

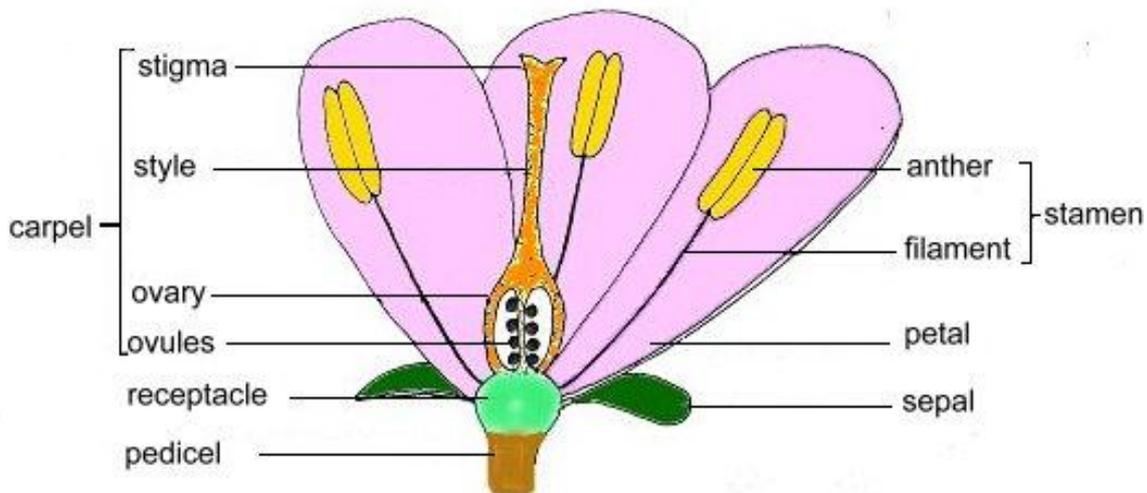


Topic 2: Flowers and Inflorescences

FLOWERS

In common usage the word 'flower' is used for both a single flower and a number of flowers grouped together, for example a *Banksia* spike. In precise botanical terms, a group of flowers borne together is an 'inflorescence'. Closer examination shows it is made up of single flowers, all with a similar structure.

A flower is the sexual reproductive shoot of a plant, consisting of a receptacle that bears the sepals, petals, stamens and carpels – the four basic parts of a flower. Broadly speaking, the parts are in concentric rings.



Sepal: Makes up the outer ring, usually green and leaf-like, and in the bud stage encloses and protects the other flower parts. Collectively known as the **calyx**. Sepals could be free, wholly or partly united, they could fall early or remain as part of the fruit.

Petal: Makes up the next inner ring, usually conspicuous, brightly coloured, to attract pollinators. Collectively known as the **corolla**. They could also be free, part or fully united giving rise to variety of types.

Tepal: A free segment of a perianth not recognized as a petal or a sepal.

Perianth: Usually consisting of a whorl of sepals and/or a whorl of petals, or two whorls of tepals.

Pedicel: (stalk) of a flower, if not present the flower is sessile.

Female part of the flower

Gynoecium: the carpel (if solitary) or carpels of a flower.

Carpel: A unit of the female organ of the flower, with an **ovary** bearing one or more **ovules (female cells)**, usually a **style** (stalk), joining the ovary and a pollen receptive **stigma** of various shapes and size. A simple stigma has no structures present.

A flower can have a solitary carpel or numerous carpels; these could be free or fused together. The ovules, if fertilized by compatible pollen, develop into seeds, and the ovary into the fruit.

Male part of the flower

Androecium: consists of the stamens of a flower.

Stamen: A unit of the male organs of the flower, with an **anther** and often a **filament** or stalk. The anther, located at the terminal part of a stamen, bears pollen sacs containing pollen grains (**male cells**).

Staminodes are sterile stamens which do not produce pollen, or the anthers are deformed or absent, in this case the filament may look like a petal. Anthers may open by longitudinal slits, valves or pores on the apex. They could be united, free, have appendages and be attached to filaments from the base, from the back or be pendulous.



Bract: A modified leaf, often small and associated with a flower or group of flowers

Bracteole(s): One or two bract-like structures on the stalk or on the calyx of a flower.

