Types of Botanical Preparations

Botanical preparations comprise different categories, most of common use are

I- Non-Section Preparations

These are prepared without sectioning.

II-Section Preparations

Hence tissues are cut into very thin slices.

III- Cell and Tissue Cultures (details in another course at 4th level)

These allow cells and tissues to live and grow outside the body (i.e. ***in vitro***) by incubating them in special media.

I- Non-Section Preparations

These comprise macroscopic and microscopic preparations.

A. Macroscopic Preparations

1-*Dry preparations*

as bulk specimens and herbarium sheets.

2- *Wet preparations*

as museum-jar preparations.

B. Microscopic Preparations

- These depend on the nature of the prepared material.
- They can be roughly classified into the followings:

1- *Whole mount preparations*

These are mostly concerned with preparations of **filamentous** (e.g. *Spirogyra*) and **thalloid** forms that is small enough to be **entirely mounted** on a glass slide and studied by the transmitted light.

2- *Smear preparations*

Smearing is to spread the material into a very thin layer, or film, so that its elements are individually distinguishable. Therefore, smearing is **restricted to** materials of **fluid** or **semifluid** nature (e.g. suspension of bacteria, diatoms, yeast, pollen grains, etc…).

3- ***Squash preparations***

This is a special type of smear preparations employed for **soft tissues** by crushing them between the slide and the cover slip (cf., **Feulgen technique**).

4- ***Macerated preparations***

Maceration is to separate **tight tissue** elements through chemical dissociation methods (e.g. Hydrolysis of root tips by HCl).

5- ***Teased preparations***

Teasing means the **manual pulling apart** of tissue elements usually by fine needles. This can be applied to **fibrous tissues** (e.g. Separation of xylem vessels to examine the different patterns of secondary thickening).

6- ***Peeling of epidermal cells***

Peeling represents one of special techniques which are performed for particular studies. Epidermal peels are successfully applied to study the epidermal tissue whereas a small piece is **stripped**, **mounted** in water then **examined**. Peels are prepared manually or with the aid of a sharp blade.

N.B.

Techniques employed for making microscopic non-section preparations permanent involve steps similar to these of section preparations except for embedding (in a supportive material) and cutting.

II- Section Preparations

Sectioning keeps the constituent cells undisturbed. However, it is laborious: time consuming and requires much training. Tissues are usually sliced with either **free hand** or special instruments called **microtomes**.

A. Types of Microtomes

Microtomes of common use are

1. ***Sliding types***

These with the **specimen fixed** and the razor moving horizontally.

2. ***Rotary types***

These with the **razor fixed** and the specimen moving vertically.

3. *Special types* (for specific studies)

a. Ultramicrotome

It is rotary type used in the preparation of EM sections (25-100 nm, mμ thick).

b. Freezing microtome

Freezing in this type is accomplished **by** either a ***freezing agent*** as **solid CO_2** (dry ice) in the sliding type or ***electrically*** in the rotary type '**Cryostat**'.

B. Sectioning of Unembedded Tissues

Unembedded tissues are cut ***without embedding*** in a suitable matrix (e. g. paraffin wax) to support tissues against the impact of the knife. However, sectioning can be aided by ***enclosing*** the specimen by an ***external supporting material***.

According to the nature of the experimental tissue, section preparations involve **three** main categories

1- *Free hand Sectioning*

This is applied to **rigid tissues** (eg. T.S. in a young stem) using a sharp blade. Sectioning can be aided by enclosing of material between pieces of pith.

2- *Sectioning with Sliding Microtomes*

This is employed for **supported rigid** or **stiff specimens** from which, it is difficult to obtain complete sections by free hand technique.

3- *Sectioning with Freezing Microtomes*

This is employed for too **soft** or **fragile tissues**. These tissues are usually **enveloped** in a fluid or semifluid medium that, on freezing, affords additional support (as gelatin or gum Arabic).

Advantages

-This method is quick.

-Freezing preserves the chemistry of tissues as no heating is used. Therefore, it is applied to demonstrate the activity of enzymes.

Disadvantages

-Sectioning gives non-serial and thick sections.

-These sections are very difficult to be cut and stained.

C. Sectioning of Embedded Tissues

There are three main techniques used in preparing sections from embedded tissues namely **paraffin**, **celloidin** and **electron microscopy** techniques whereas ***rotary-***, ***sliding-*** and ***ultra types of microtomes*** are used respectively. (cf., the succeeding laboratory notes).