

### c) Drying of herbarium specimens

The most important thing to do with freshly collected material is to dry it out as fast as possible. This prevents fungal infections and preserves color.

1. Plant specimens are laid in the folded newspaper between layers of blotter, foam sheets and corrugated cardboard.
2. Blotter and corrugated sheet should be kept in every specimen, so that specimen dries up quickly.
3. The paper, blotter and foam draw the moisture away from the specimen.
4. The cardboard allows air circulation within the press to speed up the drying process and helps to keep the specimens flat.
5. Plants in their newspaper folders are piled in layers of alternating padding and cardboard on one of the wooden frames.
6. When the entire specimen is laid completely, the second frame is laid on top of the pile which is compressed and strapped as tightly as possible with two adjustable straps. While fastening the straps, standing on the press helps to get them properly tight.
7. After pressing the specimens, they should be heated or dried artificially by electric heater, kerosene heater or firewood for about 2 to 4 hours until the specimens are completely dried up.
8. The specimen bundle should be turned upside down time to time for proper drying.
9. Drying without artificial heat is universal in which the press is placed to dry in warm (not hot), dry, circulating air.
10. After 24 hours the paper and blotters should be changed to enhance the drying process.
11. The straps must be tightened periodically as the plant material shrinks.
12. Dried specimens can be stored and transported in their newspaper folders in a cardboard carton.



### d) Mounting of herbarium specimens

Mounting is the process of affixing a dried pressed plant and its label to a sheet of standard sized heavy paper 29 X 43cm. This provides physical support that allows the specimen to be handled and stored with a minimum of damage. Plants should be mounted in such a way that they could be inspected directly. All parts

must be well pasted so that no part is detached while handling. The commonly used technique is glass plate method that requires a glass plate at least 50 X 35cm. The gum paste is spread thinly over most of the surface with a flat 5cm brush. The specimen is removed from the pressing sheet, herbarium is placed face upward on the prepared plate, with all parts of the lower side in contact with the paste. It is then lifted with the aid of a forceps and transferred to the sheet of mounting paper. The newspaper is placed over the specimen that takes off and removes all excess paste from edge of leaves and flowers. The label is pasted on the lower right-hand corner of the sheet prior to mounting or after mounting. Fallen flowers and fruits from specimens are kept in a pocket (capsule) and attached to the same sheet on right side of upper corner. After one to two specimens have been mounted, fresh paste is reapplied to the plate at intervals, the accumulated dried paste and bits of debris must be scrapped off with a spatula. The glass should be washed after finishing mounting. Bulky specimens are also mounted by stitching by needle and thread or by paper tapes. Consequently, the mounting paper, label paper,



packet paper, ink, glue, mounting strips and storage folders should all be acid free and designed for long-term stability.

### 3. Arrangement of Herbarium Specimens

The families are arranged according to one of the several accepted systems of classification e.g. Bentham and Hooker, Engler and Prantl, APG (Angiosperm Phylogenetic Group), etc. which place closely related families together. The genera are then arranged alphabetically within each family and the species within each genus. National Herbarium and Plant Laboratories (KATH) is based on Bentham and Hooker System of Classification and further has started following the APG System of classification.



#### ❖ Annotation and Synonym

It is necessary when a specimen has been misidentified or an authority verifies an identified specimen formerly in doubt or name of species has merely been changed in the literature, an updated synonym is all that is necessary. It is done by gluing a label of (0.75 X 4.3 inch) above the original label on the herbarium sheet.

*Isodon rugosus* (Wall. ex Benth.) Codd

Det.: C.A. Pendry 2018  
Revised for the Flora of Nepal

### 4. Functions of Herbarium

The following are the main functions of herbarium:

1. It safeguards dried plant specimens (herbarium specimens) against loss and destruction by fungi, insects, etc.
2. It helps in the correct identification of plants by comparing with already identified herbarium specimens.
3. It provides material and data for scientific research and teaching activities.
4. It is a source of information about plants (e.g. distribution, ecology, threat category, medicinal usage, conservation status, etc).
5. It preserves Type Specimens which is the principal proof for the existence of a species.

#### ❖ Different types of herbaria

There are different types of herbaria based on the kinds of specimens they are housed.

