Introduction to Plant Taxonomy

مقدمة في التصنيف الزهري

4th Lecture

Flower symmetry التناظر في الزهرة

Flower symmetry is an assessment of the presence and number of mirror-image planes of symmetry.

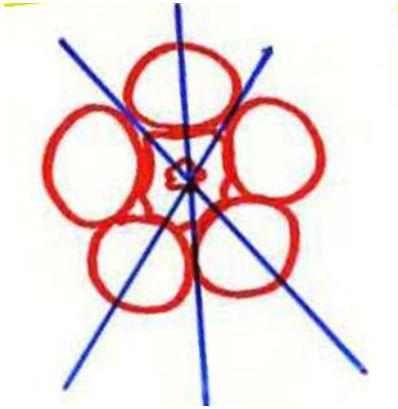
- ✓ Symmetric flowers are regular flowers that have parts, which are similar in size and shape so that the flower may be divided into equal halves by a vertical plane and /or planes.

1. **Actinomorphic or radial symmetry:** flower in which can be divided into equal halves by a vertical plane in various directions. E.g., *Eruca sativa*
2. **Zygomorphic or bilateral symmetry:** is that in which there is only one plane of symmetry and have one or more of the flower parts dissimilar in size and shape . E.g., members of Labiatae, Papilionaceae.

- ✓ **Asymmetric or irregular flower lacks any plane of symmetry, usually the result of twisting of parts.** E.g., *Canna indica*..

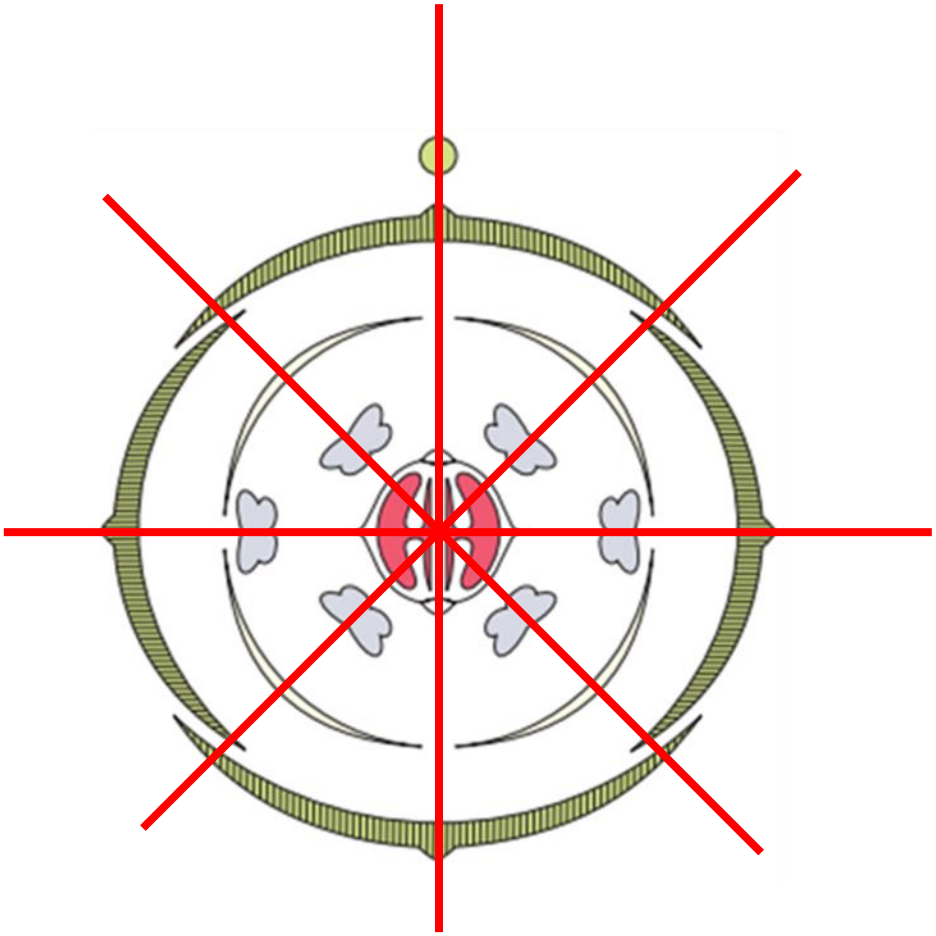
Asymmetric زهرة غير منتظمة

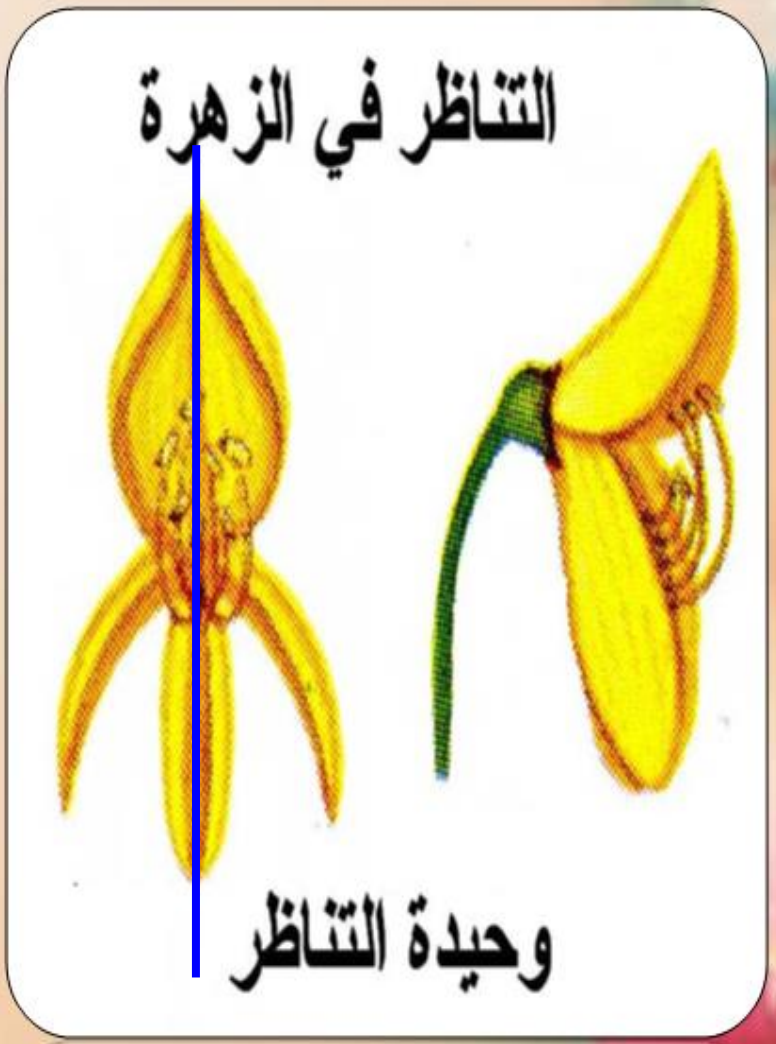
Zygomorphic زهرة وحيدة التناظر



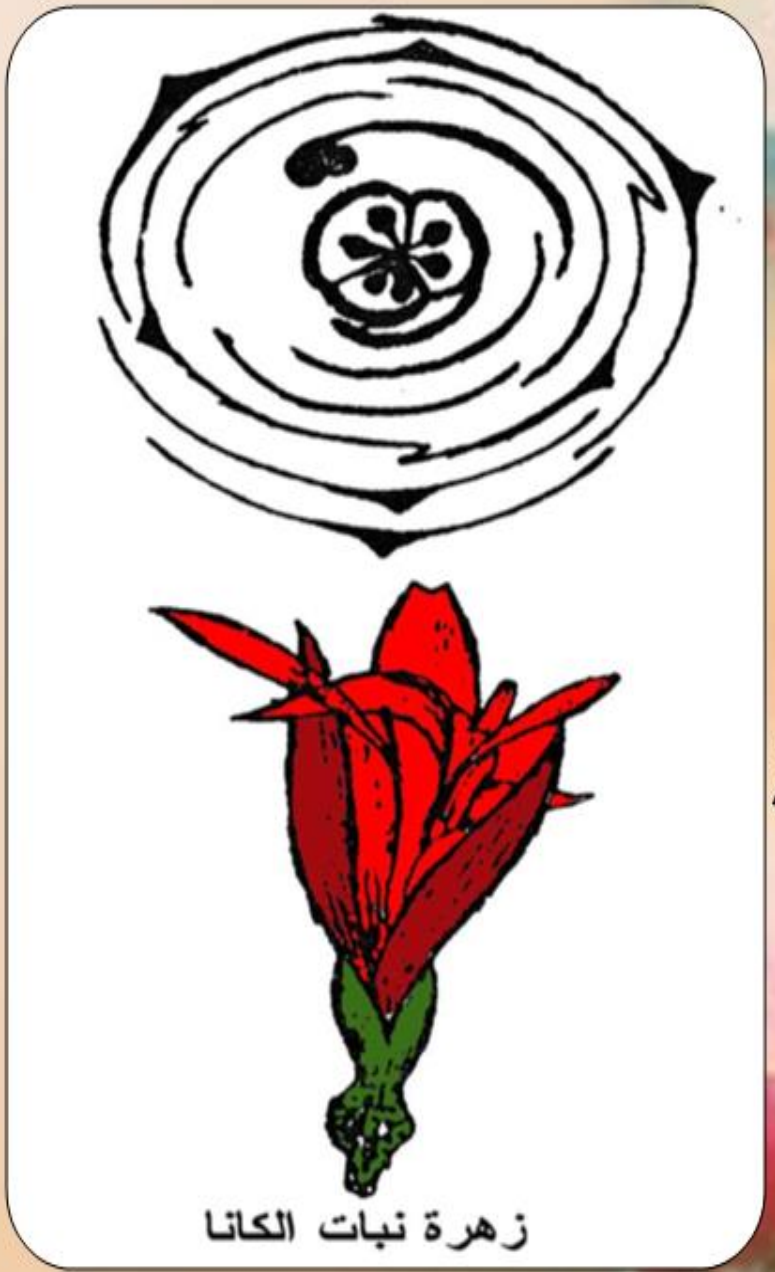
Actinomorphic

Actinomorphic flower





وحيدة التناظر



غير
منتظمة

وضع المحيطات الزهرية علي التخت
Position of the ovary in relation to other flower parts

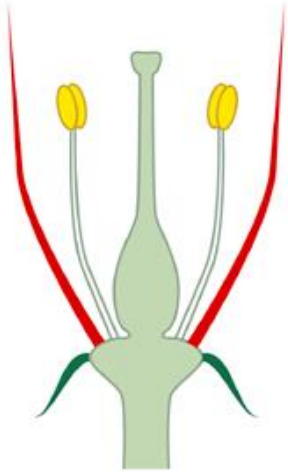
- **The position of the ovary in relation to other flower parts may be superior, inferior or half inferior. The relative positions, as seen in the flowers of different plants, are of three kinds:**

1. **Hypogynous** is used for sepals, petals, and stamens attached at base of a **superior** ovary.

