FLOWERS AND INFLORESCENCES
Flowers

The flower is the reproductive organ of the angiosperm plants. It is the most important organ for the plant classification and identification.
Dicot. And Monocot Flowers

Dicot Characteristics
- Two Cotyledons
- Floral Parts In 4's or 5's
- Netted Venation
- Stem Vascular Bundles Arranged in a Ring

Monocot Characteristics
- One Cotyledon
- Floral Parts In 3's
- Parallel Leaf Venation
- Stem Vascular Bundles Scattered
Parts of the Flower
Parts of Flowers

- **Perianth:**
  - When the sepals and petals are not differentiated
  - It is called perianth (units are called tepals, sepalloid or petaloid).
Parts of the Flower

- Pedicle
- Receptacle (if elongated it is called Hypanthium as in clove).
- Calyx [sepals, polysepalous (separate sepals) or gamosepalous (united sepals)]
- Corolla [petals, polypetalous (separate petals) or gamopetalous (united petals)]
- Perianth (tepals when the calyx and corolla are undifferentiated).
- Androecium [stamens (filament and anthers), free or joined]
- Gynaecium (Pestil) [carpels (ovary, style and stigma) free or joined].
Adhesion in Calyx and Corolla

- **Gamosepalous calyx:**

- **Gamopetalous corolla:**
Androecium

- Consists of stamens. Each stamen consists of a filament and an anther (formed of two lobes open by slits and lined by a lignified fibrous layer and containing the pollen grains).

- Stamens may be united either by filaments or by anthers.

  - **Stamens united by filaments:**
    Monadelphous, diadelphous, tetradelphous…etc.

  - **Stamens united by anthers (syngenesious):**
    Didynamous, tetrady namous,…etc.

Stamens may be situated over the inner side of petals and in this case called Epipetallous.
Adhesion of Androecium

- United by filament:
  Monadelphous, diadelphous.

- United by anthers (syngenesious):
  Diadynamous, Teradynamous.

- United with the petals:
  Epipetalous
Gynaecium (Pistil)

- It consists of one or more carpels (ovary, style and stigma).
- Carpels may be free (apocarpous) or united (syncarpous, note the number of locules; mono, bi, etc.).
- The ovary (containing the ovules) may be superior (in hypogenous flower) or inferior (in epigenous flower).
- The ovary contains one or more ovules carried on placenta which may be:
  - Axile placentation
  - Parietal placentation
- The stigma usually bifid and have papilloosed surface (why?)
Gynaecium and Placentation

- Free Carpels (Apocarpous).
- Fused Carpels (Syncarpous).
- Axile placentation.
- Parietal placentation.
- Free central placentation.
Types of flowers

According to the presence or absence of any of the gynaecium or the androecium the flower may be:

- **Hermaphrodite**: contains both the gynaecium and androecium.

- **Unisexual**: 
  - Pistillate (contains gynaecium only)
  - Staminate (contains androecium only)
Types of Flowers

According to the position of the floral parts in comparison to the gynaecium the flower may be described as:

- Hypogenous \((A1)\).
- Perigenous \((A2)\).
- Epigenous \((A3)\).
Types of Flowers

According to giving two equal parts if divided in any direction the flower may be described as:

- **Regular (actinomorphic)** (giving two equal parts when divided at any direction).
- **Zygomorphic** (giving two equal parts only if divided in one direction).
- This is usually represented in the floral diagram.
Anatomy of Flowers

- The Pedicel has the stem structure.
- The bract, calyx and corolla have the leaf structure (epidermis of corolla often colored and has papillosed or striated cuticle).
- The stigma usually have papillosed epidermis.
- The anthers contain fibrous layer characteristic for the flowers.
- Of first importance for the existence of flowers is the presence of pollen grains. The shape, size and wall structure of them are characteristic for each flower.
Characteristic Elements Of Powdered Flowers

- **Pollen grains:**
  - Shape, exine, germinal pores and furrows.

- Fibrous layer of anther (lignified appear beaded in s. v.).
- Papilloosed epidermis of stigma.
Inflorescence

- It consists of a group of flowers arranged in certain order.
- The main axis of the inflorescences is called **Rachis**

- **Types of inflorescences:**
  - Racemose.
  - Cymose.
  - Mixed (racemes of cymes as in clove).
Types of Inflorescences

**Racemose**
- spike
- raceme
- corymb
- round umbel
- flat umbel
- capitulum or head
- compound umbel

**Cymose**
- monochasial cymes
- dichasial cyme
Example of Flower Medicinal Drugs

- Clove.
- Echinacea.
- German Chamomile.
- Roman Chamomile.
- Santonica.
- Pyrethrum.
- Calendula.
- Arnica.
- Saffron.
- Safflower.
- Hibiscus.
Clove

- **Botanical origin:**
  
  It is the dried flower buds of *Eugenia caryophyllus* family *Myrtaceae*.

