amaranthaceae | OX-knee | NBG, Godawari | 5/8/2018 | 130 | NBG-SB-000037 | S Shah | Medicinal |
| 4 | *Aconogonum molle* (D. Don) H. Hara | Polygonaceae | Thotne | NBG, Godawari | | | NBG-SB-000015 | D Lamichhane & S Shah | Medicinal, Wild edible (Young shoot) |
| 5 | *Aconitum ferox* Wall. ex Ser. | Rannuanculaceae | Aconitum | Daman, Makwanpur | | | NBG-SB-000077 | R Tamang | Medicinal |
| 6 | *Adenanthera pavonina* L. | Fabaceae | | Tamanggadhi | | | | | Medicinal, Ornamental, Timber |
| 7 | *Agave americana* L. | Asparagaceae | Sentry plant | NBG, Godawari | | | NBG-SB-000038 | D Lamichhane & S Shah | Ornamental, Fodder |
| 8 | *Apios carnea* (Wall.) Benth. ex Baker | Fabaceae | | Sundarijal, Kathmandu | 10/1/2019 | 29 | | SK Kasaju | Wild Edible (Beans and tuber) |
| 9 | *Ardisia macrocarpa* Wall. | Primulaceae | Himalayan Coralberry/ Damai phal | NBG, Godawari | 3/25/2020 | 45 | NBG-SB-000001 | D Lamichhane, S Shah & S Dhakal | Ornamental, Wild Edible (Fruit) |
| 10 | *Ardisia solanacea* Roxb. | Primulaceae | | Pokhara | 2/24/2021 | 60 | | | Medicinal |
| 11 | *Astilbe rivularis* Buch.-Ham. ex D.Don | Saxifragaceae | False spiraea | NBG, Godawari | 10/12/2018 | 1000 | NBG-SB-000070 | S Shah | Medicinal |
| 12 | *Baliospermum solanifolium* (Burm.) Suresh | Euphorbiaceae | | Betkot tal, 500m | 1/7/2021 | | | | Medicinal |
| 13 | *Begonia sikkimensis* A. DC. | Begoniaceae | Begonia | NBG, Godawari | | | NBG-SB-000026 | S Shah | Ornamental |
| 14 | *Berberis aristata* DC. | Berberidaceae | Tree turmeric/Chutro | Katakuti, Dolakha | 5/23/2021 | | NBG-SB-000082 | S Shah | Medicinal, Wild edible (Fruit) |
| 15 | *Butea minor* Buch.-Ham. ex Baker | Fabaceae | Bhujetro | Way to Narayanghat to Muglin, Chitwan | 11/15/2018 | 50 | NBG-SB-000081 | D Lamichhane | Ornamnetal |
| 16 | *Cajanus elongatus* (Benth.) Maesen | Fabaceae | Pigeon pea | Champadevi, Kathmandu | 9/2/2019 | 4 | NBG-SB-000099 | SK Kasaju | Other (Fodder) |

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| 17 | *Callicarpa macrophylla* Vahl | Lamiaceae | | Daman, Makwanpur | | 200 | NBG-SB-000076 | R Tamang | Medicinal |
| 18 | *Calotropis procera* (Aiton) W.T.Aiton | Apocynaceae | Apple of Sodom | Chhatradeurali, Dhading | 7/7/2018 | 50 | NBG-SB-000009 | D Lamichhane, S Shah & S Dhakal | Medicinal |
| 19 | *Camellia sinensis* (L.) Kuntze | Theaceae | Tea | NBG, Godawari | 10/6/2018 | | NBG-SB-000109 | D Lamichhane & ML Pathak | Medicinal, Wild edible (dry leaves as tea) |
| 20 | *Carex baccens* Nees | poaceae | Carex | NBG, Godawari | | | NBG-SB-000041 | S Shah | Other (Fodder) |
| 21 | *Castanopsis indica* (Roxb. ex Lindl.) A.DC. | Fagaceae | Chest-nut | NBG, Godawari | 9/4/2018 | | NBG-SB 000006 | S Shah | Wild Edible (Fruit), Timber |
| 22 | *Catharanthus roseus* (L.) G.Don | Apocynaceae | Bright eyes | NBG, Godawari | | | NBG-SB 000042 | D Lamichhane & S Shah | Medicinal |
| 23 | *Cedrus deodara* (Roxb. ex D.Don) G.Don | pinaceae | Deodar | NBG, Godawari | 11/2/2018 | 16 | NBG-SB000044 | R Tamang | Timber |
| 24 | *Cinnamomum glaucescens* (Nees) Hand.-Mazz. | Lauraceae | Sugandhako kila | Chillikot, Dang | 12/24/2020 | 100 | NBG-SB 000139 | J Pandey | Medicinal aromatic |
| 25 | *Cinnamomum glaucescens* (Nees) Hand.-Mazz. | Lauraceae | Sugandhako kila | | | | NBG-SB000199 | | Medicinal aromatic |