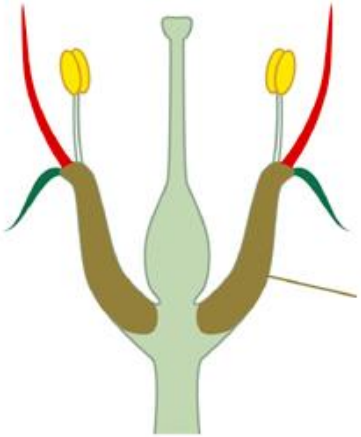
2. **Perigynous:** In a perigynous flower, the margin of the receptacle grows upward to form a cup–shaped calyx–tube, called the **hypanthium**, enclosing the ovary but remaining free from it, and carrying with it the sepals, petals and stamens. The ovary is said to be half–inferior.

3. **Epigynous:** In an epigynous flower, the margin of the hypanthium grows further upward, completely enclosing– the ovary and getting– fused with it, and bears the sepals, petals and stamens above an **inferior** ovary.

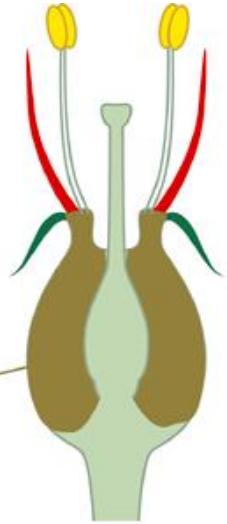
Position of flower parts on the receptacle



Ovary superior
Flower hypogynous
No hypanthium



Ovary half inferior
Flower perigynous
Hypanthium present



Ovary inferior
Flower epigynous
Hypanthium present

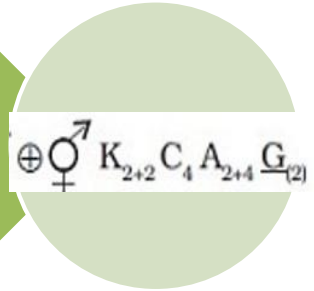
$\underline{G}$

G

$\overline{G}$

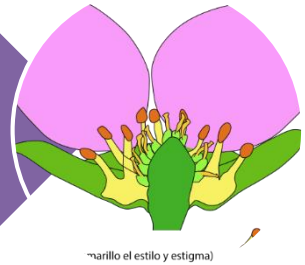
Description of Flower Morphology

1. Floral formula



2. Floral diagram

3. Longitudinal section



القانون الزهري او المعدلة الزهرية Floral formula

- **Floral formula is a summary of the structure and components of a flower using various symbols, letters, and numbers, presenting substantial information about the flower in a form of equation.**
- **The following symbols are applied:**

زهرة عديدة التناظر	⊕	Actinomorphic
زهرة وحيدة التناظر	%	Zygomorphic
زهرة مزكرة	♂	Male
زهرة مؤنثة	♀	Female
زهرة خنثي	☿	Bisexual
الكأس	K	Calyx
التويج	C	Corolla
غلاف زهري غير متميز	P	Perianth
طلع	A	Androecium
متاع	G	Gynoecium
زهرة سفلية ومتاع علوي	$\underline{G}$	Superior ovary
زهرة علوية ومتاع سفلي	$\overline{G}$	Inferior ovary

- **In these formulas**, ⊕ for actinomorphic flowers, % for zygomorphic flower.
- ⚥ for a bisexual flower, ♂ for male flower and ♀ for a female flower.
- **P** refers to perianth parts and is used where the perianth is undifferentiated into a typical outer calyx and inner corolla.
- If the perianth is differentiated into a distinct calyx and corolla, **K** represents the number of sepals or calyx lobes and **C** the number of petals or corolla lobes.
- The androecium is denoted by **A** and represents the number of stamens; staminodes may be indicated in the formula as **x** .
- The gynoecium is denoted by **G**, showing the number of carpels in the gynoecium, followed by superior or inferior to denote ovary position.
- Connation, the fusion of similar parts, is illustrated with parentheses **( )** that enclose the number.
- Separate, discrete whorls of parts are separated by the + sign; the outermost whorl is indicated by the first number, the innermost whorl by the last number.
- If there are more than about 10 12 parts, the ∞ sign is used for numerous

Floral diagram المسقط الزهري

Floral diagram is a graphic representation of flower structure. It shows the characteristics of floral organs, their relationships, arrangement and fusion.

The floral diagram is always circular

A small circle representing the mother axis is drawn above the diagram (posterior side)

Bract if present is drawn lower the diagram (anterior side).

Floral whorls are represented by concentric circles

Sepals are drawn in the outer most circle, with their number and aestivation shown

Petals are drawn in the second most circle, alternate with sepals.

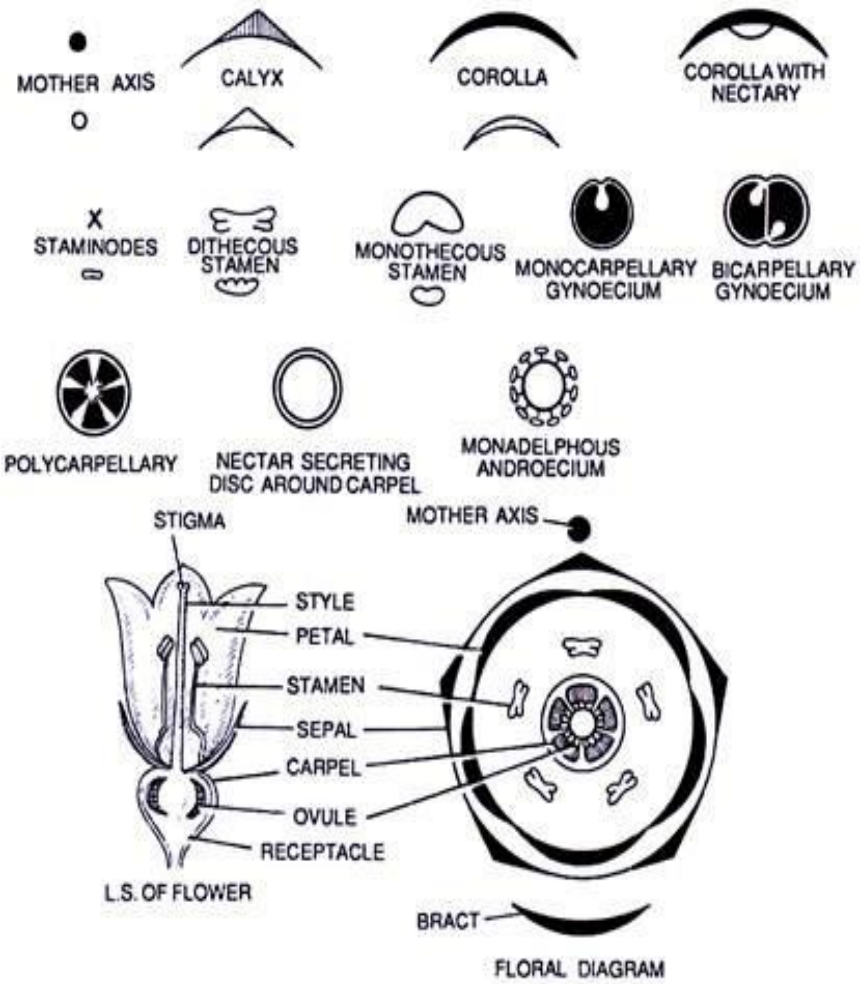
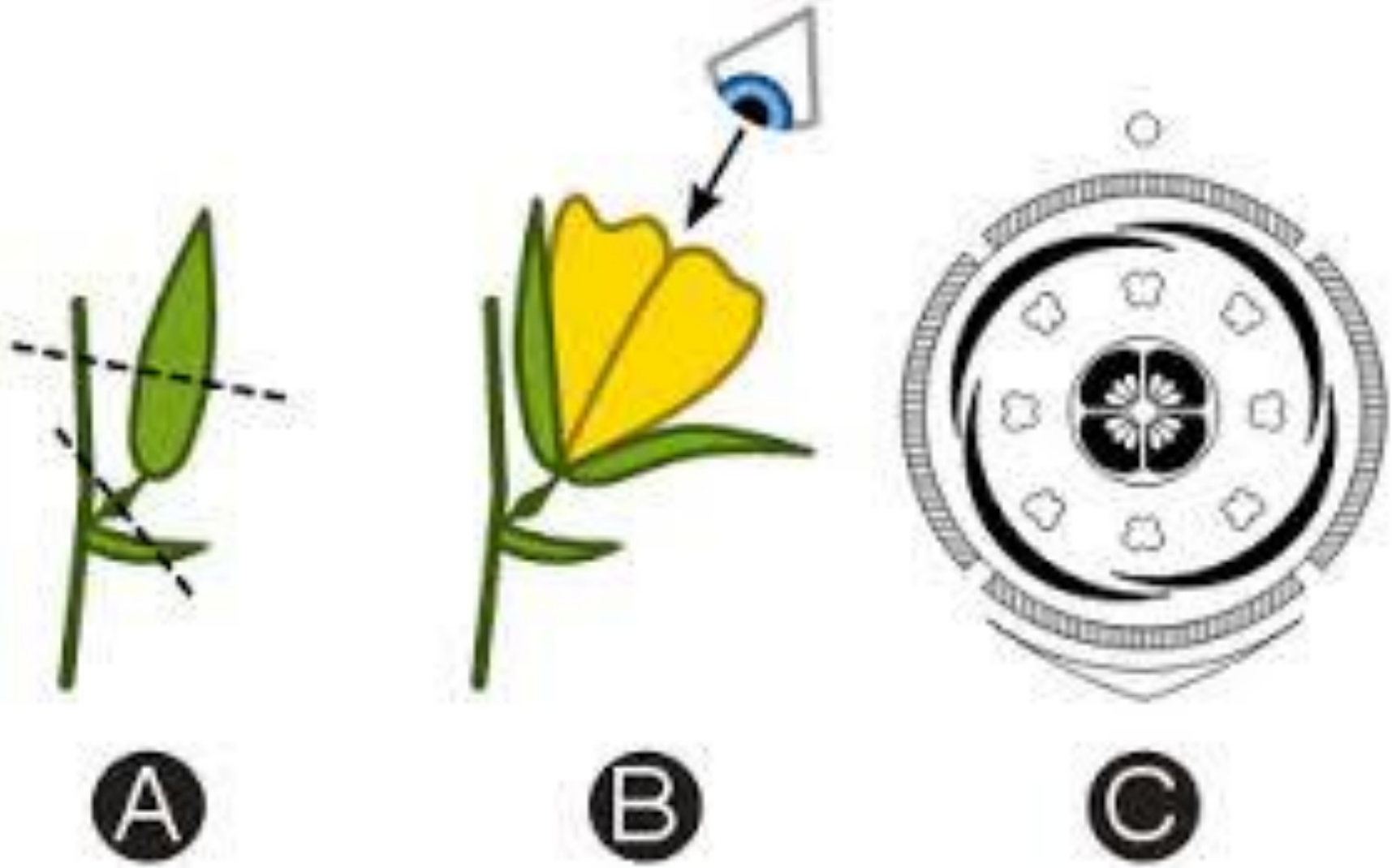