- **Geographical Source:**
  
  Madagascar, Indonesia, Brazil and smaller amounts in Seri Lanka and Tanzania.
Photo Image of Clove
Microscopical Characters

- A)&B) Two types of clove.
- C) Fruit (mother Clove).
- D) Clove stalk.
- E) L.S. in Clove.
- F) T.S. in Hypanthium.
- G) Stamen.
- H) Petal (s.v.).
- I) Filament.
- J) Fibrous layer.
- K) Oil gland.
- L) Epidermis of hypanthium.
- N) Phloem fibers.
- O) Pollen grains
- P) Sclereids of mother Clove.
Clove Powder

Key Elements:

- Triangular pollen grains.

- Schizolysigenous oil glands.

- Fibrous layer of anther.

- Cluster crystals of calcium oxalate.
Active Constituents

- Volatile oil (14-20%), the main constituent of which is the phenolic compounds eugenol, isoeugenol and acetyl eugenol, in addition to sesquiterpenes (α- and β-phellandrene).

- Hydrolysable tannin.
Therapeutic Uses

- Stimulant and aromatic flavoring and antiseptic.
- The oil has local anesthetic effect (used for treatment of toothache).
- The sesquiterpenes in oil of clove are cited to be potential anticarcinogenic compounds.
- Eugenol is used for the preparation of vanillin.
Compositae Flower Head
(Sunflower inflorescence)
Ray (Ligulate) Floret

- It is pistillate.
- Corolla is strip-like consisting of 5 united petals.
- It has an inferior ovary and a bifid stigma, sometimes a bifid style.
Disc( Tubular ) Floret

- It is hermaphrodite.
- Corolla is tubular consisting of 5 united petals showing 5 teeth.
- It has an inferior ovary and a bifid stigma.
- The androecium is joined by anther (synginaceous anther).
Roman Chamomile

- **Botanical origin:**
  
  It is the dried flower heads of *Anthemis nobilis* family *Compositae*.

- **Geographical Source:**
  
  It is cultivated in south England, Belgium, France, Germany, Hungary and Poland and others.
Roman chamomile

- Photo-image
Chamomile Powder

*Anthemis nobilis*

Key Elements:

- Pollen grains (spherical with spiny exine).
- Fibrous layer of anther.
- Papillosed stigma.
- Compositae glandular trichomes (biseriate[2-4 cells] stalk, bicellular biseriate head).
- Non glandular trichomes.
- Cluster crystals of calcium oxalate.
Active Constituents

- Volatile oil (0.4-1%) the main constituent of which is n-butyl angelate, and azulene (gives the oil blue color).
- Sesquiterpene lactones.
- Apigenin and luteolin (flavonoids).
Therapeutic Uses

- For the treatment of dyspepsia (in the form of infusion).
- In shampoo preparations.
- In poultice preparation for treatment of some skin diseases.
German Chamomile

- **Botanical origin:**
  
  It is the dried flower heads of *Matricaria recutita* family *Compositae*.

- **Geographical Source:**
  
  It is native to and cultivated in southern and eastern Europe such as Germany and Hungary.
Photo-image of German Chamomile
Roman and German Chamomile

A,B) Roman Ch.
C,E) German Ch.
D) Ray floret of German Ch.

1) Disc floret
2) Ray floret
3) Palae
4) Receptacle
5) Bract of involucre
<table>
<thead>
<tr>
<th>Roman Chamomile</th>
<th>German Chamomile</th>
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</thead>
<tbody>
<tr>
<td>* Very few disc florets and abundant ray florets (double capitulum)</td>
<td>* One whorl ray florets and abundant disc florets.</td>
</tr>
<tr>
<td>* Solid receptacle</td>
<td>* Hollow receptacle.</td>
</tr>
<tr>
<td>* There are palae (thin membranous bracts)</td>
<td>* No palae are found.</td>
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Powdered Matricaria
Active Constituents

- Volatile Oil (0.4%) blue in color due to the presence of chamazulene which is a sesquiterpene lactone found in the oil together with other sesquiterpenes (bisabololol and farnesene).
- Apigenin flavonoid.
- Coumarins.
Therapeutic Uses

- Antispasmodic for digestive disorders.
- Anti-inflammatory in skin preparations.
- It has an ulcer-protective properties (due to the bisabolol content).