| 26 | *Cinnamomum camphora* (L.) J.Presl | Lauraceae | Camphor | NBG, Godawari | 10/18/2018 | 50 | | | Medicinal aromatic |
| 27 | *Cinnamomum camphora* (L.) J.Presl | Lauraceae | Camphor | | | | NBG-SB000029 | S Shah | Medicinal aromatic |
| 28 | *Cissampelos pareira* L. | Menispermaceae | False pareira | NBG, Godawari | 10/6/2018 | <50 | | | Medicinal |
| 29 | *Cochialanthus gracilis* Benth. | Fabaceae | Taankee | Chisapani | 10/1/2019 | 36 | | SK Kasaju | None |
| 30 | *Dalbergia sisso*Roxb. ex DC. | Fabaceae | Sisso | Dang | 11/15/2018 | 50 | | | Timber |
| 31 | *Dinetus grandiflorus* (Wall.) Staples | Convolvulaceae | | Daman | | | NBG-SB000057 | R Tamang | None |
| 32 | *Duabanga grandiflora* (Roxb. ex DC.) Walp. | Lythraceae | Duabunga | Bhirkot Sundarchaur, Syangja | | | NBG-SB000010 | D Lamichhane | Timber |
| 33 | *Delonix regia* (Bojer ex Hook.) Raf | Fabaceae | | Tamagadhi, Bara | | 30 | NBG-SB000162 | | Ornamental |
| 34 | *Dipsacus inermis* Wall. | Caprifoliaceae | | NBG, Godawari | 10/12/2018 | 100 | NBG- | S Shah | Medicinal, Wild |

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SB000071 | | Edible |
| 35 | *Dumasia villosa* DC. | Fabaceae | | Shivapuri National Park, Kathmandu | 1/20/2020 | 66 | | | Medicinal |
| 36 | *Ehretia acuminata* R.Br. | Boraginaceae | Ehretia | NBG, Godawari | 9/9/2020 | 100 | NBG-SB000113 | D Lamichhane & ML Pathak | Timber |
| 37 | *Entada rheedii* Sprengel | Fabaceae | | Birgna, Syangja | | 4 | NBG-SB | | Other |
| 38 | *Ephedra gerardiana* Wall. ex Klotzsch & Garcke | Ephedraceae | Ephedra | NBG, Godawari | 10/12/2018 | 100 | NBG-SB000072 | S Shah | Medicinal |
| 39 | *Euonymus hamiltonianus* Wall. | Celastraceae | Hamilton's spindle tree | NBG, Godawari | 12/3/2018 | 100 | NBG-SB000003 | D Lamichhane, S Shah & S Dhakal | Ornamental |
| 40 | *Gaultheria fragrantissima* Wall. | Ericaceae | Fragrant wintergreen | Phulchoki, Lalitpur | 8/17/2020 | 202004 | NBG-SB000096 | D Lamichhane, M L Patahk & K Nepali | Medicinal |
| 41 | *Oreoseris maxima* (D.Don) X.D.Xu & W.Zheng | Asteraceae | | Lathabhanjyang, Lalitpur | 1/8/2020 | 150 | | SK Kasaju | Ornamental |
| 42 | *Hedychium coccineum* Buch.-Ham. ex Sm. | Zingerberaceae | Ginger lily | NBG, Godawari | | | NBG-SB000047 | D Lamichhane, S Shah & S Dhakal | Medicinal, Ornamental |
| 43 | *Hedychium flavescens* Carey ex Roscoe | Zingerberaceae | Yellow ginger lily | NBG, Godawari | | | NBG-SB000048 | S Shah | Ornamental |
| 44 | *Stauntonia latifolia* (Wall.) R.Br. ex Wall. | Lardizabalaceae | | NBG, Godawari | | | | D Lamichhane & ML Pathak | Medicinal, Wild edible (Fruit) |
| 45 | *Holoptelea integrifolia* (Roxb.) Planch. | Ulmaceae | | Kanchanpur | | | | | Timber |
| 46 | *Hypericum uralum* Buch.-Ham. ex D.Don | Hypericaceae | St.John's wort | NBG, Godawari | | | NBG-SB000028 | S Shah | Ornamental |
| 47 | *lex excelsa* (Wall.) Voigt | Aquifoliaceae | Ilex/Puwale | Sundarijal, Kathmandu | 7/17/2019 | 70 | NBG-SB000085 | SK Kasaju | None |
| 48 | *Indigofera atropurpurea* Buch.-Ham. ex Hornem. | Fabaceae | Deep-Purple indigo | Harthok, Palpa | 9/25/2019 | | NBG-SB000088 | SK Kasaju | (Other) Fodder |
| 49 | *Juglans regia* L. | Juglandaceae | Walnut | NBG, Godawari | 10/10/2018 | 26 | NBG-SB000018 | S Shah | Wild edible (Fruit) |