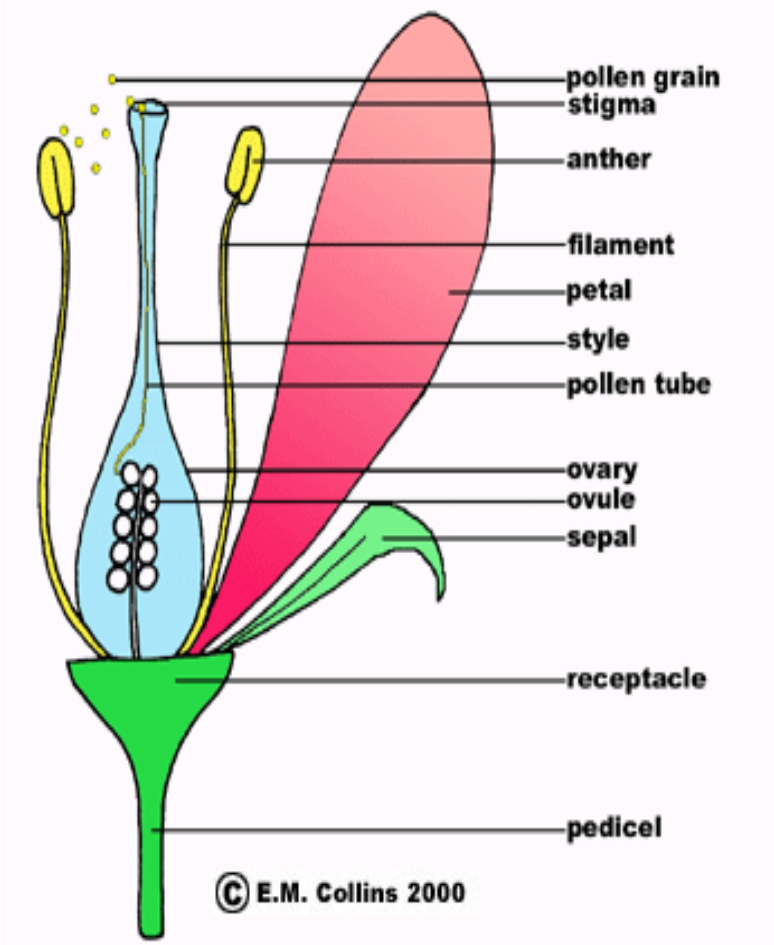
Fig. 16.4. Figures used in drawing the floral diagram.

المسقط الزهري Floral diagram



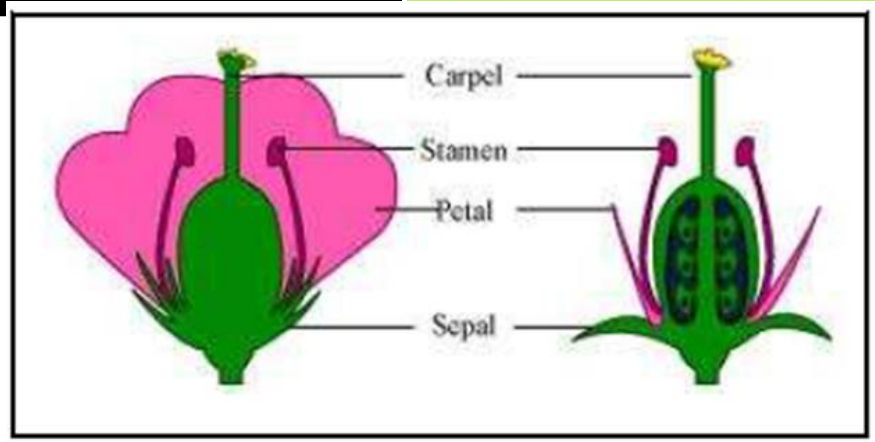
Longitudinal section القطاع الطولي

- A diagrammatic cross–sectional view of a flower bud, from the axis to the bract, showing the relative relationship of perianth, androecial, and gynoecial components.