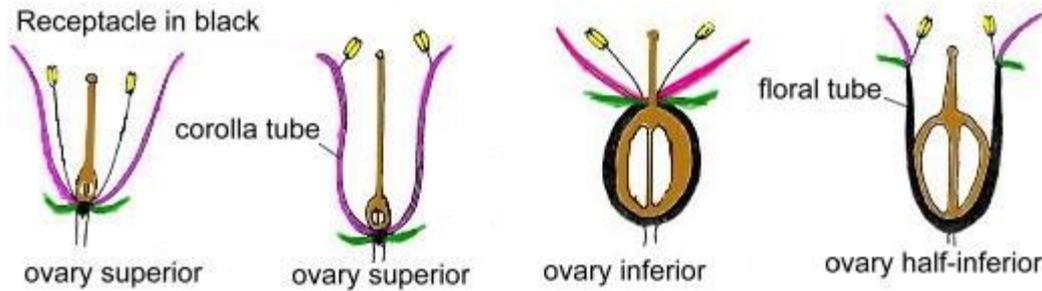
Hypanthium or Floral tube: The fused bases of perianth parts (calyx and /or corolla) and stamens. Usually a cup- like or tubular structure present in some flowers, for example *Eucalypts* and *Leptospermum*, which appear to be an upward growth from or part of the receptacle, of the edge of the ovary to casual observation.

Corolla tube: Formed by the basal section of petals being joined to each other. The **throat** is the top of the tube and the **limb** is the expanded part of the corolla, for example *Epacris longiflora*.

Free: Parts not joined together are called free.

Connate: Same parts of a flower joined together even for only part of their length; for example stamens in many of the pea flowers, melaleucas or petals in the tubular corolla of *Epacris longiflora*.

Adnate : Similar to connate but different parts of the flower joined together, for example stamens joined to tepals as in some *Banksia* and *Grevillea* species in the Proteaceae family.



Superior ovary: Perianth and stamens are inserted on the receptacle below the ovary.

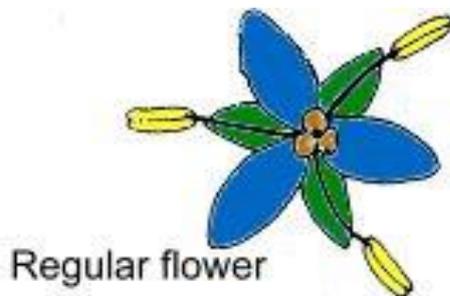
Inferior ovary: The receptacle is fused to the sides and often over the top of the ovary and the perianth and stamens are attached at the top of the ovary.

Half-inferior ovary occurs when the receptacle is fused only part of the way up the ovary wall.

Placentation: Arrangement of the ovules in the ovary

Regular flower (Actinomorphic): Perianth is radially symmetrical, the individual petals and sepals are alike. Perianth can be divided into equal parts by centrally cutting in more than one plane

Irregular flower (Zygomorphic): Petals and sepals are not alike. The perianth can be divided into 2 equal parts by cutting in one plane only.



Classification and naming of the flowering plants since Linnaeus in 1753 has been based on the structure of the flower. Parts of a flower may vary in number, size, colour, shape, arrangement and in having additional structures such as hairs, staminodes, spurs, hoods and bracts. This variation is the basis of classification into species, although with modern technology genetic and protein analyses are now also used, together with ecology.

A flower at its most basic is a receptacle with carpel and/or stamens. In other words, a flower may not have petals or sepals, and it is then referred to as a **naked flower**.

Flowers that have a carpel and stamens are called bisexual. If the flower has only either a carpel or a stamen(s), it is called unisexual. Unisexual flowers may both (male and female) occur on the one plant (**monoecious**) or on separate male and female plants (**dioecious**).

Recommended reading

Clarke, I. & Lee, H. *Name that Flower*. Melbourne University Press, Burwood, Vic. 2003.
 Harden, Gwen & Williams, John. *How to Identify Plants*. Univ. New England, Namoi.1990
 Harden, Gwen & Murray, Louisa H. *Supplement to Flora of NSW Vol 1*. UNSW Press, Royal Botanic Gardens, Sydney. 2000.

ACTIVITY – FLOWER OBSERVATION

Characteristic Flower 1 Flower 2 Flower 3 Flower 4 Flower 5

Sepals colour - No.					
Sepals free / united					
Petals or tepals colour – No.					
Petals or tepals free or united					
Stamens 1- 10 or numerous					
Stamens connate, adnate or free					
Carpels free/ united					
Stigma simple, bifid or trifid					
Ovary superior or inferior					
Flower regular or irregular					
Flower bisexual or unisexual					
Bracts, bracteoles, hairs etc.					
Inflorescence					

Acknowledgments: These notes contain hyperlinks to materials, including images, illustrations, plant descriptions and a glossary from PlantNET, with the courtesy of The Royal Botanic Gardens & Domain Trust, 2011.

For general access to PlantNET see also <http://plantnet.rbgsyd.nsw.gov.au/>

INFLORESCENCES

Did you know that,

- An inflorescence is the flowering shoot of a plant.
- It can range from a single flower to a very complex arrangement of many flowers.
- A *Banksia* 'flower' or a *Telopea* (Waratah) 'flower' is such a group of many individual flowers with similar flower structure.