| 50 | *Lagerstroemia parviflora* Roxb. | Lythraceae | | | 12/15/2018 | 300 | NBG-SB000080 | D Lamichhane | Ornamental |
| 51 | *Lindera neesiana* (Wall. ex Nees) Kurz | Lauraceae | Lindera/Bok etimur | Ilam | | | NBG-SB000101 | J Pandey | Medicinal |
| 52 | *Litsea chartacea* | Lauraceae | Litsea | Phulchoki, Lalitpur | | 30 | NBG- | D Lamichhane, | (Other) Fodder |

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| | Hook.f. | | | | | | SB00009 | ML Pathak & K Nepali | |
| 53 | *Matricaria chamomilla* L. | Asteraceae | Camomile | Tamagadhi, Bara | 4/5/2021 | | NBG-SB000131 | D Lamichhane | Medicinal aromatic |
| 54 | *Melia azedarac*h L. | Meliaceae | China-berry | Chitwan | 11/15/2018 | 10 | NBG-SB000069 | S Shah | Other (Fodder) |
| 55 | *Murraya koenigii* L. | Rutaceae | Curry leaf | NBG, Godawari | | | NBG-SB000019 | S Shah | Medicinal aromatic |
| 56 | *Nageia nagi* (Thunb.) Kuntze | Podocarpaceae | | NBG, Godawari | 9/1/2018 | | | | Ornamental |
| 57 | *Nicandra physalodes* (L.) Gaertn. | Solanaceae | | | | | | | Medicinal |
| 58 | *Nyctanthes arbor-tristis* L. | Oleaceae | Nightflowering jasmine | NBG, Godawari | 11/25/2018 | 25 | NBG-SB000036 | S Shah | Ornamenatal |
| 59 | *Oroxylum indicum* (L.) Kurz | Bignoniaceae | | Salyan | | | | D Baral | Medicinal |
| 60 | *Osmanthus fragrans* Lour. | Oleaceae | Sweet olive/ Siringe | NBG, Godawari | 9/11/2020 | 245 | NBG-SB000002 | D Lamichhane & ML Pathak | Medicinal aromatic, Ornamental |
| 61 | *Persicaria hydropiper* (L.) Delarbre | Acanthaceae | Joint weed | NBG, Godawari | 10/12/2018 | 100 | NBG-SB000073 | S Shah | Medicinal |
| 62 | *Phytolacca acinosa* Roxb. | Phytolaccaceae | Poker weed | NBG, Godawari | | | NBG-SB000021 | S Shah | Wild edible (Young shoot) |
| 63 | *Prunus cerasoides* Buch.-Ham. ex D.Don | Rosaceae | Wild himalayan cherry | NBG, Godawari | | | NBG-SB000058 | D Lamichhane & S Shah | Wild edible (Fruit) |
| 64 | *Pyracantha crenulata* (D.Don) M.Roem. | Rosaceae | Nepalese firethorn/ Ghangaru | NBG, Godawari | 9/11/2020 | 200 | NBG-SB000100 | D Lamichhane & ML Pathak | Medicinal, Wild edible (Fruit) |
| 65 | *Rauvolfia serpentina* (L.) Benth. ex Kurz | Apocynaceae | Snakeroot | Tamagadhi, Bara | | | NBG-SB000132 | D Lamichhane | Medicinal |
| 66 | Rauvolfia serpentine (L.) Benth. ex Kurz | Apocynaceae | Snakeroot | NBG, godawari | 9/4/2018 | 46 | NBG-SB000014 | D Lamichhane & S Shah | Medicinal |
| 67 | *Rauvolfia verticillata* (Lour.) Baill. | Apocynaceae | Snakeguard | NBG, godawari | 9/11/2020 | 100 | NBG-SB000004 | D Lamichhane, ML Pathak & K Nepali | Medicinal |
| 68 | *Rhododendron arboreum* Sm. | Ericaceae | Rhododendron | NBG, Godawari | | | NBG-SB000059 | S Shah | Medicinal, Ornamental, Timber |

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| 69 | *Ricinus communis* L, | Euphorbiaceae | Castor oil plan | Devghat, Chitwan | 10/16/2020 | 200 | NBG-SB000107 | D Lamchane & ML Pathak | Medicinal aromatic |
| 70 | *Rubia manjith* Roxb. | Rubiaceae | Majitho | NBG, Godawari | 3/28/2021 | 120 | NBG-SB000061 | D Lamichhane & S Shah | Other (Dye) |
| 71 | *Rubus ellipticus* Sm. | Rosaceae | Golden evergreen raspberry | NBG, Godawari | | | NBG-SB000062 | S Shah | Wild edible (Fruit) |
| 72 | *Sambucus javanica* Reinw. ex Blume | Viburnaceae | American Alder | NBG, Godawari | | 100 | NBG-SB000022 | S Shah | Ornamental |
