UNIT SEVEN

TAXONOMIC TECHNIQUES

Botanical Techniques (Field and Herbarium Techniques)

- In botany, a **herbarium (plural: herbaria)** is a collection of preserved plant specimens.
- These specimens may be whole plants or plant parts: these will usually be in a dried form, mounted on a sheet, but depending upon the material may also be kept in alcohol or other preservative.
- A herbarium is a collection of preserved plants in dry form in the sheets

- The term can also refer to the building where the specimens are stored, or the scientific institute that not only stores but researches these specimens.
- The specimens in a herbarium are often used as reference material in describing plant taxa; some specimens may be types.

Herbaria can offer four main services:

1. The basis for research and preparation of Floras and Monographs.
2. Teaching
3. Preservation of voucher specimens for further study

Methods of Identification

There are four methods of identification. They are:

1. Expert determination;
2. Determination by recognition;
3. Determination by comparison to preserved and well authenticated specimens and drawings, illustrations, photographs, descriptions, books (Floras) etc.; and
4. Determination with the help of **taxonomic keys**

¬ **A key** is a device, in which successive

- In terms of reliability and accuracy, the best method of identification is **expert determination**.
- In general the expert will have prepared treatments (monographs, revisions, synopsis) of the group in question.
- **Recognition** approaches expert determination in reliability.
- This is based on extensive, past experience of the identifier with the

- The third method is by comparison of the unknown with named specimens, photographs, illustrations or descriptions.
- Even though this is a reliable method, it may be very time consuming or virtually impossible due to the lack of suitable materials for comparison.

- The use of **keys** or similar devices (synopsis, outlines, etc.) is by far the most widely used method and does not require the time, materials, or experience involved in comparison and recognition.

KEYS (DIAGNOSTIC KEYS)

Keys are of two types.

1. **Dichotomous key** (Single-access or Sequential Keys)
2. **Multi-access Key** (polyclave or synoptic)

¬ Multi-access keys are usually produced

Dichotomous keys (Single-access)

- **Dichotomous keys** are devices consisting of a series of contrasting or contradictory paired statements or propositions requiring the identifier to make comparisons and decisions based on statements in the key as related to the material to be identified.
- The dichotomous key consists of a series of couplets or mutually exclusive pairs of statements each statement, or lead, of a pair leading on to a further couplet.
- At each couplet a decision to follow one lead or the other has to be taken so that the number of taxa with which the unknown specimen can be identified is

- **To use the key**, begin with the first couplet and select the statement that best fits your specimen.
- This will direct you to another couplet and ultimately provide the identity of your specimen.
- There are **two** types of dichotomous keys:

1. Bracketed key
2. Indented key

- The essential difference between these two layouts is that in the **Indented key** all the possibilities arising from the first

- However, the **indented** key has advantages when the key is short, as the pattern of characters is clearer,
- but when the key is long there is much **wastage of page space** and the user has to turn pages to find two halves of a couplet.
- **Indented keys-** indents the choices (leads) of the couplet an equal distance from the left margin.
- The two choices of the couplet are usually labeled 1 and 1’ or 1a and 1b but it is not necessary.

- The user goes to the next indented couplet following the lead that was selected
- **Bracketed keys-** provides both choices side-by-side.
- The choices of the couplet **must be numbered** (lettered).
- The user proceeds to the couplet that is indicated by the lead selected.

- **Examples of the Two Types of a Dichotomous Key**

Type 1: Bracketed key

1. Leaves simple. ***Olea europaea subsp. cuspidata***

1’. Leaves compound. ***2***

2. Crown flat; leaves twice pinnate; leaflets upto 40 pairs, less than 4 mm long. ***Acacia abyssinica***

2’. Crown variously-shaped but not flat; leaves once-pinnate; leaflets much longer than 4 mm. ***3***

3. Branches prickly. ***Erythrina brucei***

3’. Branches not prickly. ***4***

Type II-Indented

1. Leaves simple. ***Olea europaea subsp. cuspidata***

1. Leaves compound

2. Crown flat; leaves twice pinnate; leaflets up to 40 pairs, less than 4 mm long.
Acacia abyssinica

2. Crown variously-shaped but not flat; leaves once-pinnate; leaflets much longer than 4 mm

3. Branches prickly.
Erythrina brucei

3. Branches not prickly

4. Leaves alternate, pinnately 3-foliolate; leaflets elliptic.
Allophylus abyssinicus

A. Bracketed key

1.	Fruit more than twice as long as broad, with a skin in three or more distinct segments	*Banana*
	Fruit less than twice as long as broad, with a skin not in segments	*2*
2.	Fruit with a thick, aromatic skin	*3*
	Fruit with a thin, non-aromatic skin	*4*
3.	Skin yellow; fruit with a marked protuberance at one end	*Lemon*
	Skin orange; fruit rounded at both ends	*Orange*
4.	Fruit with a single 'stone' in the centre	*Plum*
	Fruit with several separate seeds in the centre	*5*
5.	Fruit greenish-yellow, hairy	*Gooseberry*
	Fruit blackish-purple, glabrous	*Blackcurrant*

B. Indented key

1.	Fruit more than twice as long as broad, with a skin in three or more distinct segments	*Banana*
1.	Fruit less than twice as long as broad, with a skin not in segments	
2.	Fruit with a thick, aromatic skin	
3.	Skin yellow; fruit with a marked protuberance at one end	*Lemon*
3.	Skin orange; fruit rounded at both ends	*Orange*
2.	Fruit with a thin, non-aromatic skin	
4.	Fruit with a single 'stone' in the centre	*Plum*
4.	Fruit with several separate seeds in the centre	
5.	Fruit greenish-yellow, hairy	*Gooseberry*
5.	Fruit blackish-purple, glabrous	*Blackcurrant*

The **purposes of collection**, there are two main reasons for collecting plants:

1. To obtain records and specimens of plants, either for a personal collection or to be stored in a herbarium.
2. The major reason for plant collecting is in order to later identify an unknown specimen encountered during fieldwork.