The stalk of an individual flower is called a **pedicel**. The main stalk of an inflorescence is a **peduncle**. Individual flowers may be called pedicellate (with a stalk) or sessile (without a stalk). The stem-like flowering stalk of a plant with leaves clustered at the base is a **scape**. In the diagrams, a circle represents a flower bud and an arrow represents a vegetative bud.

A single flower is called **solitary**.

A group of flowers is called an **inflorescence**:

Solitary on scape

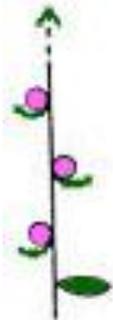
e.g. many *Pterostylis* species



Spike:

flowers sessile

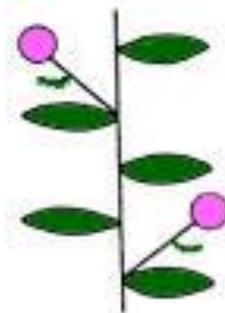
e.g. *Callistemon* sp.



Solitary in leaf axil

(the angle between the leaf and the stem)

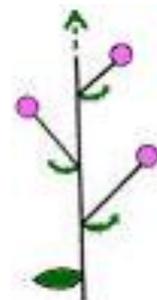
e.g. *Boronia ledifolia*



Raceme:

flowers pedicellate

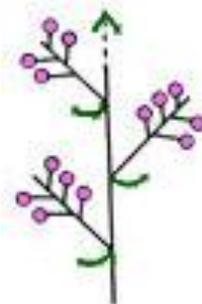
e.g. *Hardenbergia violacea*



An inflorescence which has internal branching is called a **compound inflorescence**

Panicle:

main axis has branches which may be further branched e.g. *Dianella* sp.



Corymb:

all the flowers are at the same level though the pedicels arise at different levels e.g. *Poranthera* sp.



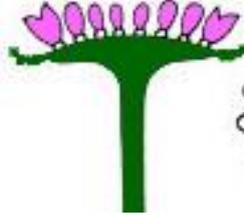
Spadix:

a spike with a thickened axis being surrounded by a spathe e.g. *Alocasia brisbanensis*



Head:

a dense cluster of more or less sessile flowers e.g. Asteraceae a group of florets sessile on a common receptacle



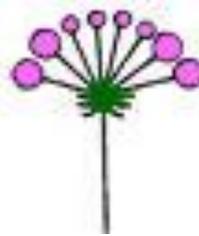
Cyathium:

a group of reduced unisexual flowers surrounded by a whorl of bracts e.g. *Euphorbia* sp.



Umbel:

All flowers arise from one point at the top of the peduncle e.g. *Actinotus* sp.



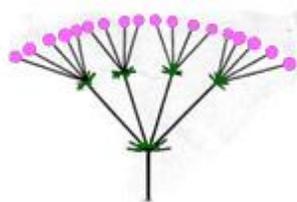
Spikelet:

an axis bearing glumes enclosing florets e.g. Poaceae (grasses)



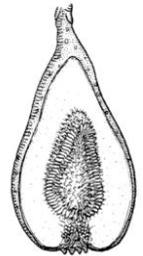
Compound Umbel:

branched umbel e.g. *Platysace* sp.



Invaginated inflorescence

a pocket formed by turning in on itself e.g. *Ficus* spp. where the minute flowers and fruits are actually inside the axis

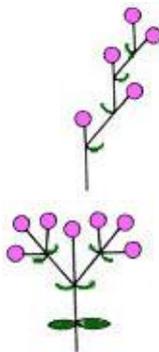


Inflorescences can be described as **racemose** or **cymose**. In most inflorescences the oldest flowers are at the base and end in a vegetative (non-floral) bud thus allowing further growth of the axis: these are called racemose inflorescences. However, in others the flower terminates the axis and expansion takes place through the growth of axillary buds which also end in a flower, these are called cymose.

Types of cyme

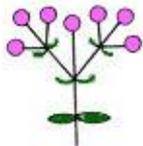
Monochasial cyme:

a cyme with the branches arising singly



Dichasial cyme:

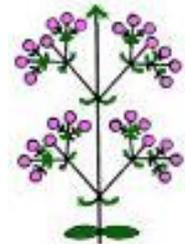
a cyme with the branches arising in opposite pairs



Mixed type:

Thyrse:

a compound inflorescence ending in a vegetative bud i.e, racemose, but with lateral branches ending in a flower i.e. cymose e.g. *Goodenia ovata*



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