| 73 | *Sapindus mukorossi* Gaertn. | Sapindaceae | Washnut | Chhatradeurali, Dhading | | 145 | NBG-SB000011 | D Lamichhane & S Shah | Medicinal aromatic |
| 74 | *Sarcococca coriacea* (Hook.) Sweet | Buxaceae | Sarcococca | NBG, Godawari | 12/12/2019 | 115 | NBG-SB000074 | S Shah | Ornamental |
| 75 | *Searsia parviflora* (Roxb.) F.A.Bar | Anacardiaceae | | NBG, Godawari | | | NBG-SB000060 | D Lamichhane | Wild edible (Fruit) |
| 76 | *Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb. | Fabaceae | Khayar | Satbariya, Dang | 2/19/2021 | 210 | NBG-SB000137 | J Pandey | Medicinal, Timber |
| 77 | *Senna* × *floribunda* (Cav.) H.S.Irwin & Barneby | Fabaceae | | NBG, Godawari | 8/26/2018 | | | | Ornamental |
| 78 | *Senna occidentalis* (L.) Link | Fabaceae | Coffee senna | NBG, Godawari | 9/2/2020 | 250 | NBG-SB-000098 | D Lamichhane, ML Pathak & K Nepali | Ornamental |
| 79 | *Solanum americanum* Mill. | Solanaceae | Black nightshade | NBG, Godawari | | | NBG-SB000023 | S Shah | Medicinal |
| 80 | *Solanum pseudocapsicum* L. | Solanaceae | Jerusalem cherry | NBG, Godawari | 5/8/2018 | 250 | NBG-SB000024 | S Shah | Ornamental |
| 81 | *Solanum virginianum* L. | Solanaceae | Yellow fruit nightshade | Devghat, Chitwan | | 200 | | ML Pathak | Medicinal |
| 82 | *Solanum virginianum* L. | Solanaceae | Yellow fruit nightshade | NBG, Godawari | | | NBG-SB000025 | D Lamichhane & ML Pathak | Medicinal |
| 83 | *Spiraea bella* Sims | Rosaceae | Pretty Spirea | NBG, Godawari | | | NBG-SB000066 | S Shah | Ornamental |
| 84 | *Tagetes minuta* L. | Asteraceae | Wild marigold | Tinpanebhangyang, Lalitpur | 10/4/2018 | 60 | | | Medicinal, Ornamental |
| 85 | *Taxus contorta* Griff. | Taxaceae | West himalayan yew | Rara, Mugu | 10/28/2018 | 100 | NBG-SB000032 | S Shah | Medicinal |
| 86 | *Valeriana jatamansi* Jones ex Roxb. | Caprifoliaceae | | NBG, Godawari | 4/2/2019 | 150 | | | Medicinal |

| S.N. | Scientific name | Family | Local name/ Common name | Locality | Date of collection (AD) | No. of seeds | Accession no. | Collectors | Use value |
|---|---|---|---|---|---|---|---|---|---|
| 87 | *Viburnum erubescens* Wall. ex DC. | Rosaceae | Viburnum | Phulchoki, Lalitpur | 9/11/2022 | | NBG-SB000114 | D Lamichhane, ML Pathak & K Nepali | Ornamental |
| 88 | *Viburnum punctatum* Buch.-Ham. ex D.Don | Rosaceae | | Sundarijal, Kathmandu | | 48 | | SK Kasaju | None |
| 89 | *Wisteria sinensis* (Sims) DC. | Fabaceae | | NBG, godawari | 9/11/2020 | 100 | NBG-SB000112 | ML Pathak | Ornamental |
| 90 | *Withania somnifera* (L.) Dunal | Solanaceae | Indian ginseng | NBG, Godawari | | 200 | NBG-SB000016 | D Lamichhane & S Shah | Medicinal |
| 91 | *Xylosma controversa* Clos | Salicaceae | | NBG, Godawari | 2/15/2019 | 48 | NBG-SB000067 | S Shah | Ornamental |
| 92 | Zanthoxylum armatum Dc. | Rutaceae | Prickly ash/Timur | Kapurkot, Salyan | 10/8/2021 | | NBG-SB000135 | J Pandey | Medicinal aromatic |
| 93 | Zanthoxylum armatum DC. | Rutaceae | Prickly ash/Timur | NBG, godawari | 9/11/2020 | | NBG-SB000108 | D Lamichhane, ML Pathak & K Nepali | Medicinal aromatic |

**Appendix 2:** List of seeds collected in 2022

| S.N. | Scientific name | Local name | Family | Locality | Collectors |
|---|---|---|---|---|---|
| 1 | *Albizia julibrissin* Durazz. | Seto siris | Fabaceae | Matichaur, Lalitpur | T Chaudhary & M Nagarkoti |