Plant parts to be included in collection:

- Specimens for collection should be as complete as possible.
- Ideally **flowers** and **fruit** should be included, as well as **vegetative** parts.
- Specimens should be typical and healthy, with at least some fully expanded leaves where possible.
- Take the plant from its typical habitat.
- If a species normally grows in woodland, **do not** collect specimens growing by the **roadside** because sometimes leaf shape, flower Color and other characters are completely altered on

Method of collection:

Note taking: Every specimen should be accompanied by comprehensive notes retained in a collecting note book.

- The notes should contain the following information.

1) **Collection number:** This is a serial number specific to a collector and a specimen.
2) **The name of the plant:** This is important as it helps the collector remember the individual specimen even if the labels are accidentally lost or mixed.
3) **Locality:** The name of towns, roads, lakes

5) Habitat: This should include the general habitat as well as more specific details of micro-habitat.

- Important points are type of soil or other substrate (sand, clay, granite, and dead wood, other vegetation), associated species, moisture and aspect

6) Date: appropriate time of collection

7) Names of collector(s):

Pressing and drying vascular plants

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**.

The plant press

- The plant press is designed so that plants can be dried quickly while being pressed flat.
- It consists of two cross-slatted wooded frames about the size of a folded newspaper.
- Plant specimens are laid in folded newspaper between layers of blotter, foam sheets and corrugated cardboard.
- The newspaper provides a folder for the plant.
- The paper, blotter and foam draw the moisture away from the specimen.
- The cardboard allows air circulation within

The press is then placed to dry in warm (not hot), dry, circulating air. Herbaria have special **drying cabinets** in which the presses are dried.

- To **preserve** their **form** and **color**, plants collected in the field are spread flat on sheets of newsprint and dried, usually in a plant press, between blotters or absorbent paper.
- Once plants are pressed, changing the paper after the first 24 hours not only enhances drying, but allows the collector to make cosmetic adjustments to the specimen while it is still supple.
- Loose seeds and fruit can be placed in a small paper packet and pressed with the specimen.

Mounting specimens

- **Mounting** is the process of affixing a dried pressed plant and its label to a sheet of heavy paper.
- This provides **physical support that allows the specimen to be handled and stored with a minimum of** damage.
- Once material is pressed and thoroughly dried, it is mounted on herbarium sheets of standard size.
- Specimens should be laid on the sheet in an attractive, space-filling way.
- Space should be left in the lower right

- To secure the specimen firmly to the mounting paper, it is attached to the sheet using a combination of **glue** and **strips of gummed linen cloth tape.**
- **Herbarium Specimen labels:** A plant specimen is incomplete without label data.
- Label data is a form of field data and must be accurate.
- The following are important elements:
  - **Scientific name,**
  - **Determiner of the scientific name:** the name of the person who identified the plant
  - **Detailed location:** A location taken with a GPS is a desirable complement to the locality

- **Habitat:** the type of plant community where the plant is growing and, if known, other plants growing in association
- **Plant habit:** describes the form of the plant (tree, shrub, vine, and herb) and its height.
- **Frequency:** whether or not the plant rare, occasional, frequent or common.
- **Plant description:** describe characteristics of the plant which may be lost upon drying, such as flower/fruit color and fragrance, leaf orientation and aroma
- **Collector name**
- **Collection number**

Zoological Techniques (Field Techniques and Museum Techniques)

- The purpose of a zoological museum is to protect and conserve animal species, for the sake of researches, study, education, aesthetic, ethical and economic values.
- **Museum (from the Greek *mouseion,*** *which denotes a place or temple dedicated to the* Muses) houses important historical artifacts for public viewing.
- **Zoological museums** demonstrate a different preserved body parts of extinct,

The purpose of **a zoological museum** is to protect and conserve animal species, for the sake of

- researches,
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Sampling techniques

- Tracing method: counting foot-step or height-steps
- Trapping method
- Telemetric method
- **Taxidermy**/or skin preparations: T**axidermy:** (from the Greek for arrangement of skin) **is the art of preparing, stuffing, and mounting** the skins of animals (especially vertebrates) for display (e.g. as hunting trophies) or for other sources of study.
- Taxidermy can be done on all vertebrate

UNIT EIGHT

APPLICATION OF TAXONIMC RESULTS

- Taxonomy is **dependent** on many other sciences and they in turn are equally dependent on it.
- A taxonomist must have a knowledge of morphology;
- He must know not only the gross morphology of the plants with which he works, but if he is to comprehend the relationships of these plants he must often be conversant with studies of their **embryology**, **floral anatomy**, **ontogenetical development**, and **teratological** variations.
- Modern systematists place considerable

Without taxonomy it is impossible

- To know which species lived yesterday, are living today, and will have the chance to be alive tomorrow in a given area;
- what type of balance exists within a community that occupies an area, and why that balance dominates;
- what is the cost of the biodiversity of a certain area;

- what will happen to the biological balance of a given area if the dominant environment conditions change, etc.
- In conclusion, none of the above will become realized if there is no taxonomy or taxonomists.

ϖ Therefore, the knowledge of taxonomy is important for many other fields of science such as ecology, conservation biology, agriculture, forestry and pharmacy.

- Discuss the dependence of taxonomy on other fields?
- Explain different disciplines that need service of taxonomy?

Questions?