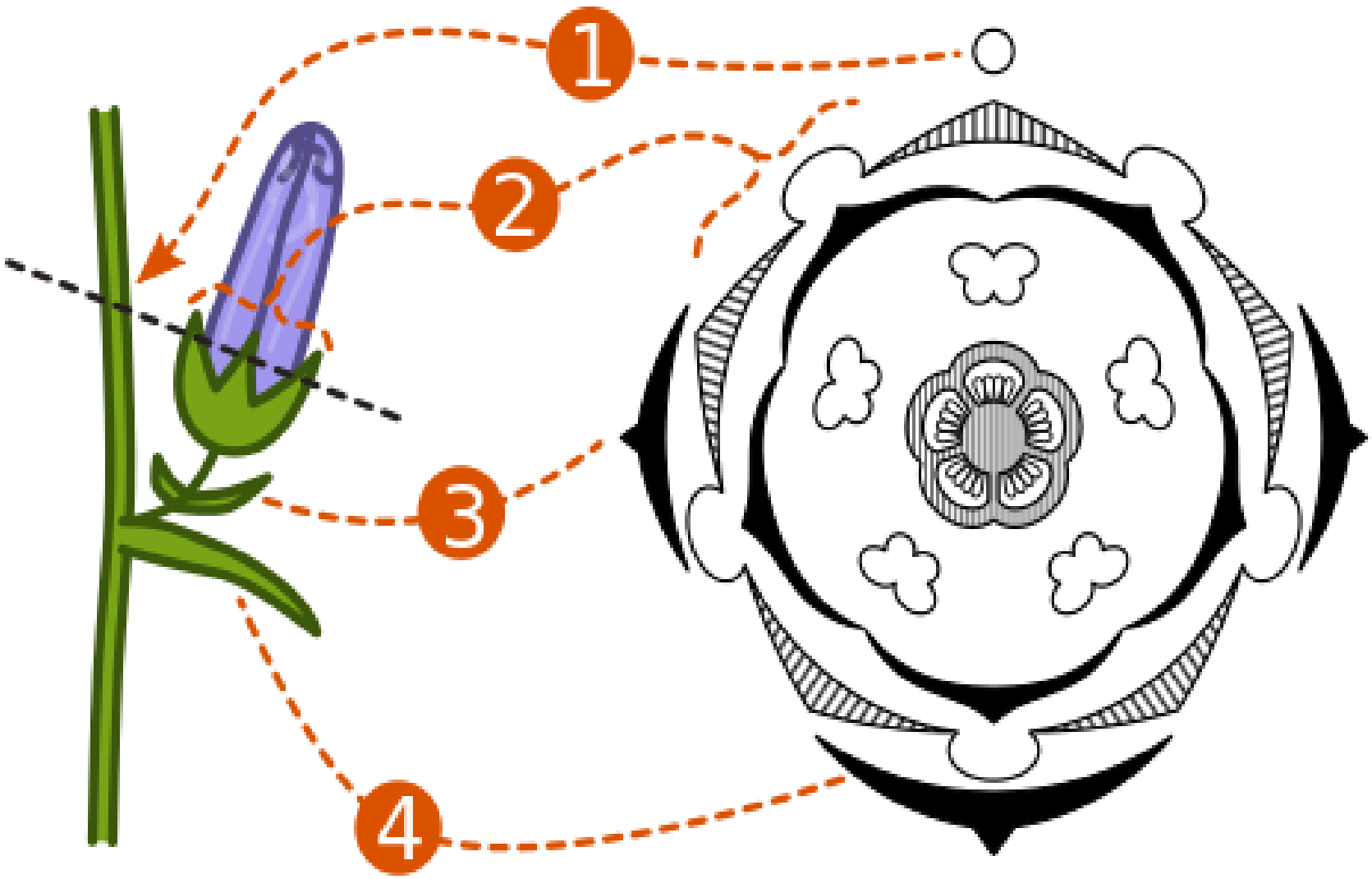


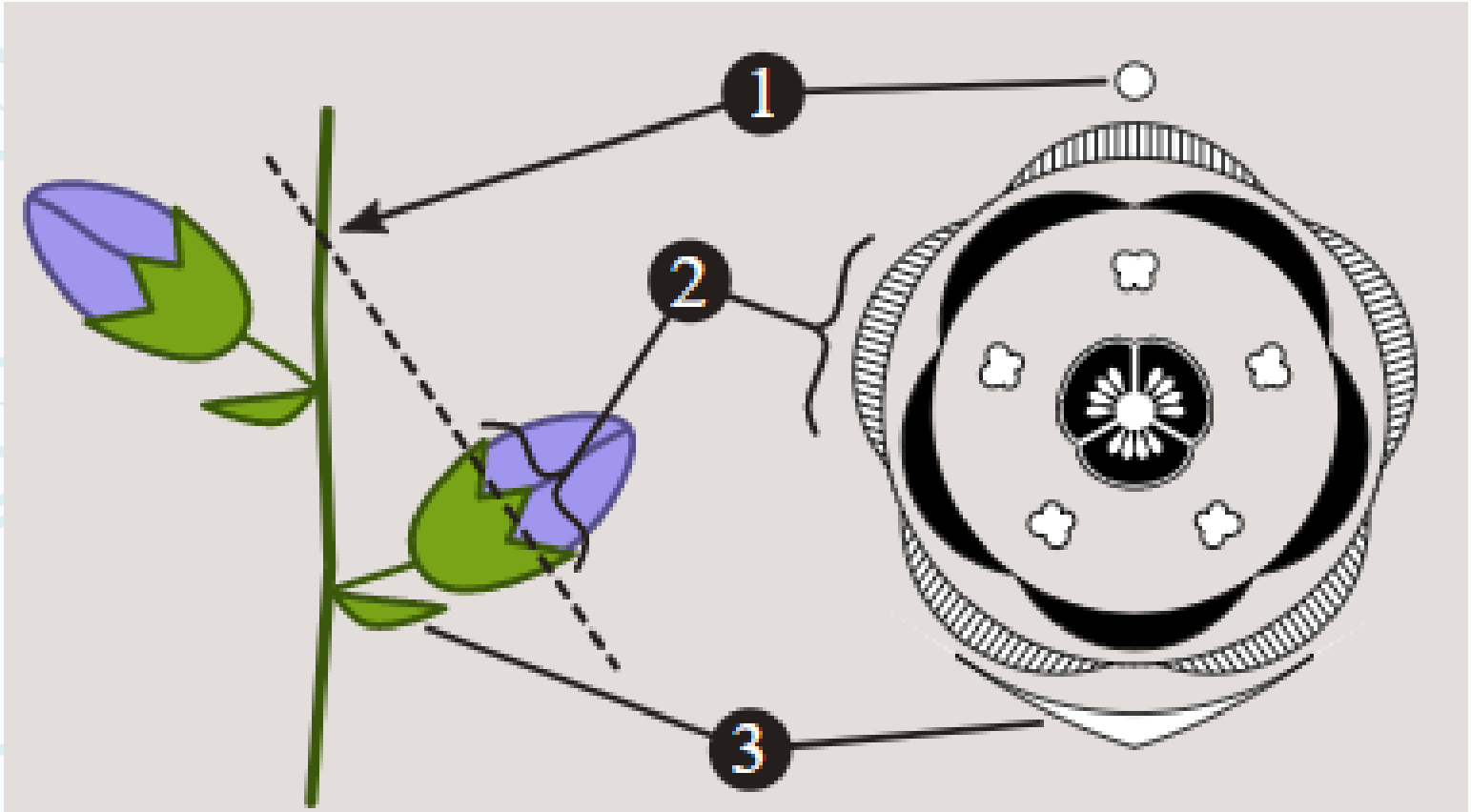
1. A stamen is represented by a filament and anther
2. The shape and size of the ovary and the mode of its insertion on the receptacle should be represented to scale.
3. The type of placentation, length of the style and the size and shape of stigmas are also represented

Longitudinal section القطاع الطولي



كيف نرسم القطاع الطولي من المسقط الزهري

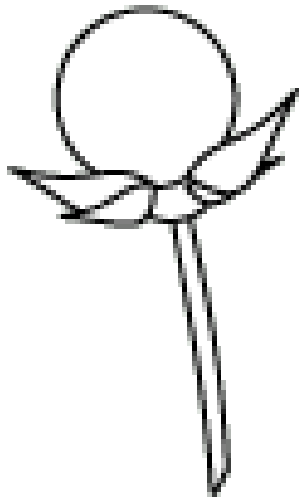




Relation of a hypothetical plant material to the diagram. 1 – the main axis relative to the flower, 2 – cross section, 3 – bract.

Inflorescences

النورات

	 solitary

- **An inflorescence** is a collection or aggregation of flowers on an axis of a plant in a definite manner.
- **Some terms related to inflorescence structure:-**

1. **A peduncle** (adjective pedunculate) is the stalk of an entire inflorescence.
2. **Pedicel** is the stalk of each flower.
3. A group or cluster of bracts subtending an entire inflorescence is termed an involucre (adjective involucrate)
4. A spathe (adjective spathaceous) is an enlarged, sometimes colored bract subtending and usually enclosing an inflorescence.

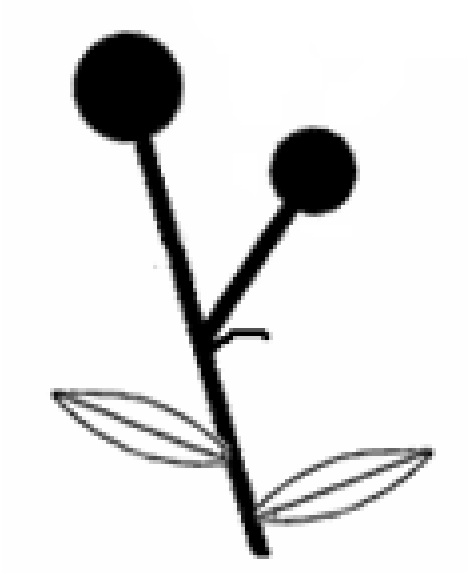
Types of the inflorescence

The present system of inflorescence classification distinguishes three major types, **racemose, cymose** and **special types** of inflorescence.

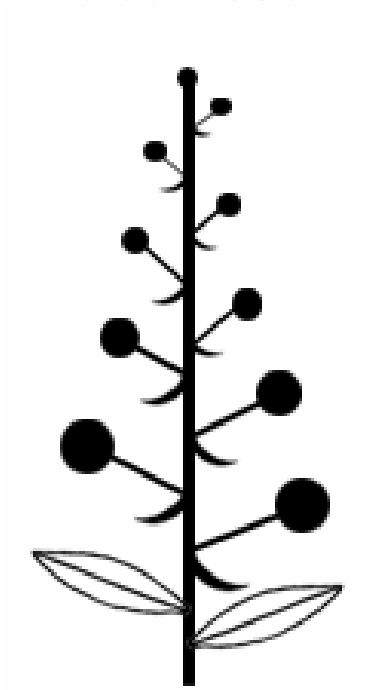
النـورات

The Inflorescences

1- نورات محدودة
Cymose



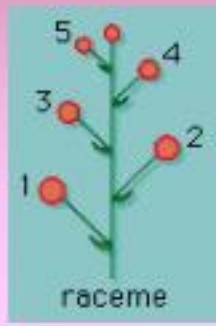
2- نورات غير محدودة
Racemose

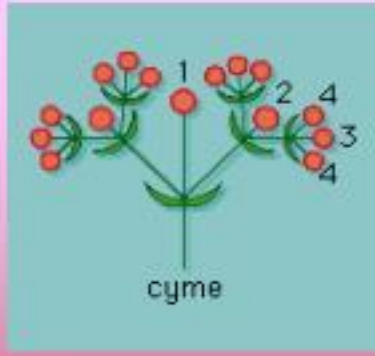


3- نورات خاصة
Special type inflorescence

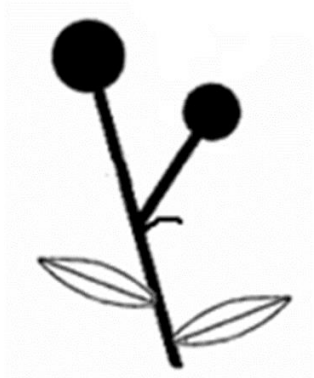
Types of Inflorescence

- ***Racemose Type:*** The main axis grows indefinitely giving rise to younger flowers in an acropetal order.
- ***Cymose Type:*** The apical bud is a flower. The younger flowers are borne below it, in a basipetal manner.
- ***Special Inflorescence***





1- نورات محدودة Cymose



تتميز النورات المحدودة إلي ثلاثة انواع:

1- أحادية الشعبة Monochasium :