| 2 | *Albizia* sp. | | Fabaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 3 | *Amaranthus caudatus* L. | Latte dana, Gangalari | Amaranthaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 4 | *Asparagus racemosus* Willd. | Satavari, Kurilo | Asparagaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 5 | *Barleria noctiflora* L.f. | | Acanthaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 6 | *Berberis asiatica* Roxb. ex DC. | Chutro | Berberidaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 7 | *Mahonia napaulensis* DC. | Jamanemandro | Berberidaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 8 | *Mahonia acanthifolia* Wall. ex G.Don | | Berberidaceae | Konjosom-05, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 9 | *Bischofia javanica* Blume | Kaijal | Phyllanthaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 10 | *Butea minor* Buch.-Ham. ex Baker | Bhujetro | Fabaceae | Chure-07, Khaldode, Kailali | B Chaudhary & B Chaudhary |
| 11 | *Butea monosperma* (Lam.) Kuntze | Palasha | Fabaceae | Kailali | Donated from District Forest Office, Lalitpur |
| 12 | *Calotropis gigantea* (L.) W.T.Aiton | Aakha | Apocynaceae | Dudhauli, Sindhuli | R Kafle |
| 13 | *Camellia sinensis* (L.) Kuntze | chiya | Theaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 14 | *Carex baccans* Nees | | Cyperaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 15 | *Cipadessa baccifera* (Roxb. ex Roth) Miq. | Painati | Meliaceae | Chaurideurali, Kavre | M Nagarkoti |
| 16 | *Clematis grewiiflora* DC. | | Ranunculaceae | NBG, Godawari, Lalitpur | J Pandey |
| 17 | *Coix lacryma-jobi* L. | Bhirkaulo | Poaceae | NBG, Godawari, Lalitpur | R Tamang |
| 18 | *Coix lacryma-jobi* L. | Bhirkaulo | Poaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 19 | *Coriaria napalensis* Wall. | Machaino | Coriariaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 20 | *Dalbergia sissoo* Roxb. ex DC. | Sissoo | Fabaceae | Ghorahi, Dang | T Chaudhary |
| 21 | *Daphne bholua* Buch.-Ham. ex D.Don | Loktha | Thymelaeaceae | Mahankal, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 22 | *Daphniphyllum himalense* (Benth.) Müll.Arg. | Rakta chandan | Daphniphyllaceae | Mahankal-02, Sison, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 23 | *Debregeasia longifolia* (Burm.f.) Wedd. | Tushaare | Urticaceae | Panauti-10, Kavre | D Lamichhane, J Pandey & G Parmar |
| 24 | *Delonix regia* (Bojer ex Hook.) Raf. | Gul mohar | Fabaceae | Ghorahi, Dang | LB Chaudhary |
| 25 | *Elaeagnus infundibularis* Momiy. | Madilo | Elaeagnaceae | Badikhel, Lalitpur | M Nagarkoti |
| 26 | *Elaeocarpus angustifolius* Blume | Rudrakshya | Elaeocarpaceae | | Donated from District Forest Office, Lalitpur |
| 27 | *Ensete glaucum* (Roxb.) Cheesman | Ban kera | Musaceae | Salyan | A KC & Y R Paneru |
| 28 | *Ensete glaucum* (Roxb.) Cheesman | | Musaceae | NBG, Godawari, Lalitpur | G Parmar |

| S.N. | Scientific name | Local name | Family | Locality | Collectors |
|---|---|---|---|---|---|
| 29 | *Euonymus hamiltonianus* Wall. | Ban Chitu | Celastraceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 30 | *Gaultheria fragrantissima* Wall. | Dhasingare | Ericaceae | Mahankal, Lalitpur | J Pandey & G Parmar |
