

Unit 7: Identification

Herbarium Technique

➤ Handling the special groups of plants

Collection of certain groups like succulents, aquatic plants, aroids and conifers require special methods and precautions.

- (1) **Cactus and succulent plants** must lose their high percentage of water before being put to dry. Such plants are handled by giving slits on thick organs and excess of tissues is removed by hollowing out the succulent tissue or salt is sprinkled on slits. Treating with ethyl alcohol or Formaldehyde can also kill the tissue.
- (2) **Mucilaginous plants** such as members of the family Malvaceae stick to the blotters and are difficult to process. These plants should be placed between waxed or tissue paper or in folds of muslin cloth. Only the blotter should be changed every time and the specimen separated from the tissue paper or muslin only when fully dry.
- (3) **Aroids and bulbous plants** must be treated before drying. These should be killed with ethyl alcohol and formaldehyde prior to pressing.
- (4) **Water plants, especially with submerged leaves**, readily collapse and are difficult to press normally. Such specimens are collected in bags and made to float in a tray filled with water, at the bottom of which a white sheet of paper is placed. The paper is lifted gently, carrying the specimen along and placed in a blotter and pressed. As the slender water plant sticks to the paper, the sheet along with the specimen is shifted from one blotter to another during the process of drying, and finally pasted on the herbarium sheet as such.
- (5) **Conifers** such as *Abies*, *Picea*, *Cedrus*, and several other genera generally lose the leaves during desiccation. Before pressing, such twigs should be immersed in boiling water for one minute or alternative method involves immersion in 70% ethyl alcohol for 10 minutes, followed by immersion in 50% aqueous glycerine solution for four days. Since the pre-treatment removes the bloom and waxes, and results in a slight colour change, an untreated portion of the plant should also be preserved, kept in a small pouch and attached to the herbarium sheet along with the pre-treated specimen, for reference.

Documentation

Documentation refers to the creation of scientific information, and bringing out the same in the form of a scientific publication in various forms such as floras, monographs, or journals.

➤ Floras

A flora is a taxonomic listing of the plant species occurring in defined geographical region. A flora is the most common and the strongest tool used by botanists for identification of a taxon. Floras contain description of plants and key for identification. They may also provide illustrations and information on plant uses.

Depending on the scope and the area covered, the Floras are categorized as:

1. Local Flora covers a limited geographical area.

- *Flora of Delhi* by J.K. Maheshwari (1963) and
- *Flora of Missouri* by J.A. Steyermark (1963) and
- *Flora of Central Texas* by R.G.Reeves (1972)

2. Regional Flora includes a larger geographical area, usually a large country or a botanical region. Examples:

- *Flora of British India* by Sir J.D. Hooker (1872-1897)
(A Flora covering a country is more appropriately known as a National Flora).

3. Continental Flora covers the entire continent.

Examples: *Flora Europaea* by T.G. Tutin et al., (1964-80)

4. Electronic Floras (e-Florals): Online florals are also known as Electronic Florals (e-Florals). e-florals help the users to browse and search for floristic treatments. e- florals are said to be future of floristic documentation (Singh, 2012).

A comprehensive effort made by the Missouri Botanical Gardens (MBG), USA has resulted in publication of www.eFlorals.org/, combining the information from several florals (such as Flora of Chile, Flora of China, Flora of Missouri, Flora of North America, Flora of Pakistan and Trees & Shrubs of Andes and Ecuador).

- **Manuals:** A **manual** is a more exhaustive treatment than a Flora, always having keys for identification, description and glossary but generally covering specialized groups of plants. Examples:
 - *Manual of Cultivated Plants* by L.H. Bailey (1949), and
 - *Manual of Aquatic Plants* by N.C. Fassett (1957).
- **Monographs:** It is a comprehensive taxonomic treatment of a taxonomic group, generally a genus or a family, providing all taxonomic data relating to that group. Examples:
 - *The Genus Pinus* by N.T. Mirov (1967),
 - *The Genus Datura* by A.F. Blakeslee et al., (1959)
- **Journals:** A journal is a document published periodically to update progress of research in a subject. Journals on plant sciences publish articles on different aspects analysed/ studied by botanists. Examples:
 - **Taxon-** published quarterly by the International Bureau for Plant Taxonomy and Nomenclature.
 - **Kew Bulletin-** International peer-reviewed Journal of Plant Taxonomy; published in four parts in one year by Royal Botanic Gardens, Kew.
- **Taxonomic Keys** are *aids for rapid identification of unknown plants*.
 - They constitute important component of Florals, manuals, monographs and other forms of literature meant for the identifying plants.
 - based on characters, which are stable and reliable.