أ- النورة وحيدة الشعبة البسيطة

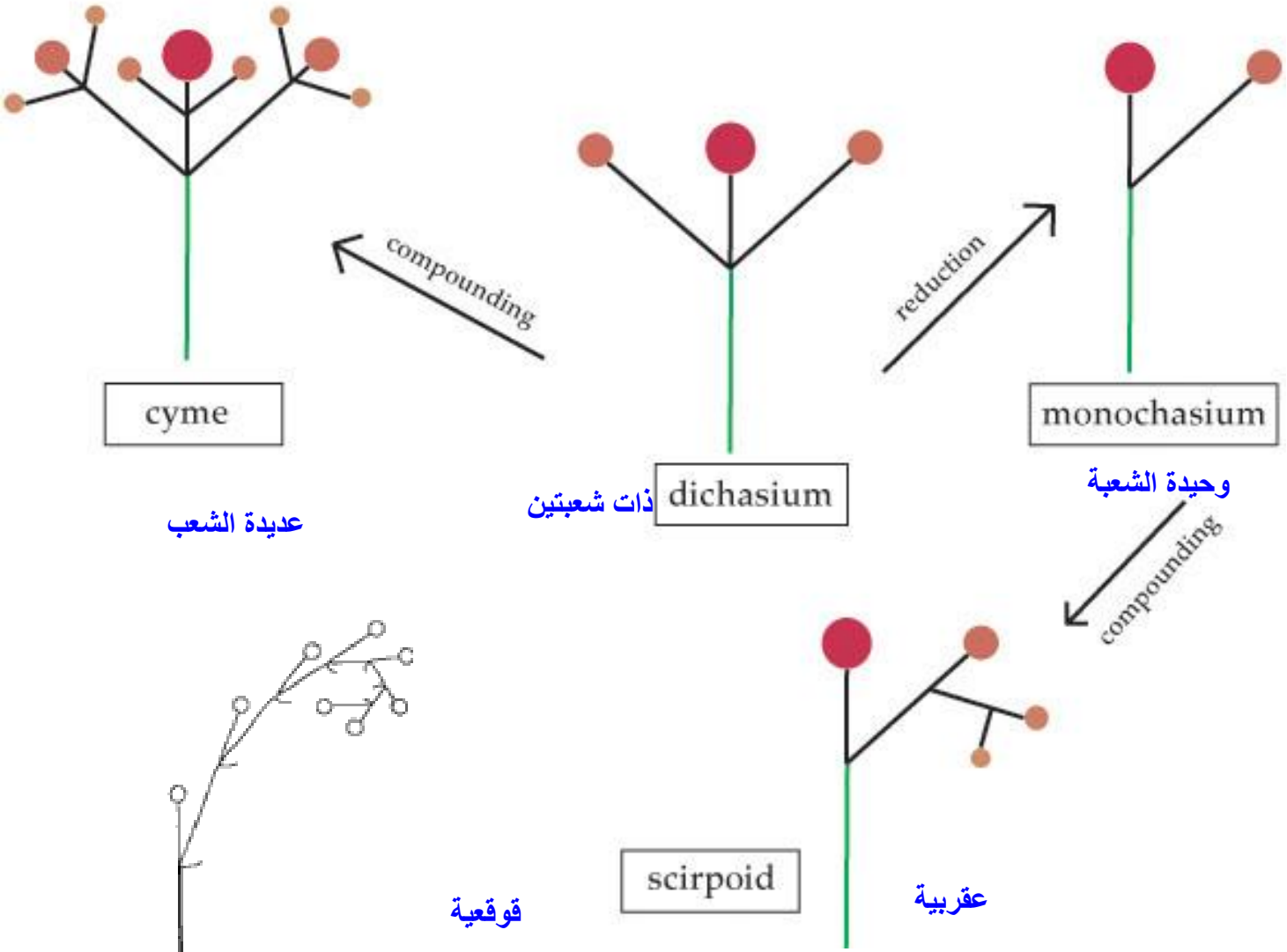
ب - النورة القوقعية Helicoid

ج - النورة العقربية Scorpiod

2- النورة ذات الشعبتين Dichasium

3- النورة عديدة الشعبة Polychasium

Determinate Inflorescence Types



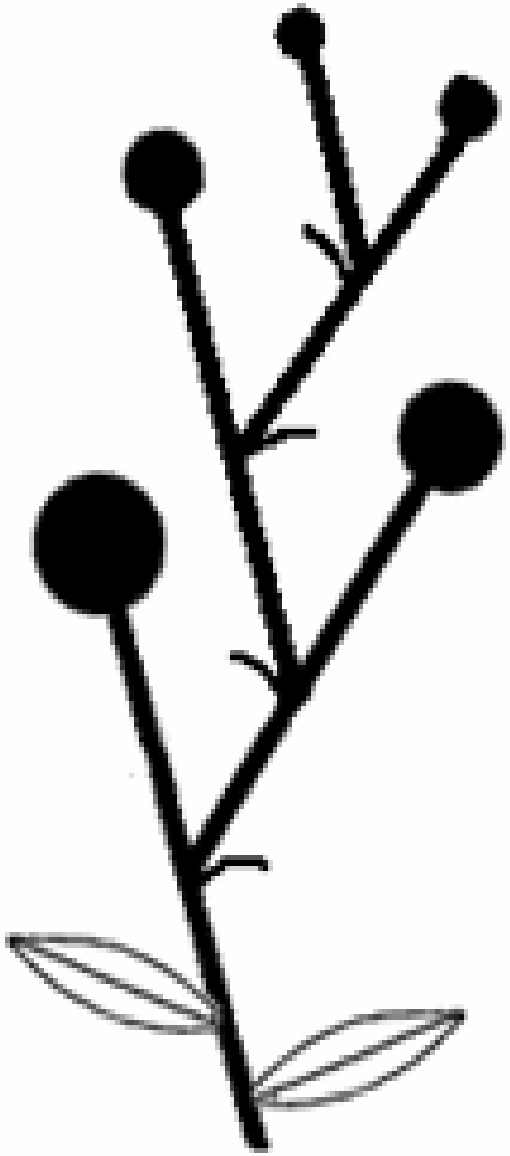
عديدة الشعب

ذات شعبتين

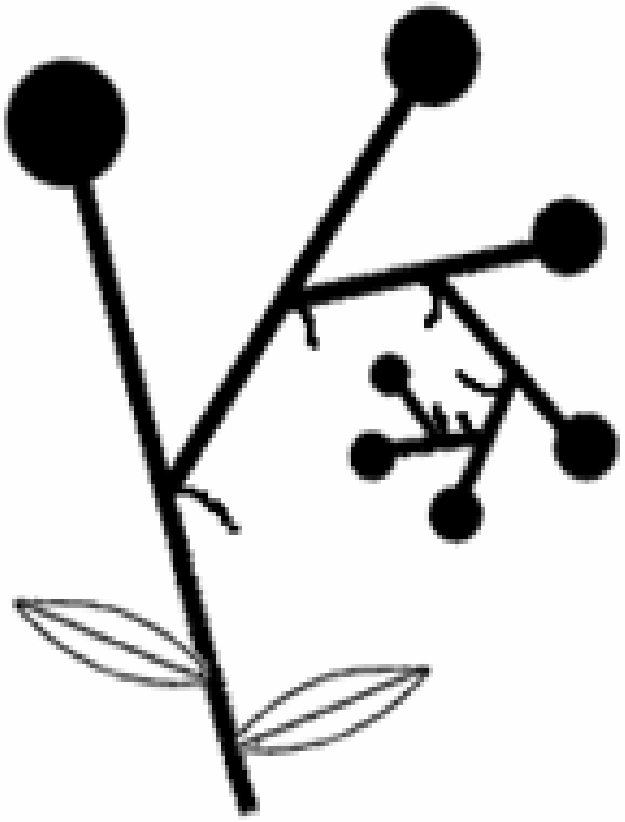
وحيدة الشعبة

عقربية

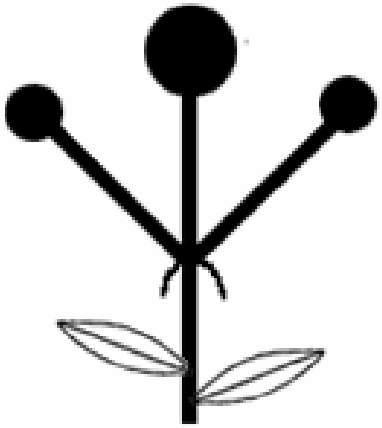
قوقعية



عقربية Scorpoid

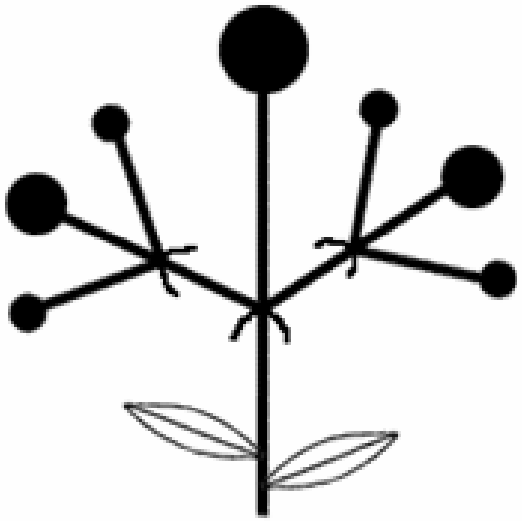


Helicoid قوقعية



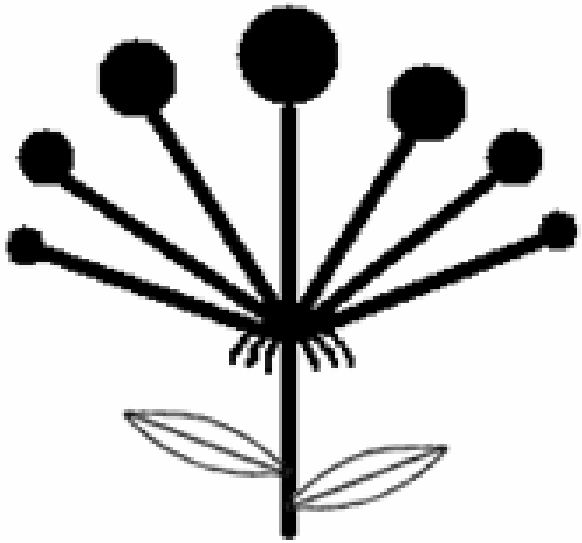
Simple Dichasium

ذات شعبتين بسيطة



Compound Dichasium

ذات شعبتين مركبة



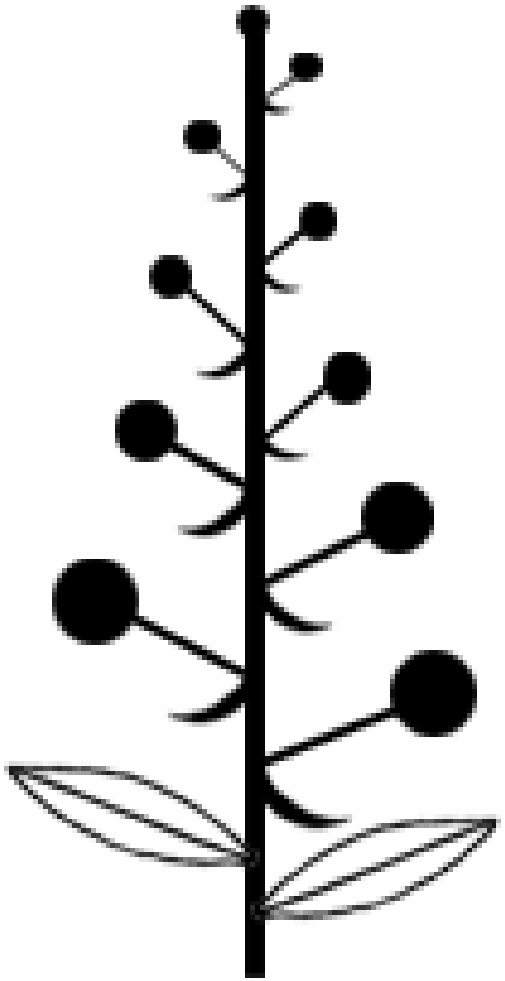
Polychasium

عديدة الشعب

Allium cepa **نورة البصل**

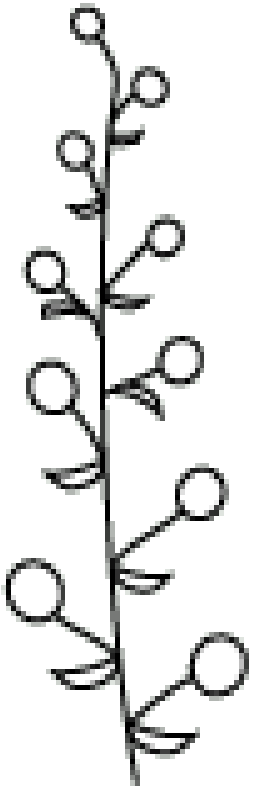
2- نورات غير محدودة Racemose

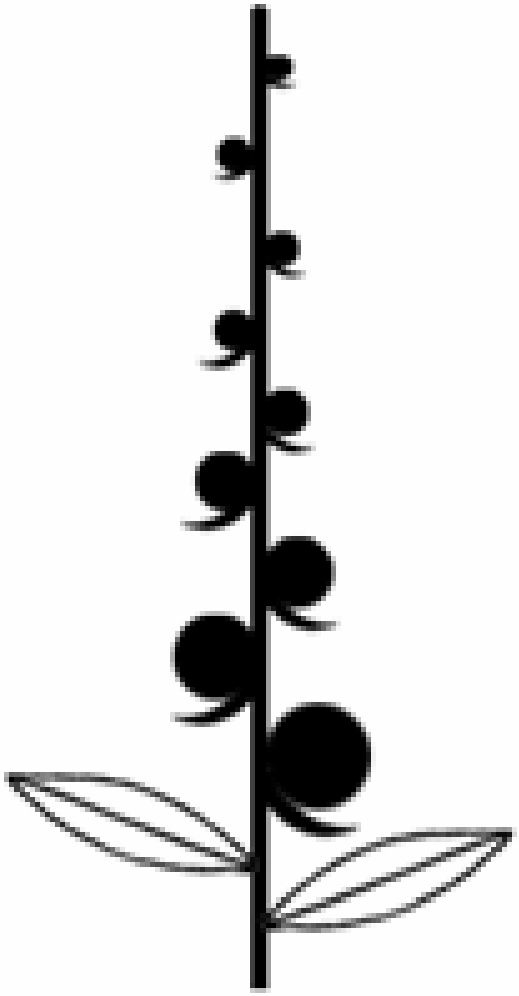
1. Raceme العنقودية
2. Spike السنبلة
3. Catkin هرية
4. Corymb المشطية
5. Umbel الخيمية
6. Head الرأس
7. Capitulum الهامه
8. Spadix اغريضية