| 31 | *Gaultheria nummularioides* D.Don | Kaali gedi | Ericaceae | Mahankal, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 32 | *Gymnanthemum amygdalinum* (Delile) Sch.Bip. | Titepati | Asteraceae | Hetauda, Makwanpur | H Ray & MP Adhikari |
| 33 | *Hedychium gardnerianum* Sheppard ex Ker Gawl. | Sun kewara | Zingiberaceae | Panauti-10, Kavre | D Lamichhane, J Pandey & G Parmar |
| 34 | *Hedychium thyrsiforme* Sm. | Sun kewara | Zingiberaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 35 | *Holoptelea integrifolia* (Roxb.) Planch. | Sano pangro | Ulmaceae | Godawari, Kailali | T Chaudhary |
| 36 | *Hydrangea febrifuga* (Lour.) Y.De Smet & Granados | Bhasak | Hydrangeaceae | Chandragiri, Kathmandu | D Lamichhane, J Pandey & G Parmar |
| 37 | *Hypericum podocarpoides* N.Robson | | Hypericaceae | Konjosom-05, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 38 | *Hypericum uralum* Buch.-Ham. ex D.Don | Urilo | Hypericaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 39 | *Leucosceptrum canum* Sm. | Bhusure | Lamiaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 40 | *Maesa chisia* D.Don | Bilauni | Primulaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 41 | *Miscanthus nepalensis* (Trin.) Hack. | | Poaceae | Mahankal-02, Sison, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 42 | *Myrica esculenta* Buch.-Ham. ex D.Don | Kafal | Ericaceae | Panauti-10, Khani, Kavre | R Tamang |
| 43 | *Nicandra physalodes* (L.) Gaertn. | Ishmahol | Solanaceae | Panini-02, Arghakhachi | J Pandey |
| 44 | *Nicotiana tabacum* L. | Surti | Solanaceae | Matichaur, Lalitpur | T Chaudhary & M Nagarkoti |
| 45 | *Ophiopogon intermedius* D.Don | Ban supari | Asparagaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 46 | *Osbeckia nepalensis* Hook. | Seto chulsi | Melastomataceae | Fikkal-1, Pathivara, Sindhuli | J Pandey |
| 47 | *Osmanthus fragrans* Lour. | Shiringe | Oleaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 48 | *Osmanthus fragrans* Lour. | Shiringe | Oleaceae | | Donated from District Forest Office, Lalitpur |
| 49 | *Oxyspora paniculata* (D.Don) DC. | | Melastomataceae | Mahankal-02, Sison, Lalitpur | D Lamichhane, J Pandey and G Parmar |
| 50 | *Phenax rugosus* (Poir.) Wedd. | | Urticaceae | Panini-02, Arghakhachi | J Pandey |
| 51 | *Phytolacca acinosa* Roxb. | Hokling | Phytolaccaceae | Industrial area, Patan, Lalitpur | M Nagarkoti |
| 52 | *Piptanthus nepalensis* (Hook.) Sweet | | Fabaceae | Chandanbari, Rasuwa | T Chaudhary & M Nagarkoti |
| 53 | *Prinsepia utilis* Royle | Dhatelo | Rosaceae | Chitlang, Makwanour | T Chaudhary & Bimal Chaudhary |
| 54 | *Prunus cerasoides* Buch.-Ham. ex D.Don | Paiyau | Rosaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 55 | *Prunus cerasoides* Buch.-Ham. ex D.Don | Paiyau | Rosaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 56 | *Rauvolfia verticillata* (Lour.) Baill. | Sarpagandha | Apocynaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 57 | *Rhaphiolepis dubia* (Lindl.) B.B.Liu & J.Wen | Jurekafal | Rosaceae | Panauti-10, Khani, Kavre | R Tamang |

| S.N. | Scientific name | Local name | Family | Locality | Collectors |
|---|---|---|---|---|---|