Two types of identification keys are differentiated:

1. **Single-access or sequential keys**
2. **Multi-access or multientry keys** (polyclaves).

1. Single-access or sequential keys

- The keys are based on **diagnostic** (important and conspicuous) characters (**key characters**) and as such the keys are known as **diagnostic keys**.
- Most of the keys in use are **based on pairs of contrasting choices** and as such are **dichotomous keys**.
- They were first introduced by J. P. Lamarck in his *Flore Francaise* in 1778.
- For each character the **two contrasting choices** are determined (e.g., **habit woody or herbaceous**).
- **Each choice** constitutes a **lead** and the **two contrasting choices** form a **couplet**.
For example:

1. Plants **woody**
Plants **herbaceous**
2. Fruit achene
Fruit follicle
3. Calyx and corolla differentiated
Calyx and corolla not differentiated
4. Spur present
Spur absent
5. Number of spurs 1
Number of spurs 5
6. Petal with nectary at base
Petal without nectary at base

Types of dichotomous keys

Based on the arrangement of couplets and their leads, **three main types of dichotomous keys are in use:**

- (1) **Yoked or Indented key**
- (2) **Bracketed or parallel key**
- (3) **Serial or numbered key.**

Yoked or Indented key

- This is one of the most commonly used keys in Floras and manuals especially when the keys are smaller in size.
- In this type of key, the statements (leads) and the taxa identified from them are arranged in visual groups or yokes and additionally the subordinate couplets are indented below the primary one at a fixed distance from the margin, the distance increasing with each subordinate couplet. Advantages of indented keys: similar specimens are grouped together; and they are faster to use.

- | | |
|---|----------------------|
| 1. Fruit achene. | |
| 2. Calyx differentiated from corolla. | |
| 3. Petal with basal nectary | 1. <i>Ranunculus</i> |
| 3. Petal without basal nectary | 2. <i>Adonis</i> |
| 2. Calyx not differentiated from corolla. | |
| 4. Plants woody..... | 4. <i>Clematis</i> |
| 4. Plants herbaceous..... | 3. <i>Anemone</i> |
| 1. Fruit follicle. | |
| 5. Spur present. | |
| 6. Number of spurs 1..... | 6. <i>Delphinium</i> |
| 6. Number of spurs 5..... | 7. <i>Aquilegia</i> |
| 5. Spur absent..... | 5. <i>Caltha</i> |

Disadvantage: But in long keys, the alternatives get widely separated and take more space.

- It becomes difficult to locate the alternate leads of initial couplets, as they may appear on any page.
- Secondly, with the number of subordinate couplets increasing substantially, the key becomes more and more sloping, thus reducing the space available for writing leads.
- This may result in wastage of a substantial page space.

Bracketed or Parallel key: This type of key has been used in larger floras such as *Flora of USSR*, *Plants of Central Asia*, and *Flora of British Isles*. **The two leads of a couplet are always together and the distance from the margin is always the same.**

- useful for longer keys
- no wastage of page space.

| | |
|---|----------------------|
| 1. Fruit achene..... | 2 |
| 1. Fruit follicle | 5 |
| 2. Calyx differentiated from corolla | 3 |
| 2. Calyx not differentiated from corolla | 4 |
| 3. Petal with basal nectary ... | 1. <i>Ranunculus</i> |
| 3. Petal without basal nectary | 2. <i>Adonis</i> |
| 4. Plants woody | 4. <i>Clematis</i> |
| 4. Plants herbaceous | 3. <i>Anemone</i> |
| 5. Spur present | 6 |
| 5. Spur absent | 5. <i>Caltha</i> |
| 6. Number of spurs 1 | 6. <i>Delphinium</i> |
| 6. Number of spurs 5 | 7. <i>Aquilegia</i> |

Drawback: the statements are no longer in visual groups.

Serial or numbered key: Such a key has been used for the identification of animals and also adopted in some botanical works. This key retains the arrangement of Yoked key, but with no indentation so that distance from the margin remains the same.

Book to be referred for this topic: **Singh, G. (2012).** *Plant Systematics: Theory and Practice.* **Chapter#5** (Process of Identification)