raceme

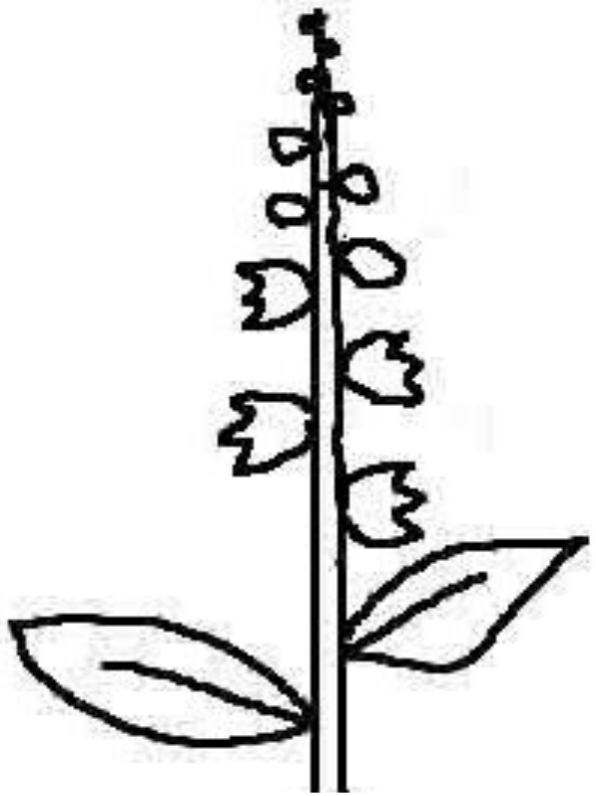
عنقودية

	
Simple	Simple النورة العنقودية البسيطة

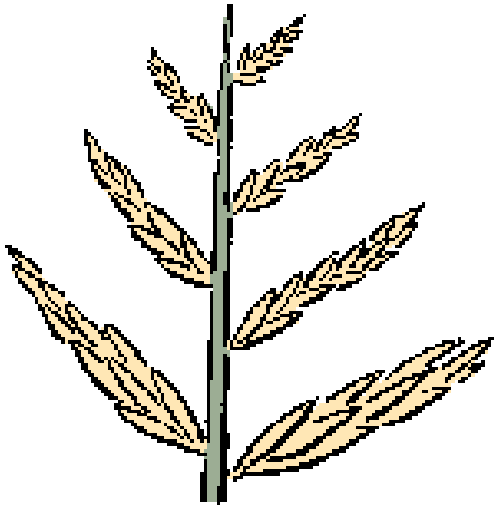


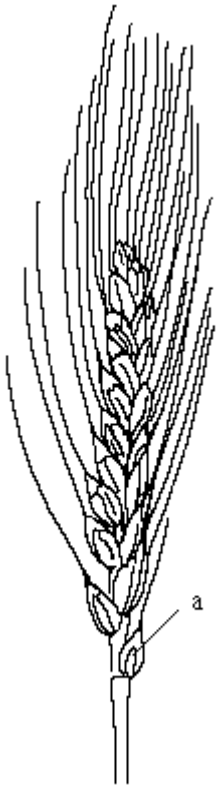
Simple spike

سنبلة بسيطة

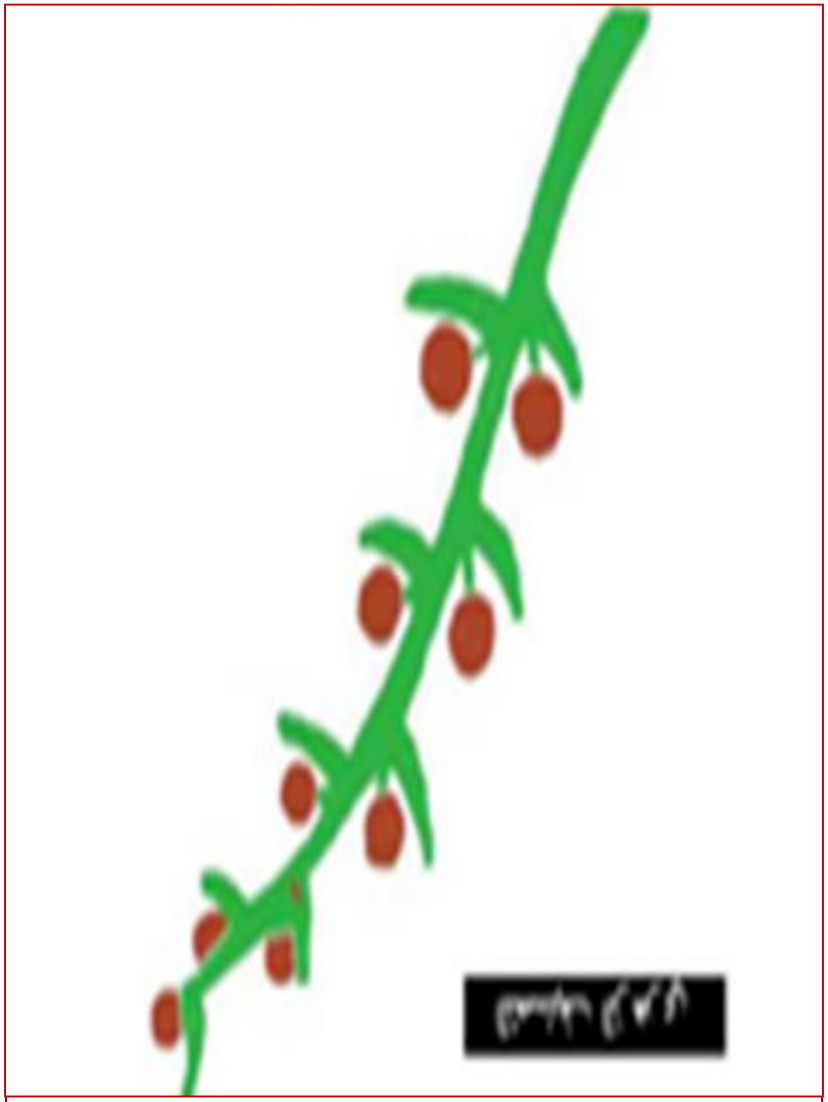
	
Spike	النورة السنبلــة Spike

سنبلة مركبة

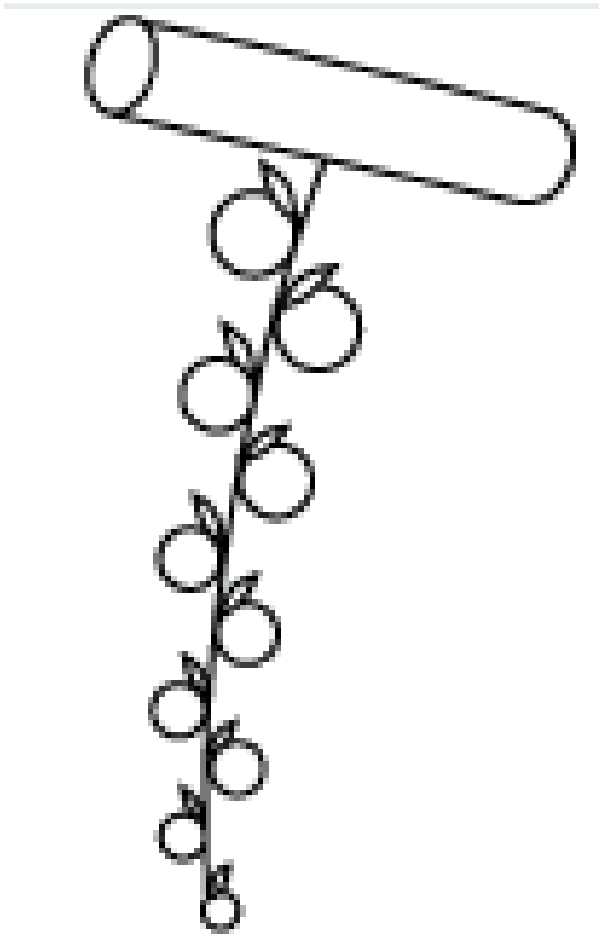


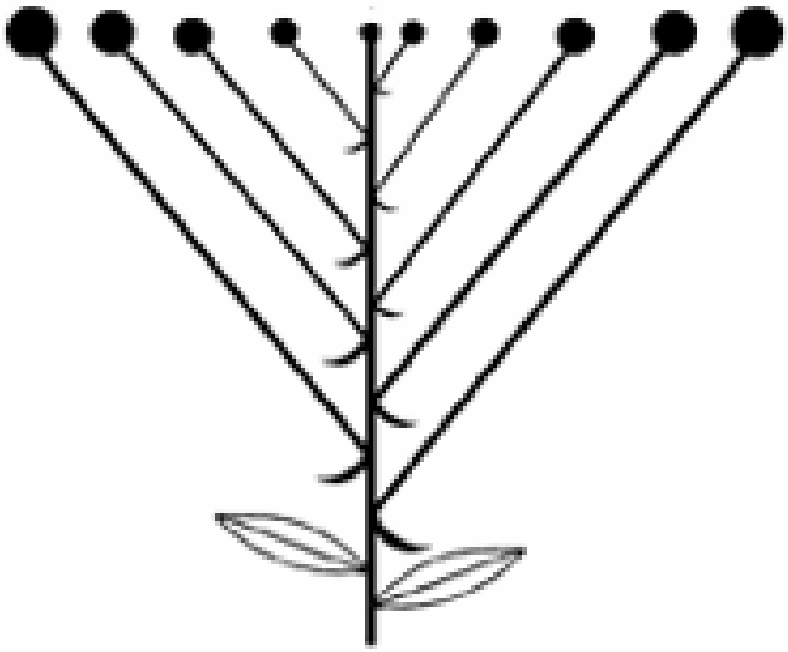


Catkin هرية



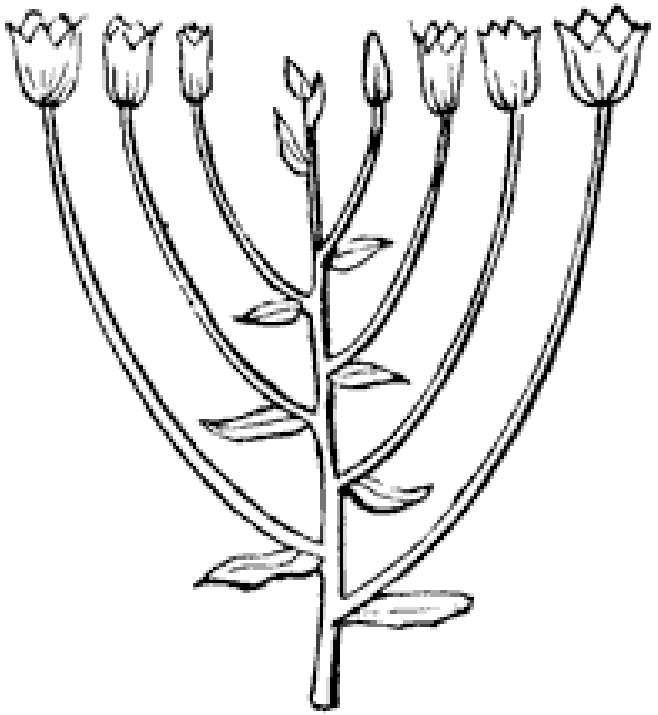
نورة هريه وحيدة الجنس (الصفصاف)