| 58 | *Rubia manjith* Roxb. | Majitho | Rubiaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 59 | *Sarcococca coriacea* (Hook.) Sweet | Phitphitiya | Buxaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 60 | *Saurauia napaulensis* DC. | Gogan | Actinidiaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 61 | *Senna* × *floribunda* (Cav.) H.S. Irwin & Barneby | Chinchine | Fabaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 62 | *Smilax aspera* L. | Kukurdaino | Smilacaceae | Mahankal, Lalitpur | D Lamichhane, J Pandey & G Parmar |
| 63 | *Solanum virginianum* L. | Kantakari | Solanaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 64 | *Solanum virginianum* L. | Kantakari | | Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 65 | *Spondias dulcis* Parkinson | Amaro | Anacardiaceae | Banganga, Kapilbastu | J Pandey |
| 66 | *Tetrastigma obtectum* (Wall. ex M.A. Lawson) Planch. ex Franch. | | Vitaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 67 | *Tetrastigma serrulatum* (Roxb.) Planch. | Charchare | Vitaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 68 | *Urtica dioica* L. | Sisnu | Urticaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 69 | *Withania somnifera* (L.) Dunal | Aswogandha | Solanaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 70 | *Woodfordia fruticosa* (L.) Kurz | Dhainyaro | Lythraceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 71 | *Xylosma controversa* Clos | Dade kada | Salicaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 72 | *Zehneria japonica* (Thunb.) H.Y.Liu | | Cucurbitaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |
| 73 | *Ziziphus incurva* Roxb. | Hade bayar | Rhamnaceae | NBG, Godawari, Lalitpur | T Chaudhary & M Nagarkoti |

**Appendix 3:** Germination test of collected seeds

| S.N. | Species name | Family | Date of seed sowing/tz test/culture | Number of seed | First date of seed germination | Total germination/ viability | Percentage of seed germination/ viability | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | *Amaranthus caudatus* L. | Amaranthaceae | 2/14/2022 | 50 | 3/20/2022 | 50 | 100 | |
| 2 | *Withania somnifera* (L.) Dunal | Solanaceae | 3/2/2022 | 30 | 3/20/2022 | 30 | 100 | |
| 3 | *Solanum virginianum* L. | Solanaceae | 3/2/2022 | 50 | 3/13/2022 | 49 | 98 | |
| 4 | *Hedychium thyrsiforme* Sm. | Zingiberaceae | 3/5/2022 | 30 | 3/29/2022 | 26 | 87 | |
| 5 | *Maesa chisia* D.Don | Primulaceae | 3/6/2022 | 50 | 3/29/2022 | 50 | 100 | |
| 6 | *Ardisia macrocarpa* Wall. | Primulaceae | 3/6/2022 | 10 | 5/25/2022 | 9 | 90 | |
| 7 | *Carex* sp. | Poaceae | 3/6/2022 | 50 | 6/5/2022 | | | Germination continued |
| 8 | *Albizia* sp. | Fabaceae | 3/7/2022 | 30 | 3/29/2022 | 22 | 73 | |
| 9 | *Abelmoschus manihot* (L.) Medik. | Malvaceae | 3/7/2022 | 30 | 3/20/2022 | | | Germination continued |
| 10 | *Gossypium hirsutum* L. | Malvaceae | 3/10/2022 | 20 | 3/20/2022 | 9 | 45 | |
| 11 | *Choerospondias axillaris* (Roxb.) B.L. Burtt & A.W.Hill | Anacardiaceae | 3/10/2022 | 25 | 4/20/2022 | 20 | 80 | Field test |
| 12 | *Santalum album* L. | Santalaceae | 3/10/2022 | 25 | 4/16/2022 | 11 | 44 | Fieldtest |
| 13 | *Barleria cristata* L. | Acanthaceae | 3/11/2022 | 50 | 3/24/2022 | 26 | 52 | |
| 14 | *Dalbergia sissoo* Roxb. ex DC. | Fabaceae | 3/11/2022 | 30 | 3/13/2022 | 26 | 87 | |
| 15 | *Nicotiana tabacum* L. | Solanaceae | 3/11/2022 | 50 | 3/29/2022 | 48 | 96 | |
| 16 | *Hibiscus mutabilis* L. | Malvaceae | 3/11/20222 | 50 | 4/10/2022 | | | Germination continued |
