

### Unit 7: **Identification process in Plant systematics**

- Definition and functions:
  - Herbarium
- Important Herbaria of the world and India
- Preparation of Herbarium specimen

To identify unknown plant specimen, it is compared with:

- already known herbarium specimens in a herbarium, and
- by utilizing the available literature and comparing the description of the unknown plant with the published description.

**I) Herbarium:** A herbarium (plural: herbaria) is a collection of pressed and dried plant specimens, mounted on sheets bearing a label, arranged in a systematic order and used for reference and plant based scientific study. Herbaria serve as major source of information on plants and vegetation. It is used in taxonomic research and for floristic records of a region.

**Luca Ghini**, an Italian botanist initiated the art of herbarium making by pressing and sewing specimens on sheets of paper. His students later mounted and bound the sheets into book volumes.

#### **The major roles of a herbarium are:**

1. **Repository of plant specimens:** Primary role of a herbarium is to store dried plant specimens, safeguard these against loss and destruction by insects, and make them available for study.
2. **Safe custody of type specimens:** Type specimens are kept in safe custody, often in rooms with restricted access, in several major herbaria.
3. **Compilation of Floras, Manuals and Monographs:** Herbarium specimens are the 'original documents' upon which the knowledge of taxonomy, evolution and plant distribution rests. Floras, manuals and monographs are largely based on herbarium resources.
4. **Training in herbarium methods:** Many herbaria have facilities for training graduates and undergraduates in herbarium practices, organizing field trips and even expeditions to remote areas.
5. **Identification of specimens:** The majority of herbaria have a wide collection of specimens and offer facilities for on-site identification or having the specimens sent to the herbarium identified by experts.
6. **Information on geographical distribution:** Major herbaria have collections from different parts of the world and, thus provide information on the geographical distribution, evolutionary and phylogenetic study of a taxon.
7. **Preservation of voucher specimens:** Voucher specimens are parts of, or wholly preserved plants or animals collected and worked on during the course of a study. Voucher specimens preserved in various herbaria provide an index of specimens on which a chromosomal, phytochemical, ultrastructural, micro-morphological or any specialized study has been undertaken.

### **Important Herbaria of the world**

Few examples of International herbaria-

- Museum National d'Histoire Naturelle (Museum of Natural History), Paris, France
- New York Botanical Garden, New York, USA (NY)
- Royal Botanic Gardens, Kew, UK (K)
- Missouri Botanical Garden, Saint Louis, Missouri, USA (MO)
- Botanical Survey of India (BSI), Kolkotta

### **Important Herbaria in India:**

Each herbarium is identified by an abbreviation that is valuable in locating the type specimens of various species.

- The **Central National Herbarium (CAL)** of the **Indian Botanic Garden**
- **Botanical Survey of India (BSI)**, Kolkotta

Other major herbaria in India:

- The herbarium of **Forest Research Institute (FRI)**, Dehradun (DD)
- **National Botanical Research Institute (NBRI)**, Lucknow, (LUCK), Uttar Pradesh.

**Virtual Herbarium:** Virtual herbarium is a database of consisting of images of Herbarium specimens and the supporting text, available over the internet.

## **II) Preparation of Herbarium specimen**

Herbarium specimens must be prepared by using standard procedures. An ideal herbarium specimen should represent all parts of the plant.

A specimen meant for incorporation in a herbarium needs to be carefully collected, pressed, dried, mounted and finally properly labelled. This must include the location of collection, date, and field data, as well as the name of the collector and the collection number.

The standard procedure for preparation of herbarium specimens involves:

- 1) Fieldwork: collection and processing of specimens
- 2) Taxonomic identification
- 3) Indexing (classification according to a standard system) and documentation, and
- 4) Inclusion in herbarium.

1) **Fieldwork:** collection and processing of specimens:

**Collection trip:** Such a trip is of short duration, usually one or two days, to a nearby place, for vegetation study and plant collection by groups of students.

**Exploration:** This includes repeated visits to an area in different seasons, for intensive collection and study, aimed at compilation of floristic accounts.

**Expedition:** Such a visit is undertaken to remote and difficult area, to study the flora and fauna, and usually takes several months.

**Equipment:** The items essential for collection include plant press, field notebook, bags, pencil, cutter, pruning shears, knife and a digging tool.

**Field Notebook:** A field notebook or field diary is an important item for a collector. A well-designed field notebook has numbered sheets with printed proforma for entering field notes such as scientific name, family, vernacular name, locality, altitude, date of collection and for recording any additional data collected in the field.

**(i) Collection:** A number of polythene bags can be carried for easy storage, as these can be readily made airtight using a rubber band and, as such, the plants retain their freshness for many hours. The specimen collected should be as complete as possible. Plants should be collected complete, in flowering condition, along with leaves and roots. All information concerning the plant should be recorded in the field notebook and a tag from the sheet attached to the concerned specimen.

**(ii) Pressing:** The specimens should be placed in the field press, which generally has one corrugated sheet alternating with one folded blotter containing few newspaper sheets, either directly after collection, or sometimes after a temporary storage in a polythene bag. While preparing herbarium specimens of a “difficult to process group” (succulents, fleshy material, water plants, woody perennials) additional steps are followed. Large plant parts (leaves, inflorescences, fruits) are processed separately; woody and fibrous material is dried as bulky collection and succulents/ fleshy material as wet collection.

**(iii) Drying:** Drying of pressed plant specimens is a slow process. The plants, freshly collected, are placed in a press without corrugated sheets and the press is locked for 24 hours. Plants lose some moisture, become flaccid and can be easily rearranged. Drying can be enhanced using artificial heat (drying chambers, ovens, stoves, etc.) (46-50 °C).

**Mounting of specimens:** Specimens pressed and dried are next mounted on herbarium sheets, and properly labelled before these can be incorporated in a herbarium. Completely dried, specimens are mounted on good quality (preferably acid free) standard-sized herbarium sheet. The standard size of herbarium sheet is **29 by 41.5 cm (11½ by 16½ inches)**. Different materials such as glue, paste, narrow strips of glued linen, thread, etc. are used for mounting.

**Labelling of specimens:** A Herbarium label (**4 by 6 inches**) containing information on plant name, family, local name, date of collection, place of collection, collector's name, identity status etc. (flowering/vegetative) should be pasted on the bottom right hand corner with information typed or filled with permanent ink. Paper pouch containing extra plant parts is pasted on the bottom left hand corner to serve as source of study material.

**Filing of specimens:** Mounted, labelled and treated (to kill insect pests) specimens are finally incorporated in a herbarium, where they are properly stored and looked after. Small herbaria arrange specimens alphabetically according to family, genus and species. Larger herbaria, however, follow a particular system of classification.

**2. Taxonomic Identification of the plant specimen:** Identification methods involve careful examination and comparison of the characters, such as the description of plant in the regional floras using family, genus and species keys, and cross matching with already available and identified specimens. Unidentified specimens can be sent to different institutions/ experts for proper identification.

**3. Indexing and documentation:** After mounting, labelling and identification, the specimens are given a unique number called Herbarium Accession Number. Specimens are arranged in a hierarchical system: species - genera - family - order and so on, following a standard system of classification such as that of Bentham and Hooker.

For detailed reading for this topic: Refer Singh, G. (2012). *Plant Systematics: Theory and Practice*. Chapter#5 (Process of Identification)