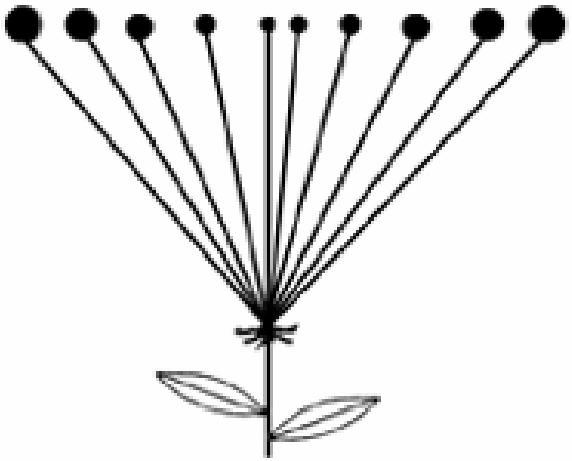
	
Catkin	Catkin النورة الهريــة



corymb

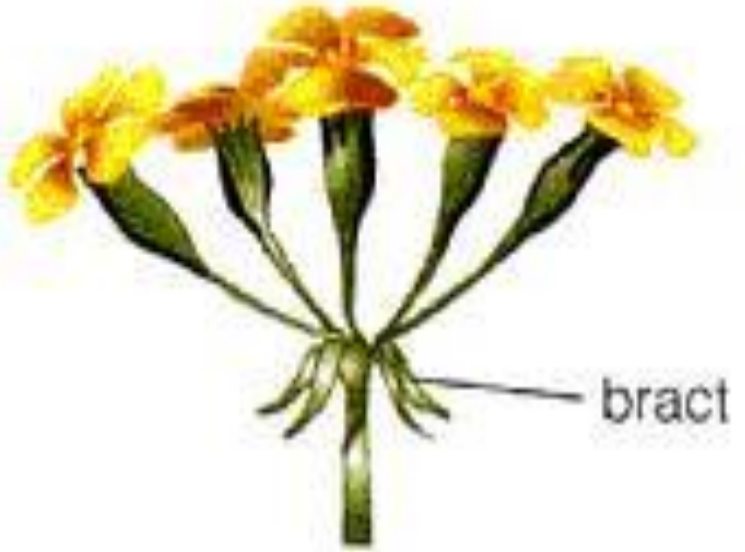
مشطية

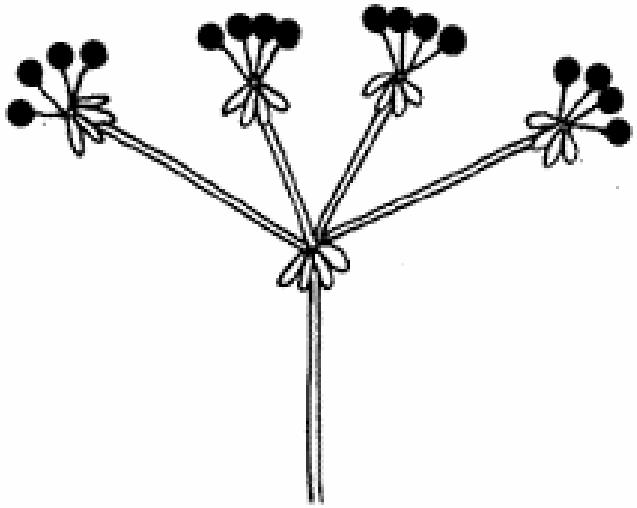
	
Corymb	Corymb (العذقية) النورة المشطية



umbel

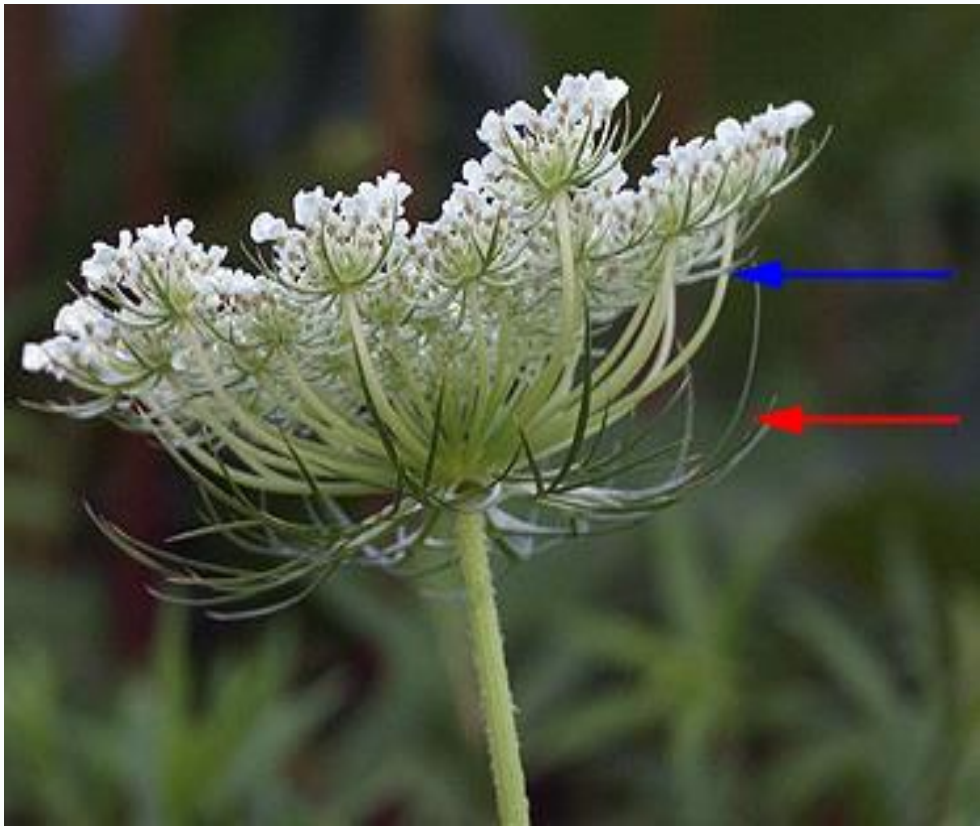
خيمية

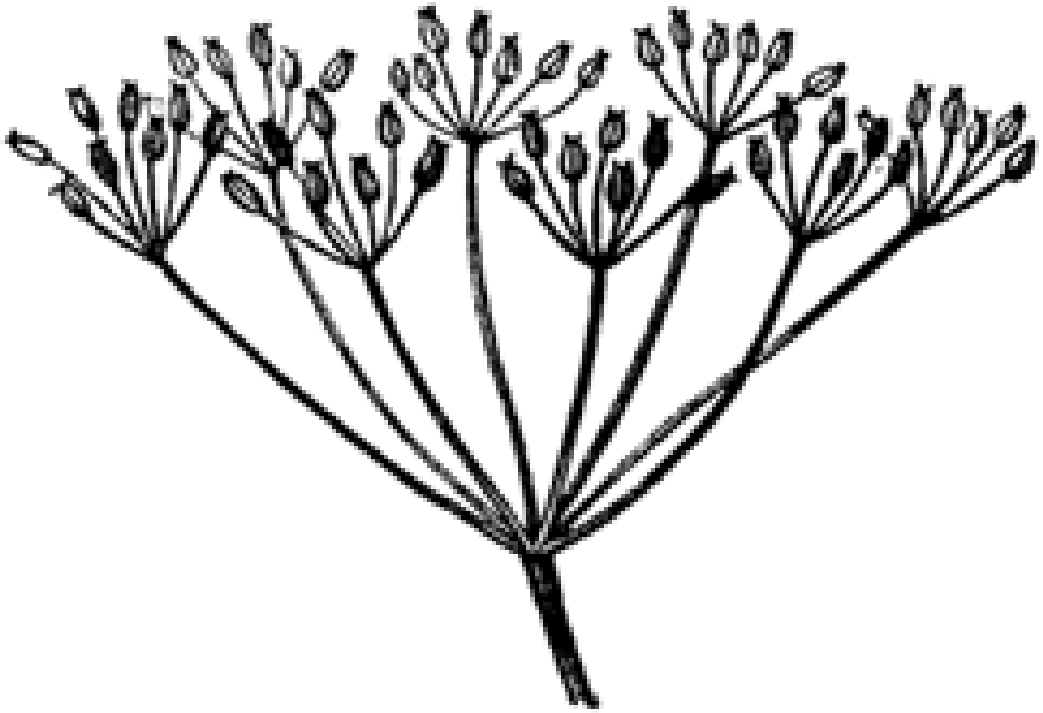




compound umbel

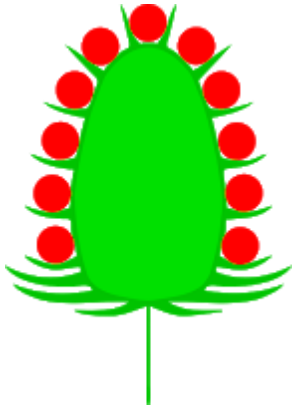
خيمية مركبة



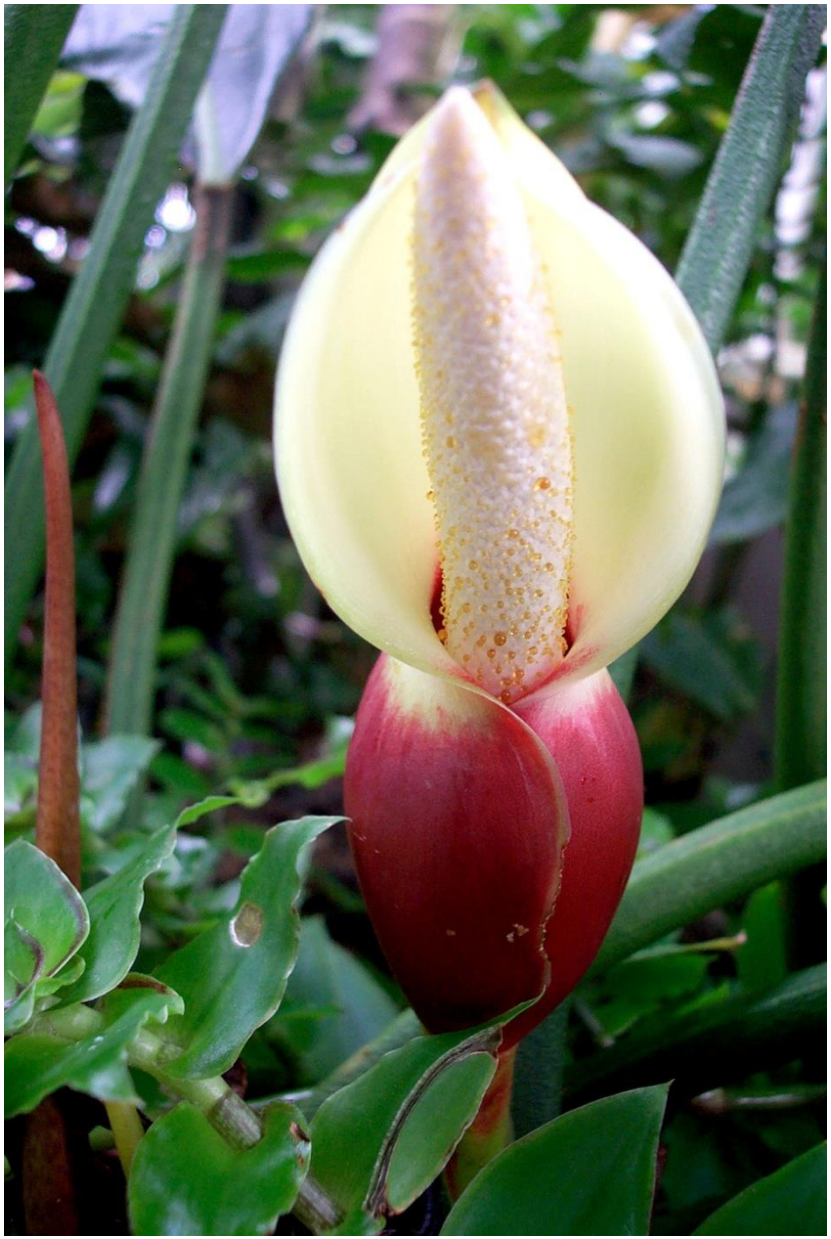