1. International herbaria keep specimens from all over the world.
2. National herbaria keep specimens from all regions within a specific country.
3. Regional herbaria keep specimens from a specified region or province within a country.
4. Local herbaria keep specimens from a small area within a region or province.
5. Teaching or academic herbaria are attached to a training institute and are generally a place where students deposit their collections.
6. Private herbaria are kept by individuals or are attached to private land such as farms or private nature reserves.
7. Research herbaria usually house voucher specimens.

#### ❖ Guidelines for handling herbarium specimens

1. Always use two hands because dry plants are brittle, and they may be broken.
2. Always keep specimens flat and face up.
3. Do not slide sheets over each other.
4. Sort by family, genus and finally species.
5. The location should be marked, otherwise it might be misplaced.

# HERBARIUM PREPARATION: TOOLS & TECHNIQUES



Government of Nepal  
Ministry of Forests and Environment  
Department of Plant Resources



## National Herbarium and Plant Laboratories

Godawari, Lalitpur, Nepal

P.B.No. 3708

Phone: 977-01-5174277, 5174047

Website: [www.kath.gov.np](http://www.kath.gov.np)

2019



## 1. Introduction

A collection of dried and pressed plant specimen arranged according to an accepted system of classification and available for study or reference is known as herbarium (pl. *herbaria*). The word 'Herbarium' was originally applied by Tournefort (1700) to describe a collection of dried plants which was later adopted by Linnaeus. Plant collections are essential for taxonomic researches because they serve as voucher specimens and reference material for identification, nomenclature and classification of the plants. Herbaria in different countries remain associated with colleges, universities, scientific societies, research institutes, botanical gardens or government organizations. They may contain a few hundred local collections or millions of them of a district, state, country or different parts of the world. Usually, herbaria are indexed with unique codes in the "Index Herbariorum" (IH) presently assigned and maintained by New York Botanical Garden herbarium.

The first herbarium and Botanic Garden was established in 1545. The art of Herbarium was initiated by an Italian taxonomist Luca Ghini (1490-1556), a teacher of Bologna. He was the first botanist to be credited as the inventor of the herbarium. The oldest preserved herbarium specimen is kept in Rome, collected by the naturalist Gherardo Cibo a pupil of Luca Ghini (1532).



There are approximately 3400 herbaria in the world today. National Herbarium and Plant Laboratories (KATH) under Department of Plant Resources and Tribhuvan University Central Herbarium (TUCH) are two herbaria of Nepal listed with Index Herbariorum. With the advent of Information Technology, new techniques are adopted for the electronic herbaria (virtual herbarium) in the form of digitized databases. National Herbarium and Plant Laboratories (KATH) has digitized 40,000 herbarium specimens among them 33,000 specimens are available on website ([plantdatabase.kath.gov.np](http://plantdatabase.kath.gov.np)).

## 2. Preparation of Herbarium Specimens

Generally, there are four steps for the preparation of the herbarium specimens:

- a) Collection
- b) Pressing
- c) Drying
- d) Mounting

### a) Collection of herbarium specimen

A small number of well-collected and clearly annotated specimens are of much greater scientific value than larger number of badly pressed, poorly labelled scraps. The quality of the specimen determines the scientific value of the collection and collecting good specimen is the first step in preparing specimen of a high standard. Specimen should be typically healthy and complete.

1. Herbaceous plants should be collected with complete root system. A good specimen comprises all the organs, underground parts, rhizomes, stems, leaves, flowers or fruits. Basal parts of grasses, sedges, ferns and bulbous plants are essential for identification. Roots, rhizomes and storage organs are often helpful (and sometimes essential) in identifying specimens.
2. When collecting large plants, such as trees, shrubs and large herbs, those parts should be collected which clearly shows branching pattern and leaf arrangement. Specimen too large for the mounting sheet can be bent, broken or cut before they are pressed. Large or complex parts, such as fern fronds or cycad leaves are collected only in part. The base, middle and apex are usually adequate for most taxa.
3. The individuals of average size should be selected. If possible, several plants should be collected to show the morphological variation within the

population (size, for example). Enough samples of the specimen should be collected to fill a herbarium sheet; extra flowers are often particularly useful.

4. Valuable information can be obtained by collecting the same species in different habitats, at different localities and in different seasons (under different collector's numbers).
5. Weeds should be collected as it provides information regarding the status, distribution record, and rate of invasion.
6. Rare, endangered or threatened species are never collected unless they are locally abundant. In this case, a digital photograph of the rare plant is sufficient.