| 17 | *Rubia manjith* Roxb. | Rubiaceae | 3/16/2022 | 30 | 3/28/2022 | 10 | 33 | |
| 18 | *Zehneria japonica* (Thunb.) H.Y.Liu | Cucurbitaceae | 3/16/2022 | 30 | 3/22/2022 | 30 | 100 | |
| 19 | *Xylosma controversa* Clos | Salicaceae | 3/16/2022 | 30 | 4/13/2022 | 21 | 70 | |
| 20 | *Tetrastigma obtectum* (Wall. ex M.A.Lawson) Planch. ex Franch. | Vitaceae | 3/16/2022 | 20 | 4/17/2022 | 8 | 40 | |
| 21 | *Tetrastigma obtectum* (Wall. ex M.A. Lawson) Planch. ex Franch. (Dark) | Vitaceae | 3/16/2022 | 20 | 4/17/2022 | 19 | 95 | |
| 22 | *Gaultheria nummularioides* D.Don | Ericaceae | 3/16/2022 | 100 | 4/13/2022 | | | Germination continued |
| 23 | *Mahonia napaulensis* DC. | Berberidaceae | 4/24/2022 | 30 | 5/1/2022 | 30 | 100 | |
| 24 | *Spilanthes* sp. | Astaraceae | 4/24/2022 | 50 | 4/29/2022 | 48 | 96 | |
| 25 | *Coix lacryma-jobi* L. | Poaceae | 4/24/2022 | 20 | 4/29/2022 | 18 | 90 | |

| S.N. | Species name | Family | Date of seed sowing/tz test/culture | Number of seed | First date of seed germination | Total germination/ viability | Percentage of seed germination/ viability | Remarks |
|---|---|---|---|---|---|---|---|---|
| 26 | *Prinsepia utilis* Royle | Rosaceae | 4/24/2022 | 10 | 5/3/2022 | 10 | 100 | |
| 27 | *Tetrastigma serrulatum* (Roxb.) Planch. | Vitaceae | 4/24/2022 | 20 | 1/18/2079 | 16 | 80 | |
| 28 | *Tetrastigma serrulatum* (Roxb.) Planch. (Dark) | Vitaceae | 4/24/2022 | 20 | 2/2/2078 | 19 | 95 | |
| 29 | *Bischofia javanica* Blume (Dark) | Phyllanthaceae | 4/24/2022 | 30 | 5/1/2022 | 22 | 73 | |
| 30 | *Coriaria napalensis* Wall. | Coriariaceae | 4/24/2022 | 50 | 5/1/2022 | 48 | 96 | |
| 31 | *Albizia julibrissin* Durazz. | Fabaceae | 4/24/2022 | 20 | 5/3/2022 | | | Germination continued |
| 32 | *Debregeasia longifolia* (Burm.f.) Wedd. | Urticaceae | 4/24/2022 | 50 | 5/3/2022 | | | Germination continued |
| 33 | *Ophiopogon* sp. | Poaceae | 4/24/2022 | 20 | 5/20/2022 | | | Germination continued |
| 34 | *Ensete glaucum* (Roxb.) Cheesman | Musaceae | 4/25/2022 | 20 | 5/24/2022 | | | Germination continued |
| 37 | *Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb. | Fabaceae | 4/26/2022 | 30 | 5/1/2022 | 22 | 73 | |
| 38 | *Eriobotrya dubia (*Lindl.) Decne. | Rosaceae | 4/26/2022 | 25 | 5/9/2022 | 21 | 84 | Field test |
| 39 | *Mahonia napaulensis* DC. | Berberidaceae | 5/2/2022 | 50 | 5/3/2022 | 49 | 98 | |
| 40 | *Eriobotrya dubia (*Lindl.) Decne. | Rosaceae | 55/2/2022 | 25 | 5/3/2022 | 23 | 92 | TZ test |
| 41 | *Mahonia acanthifolia* Wall. ex G.Don | Berberidaceae | 5/4/2022 | 50 | 5/7/2022 | 47 | 94 | TZ Test |
| 42 | *Mahonia acanthifolia* Wall. ex G.Don | Berberidaceae | 5/5/2022 | 30 | 5/10/2022 | 26 | 87 | Field test |
| 43 | *Ensete glaucum* (Roxb.) Cheesman | Musaceae | 5/24/2022 | 10 | 5/27/2022 | | | Germination continued |
| 44 | *Saurauia napaulensis* DC. | Actinidiaceae | 5/25/2022 | 50 | 5/3/2022 | | | Germination continued |
| 45 | *Calotropis gigantea* (L.) W.T. Aiton | Apocynaceae | 5/26/2022 | 30 | 5/30/2022 | 29 | 97 | |
| 46 | *Urtica dioica* L. | Urticaceae | 5/26/2022 | 50 | 5/30/2022 | | | Germination continued |
| 47 | *Osbeckia nepalensis* Hook. | Melastomataceae | 5/27/2022 | 100 | 6/1/2022 | | | Germination continued |
| 48 | *Woodfordia fruticose* (L.) Kurz | Lythraceae | 5/27/2022 | 100 | 6/1/2022 | | | Germination continued |