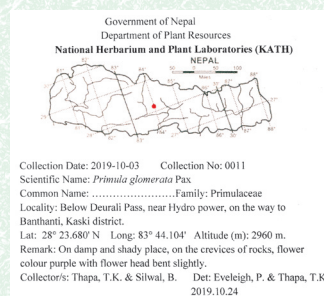
### ❖ Illustration and Photography

These are important tools for the entire taxonomist, because all parts of the plant can be recorded as habit, habitat, bark, wood, twigs, nodes, reproductive parts, flower color, hairs and complex shapes.

### ❖ Field Notes

The collector should note following observations in the field as field note which is latter on glued as herbarium label (8 X 10 cm) on the herbarium sheet.

1. **Collection number:** This is a number specific to a specimen provided by a collector in the field.
2. **Plant name:** It is the name given by the collector; it might be scientific name, common name, local name or even if the collector has no idea what the specimen is, it is sometimes useful to give a completely arbitrary name such as "*Smilax* like" or "Big Leaf".
3. **Locality:** This includes the location from where the plant is collected. It includes the name of country, province, district, village name, roads, lakes or east-west highway, etc. The latitude, longitude and altitude also should be noted.
4. **Description:** This should include everything about the plant that is not obvious on the herbarium specimen. Essential items are the height, type of bark, whether the stem is upright, sprawling or drooping and obvious smells whether the plant is clumped, single or growing in patches and the presence of creeping or underground stems. Flower and fruit color should also be noted as these often fade on dried specimens.
5. **Habitat:** This should include the habitat such as a type of soil or other substrates (sand, clay, granite, dead wood and other vegetation) associated species, moisture and aspect (fully exposed on a south-facing bank in a damp hollow under dense scrub, either epiphyte or parasite, etc).
6. **Date of collection**
7. **Names of collector(s).**
8. **If any special characters have been observed, they should be noted.**



### ❖ Materials required for collection

The following materials are usually required for plant collection:

1. Plant press (generally of wooden material)
2. Knife
3. Cutter/Secateur
4. Digger
5. Altimeter/(GPS)
6. Old newspapers and blotters
7. Corrugated sheets
8. Straps or string cords
9. Polythene bags
10. Tissue paper
11. Tags
12. Waterproof field notebook
13. Marker, pen and pencil
14. Camera
15. Herbarium bag
16. Small bottles (Spirit collection)
17. Silica gel (for DNA bar-coding)
18. Paper pockets (Bryophyte)
19. Conductivity meter
20. Vertex
21. Pole pruner
22. PH meter
23. Formalin (for collection of algae, mushroom, etc).



Herbarium Press



Vertex



Digger



Secateur



PH meter



Conductivity meter



Pole pruner

### b) Pressing the herbarium specimens

Vascular plants must be pressed and dried as soon as possible after they are collected. Usually, this means that plants should be pressed the day they are collected.

1. Specimens should be pressed in a blotting paper or newspaper. The newspaper provides a folder for the plant.
2. If a specimen is too tall (more than 35cm) to fit in the press or on the herbarium sheet, make a J, V-shaped or Z-shaped bend in the stem or cut and produce sheet of 1/3, 2/3 & 3/3.
3. Too many leaves on a herbarium sheet look untidy and can obscure detail. While removing some of the leaves, always leave part of the petiole so that it is evident that leaves have been removed.
4. Branches that are not naturally flat can be made easier to press if the angles or twigs are bent in the appropriate direction before the plant is laid on the newspaper.
5. In case of thick woody stems and cones they can be sliced lengthwise so that they are less bulky.
6. Back of at least one leaf should be made visible by twisting a petiole.
7. If there are several flowers on a specimen, some should always be pressed open and flat so that the inside is displayed. For delicate flowers, tissue paper can be used to press the flowers.
8. Loose leaves (gymnosperm needles) seeds and fruits are placed in a small paper packet (capsule) and pressed with the specimen. Later this capsule is glued to the herbarium sheet.
9. Once plants are pressed, changing the paper after the first 24 hours not only enhances drying, but allows the collector to make cosmetic adjustments of folded leaves, petals, etc.