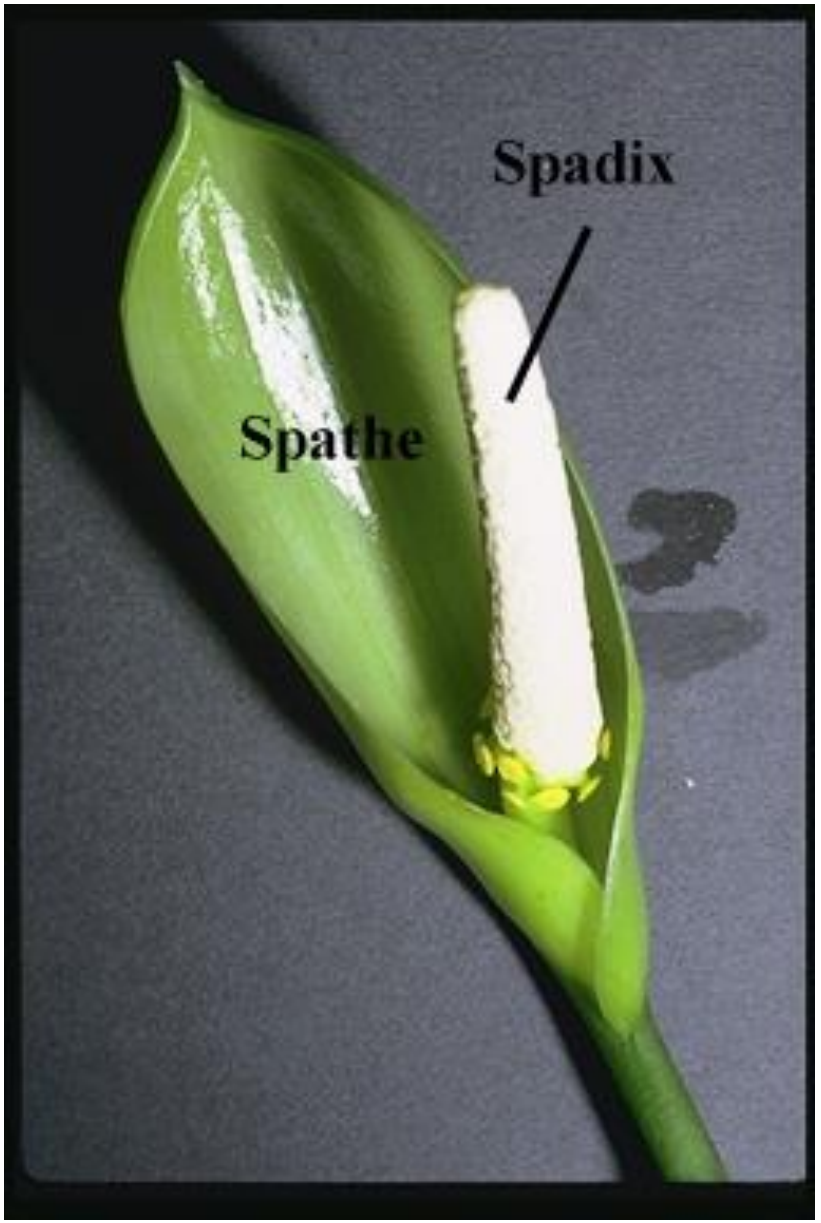
Capitulum الهامة :محور النورة قصير مفلطح أو مقعر أو محدب ويحمل الأزهار الجالسة عادة على سطحه ، وتوجد الأزهار الصغيرة السن في المراكز وتتدرج في الكبر ناحية الخارج . وتحاط النورة من الخارج بقنابات عديدة تسمى قلافة involucre، كما في نورة عباد الشمس

الرأس Capitate or Head: محور النورة كروي أو رأس ويحمل أزهارا جالسة عادة كما في نورة السنط .



Spadix اغريضية

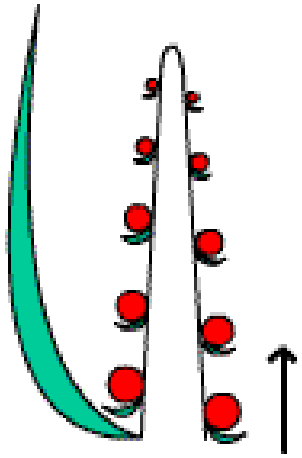


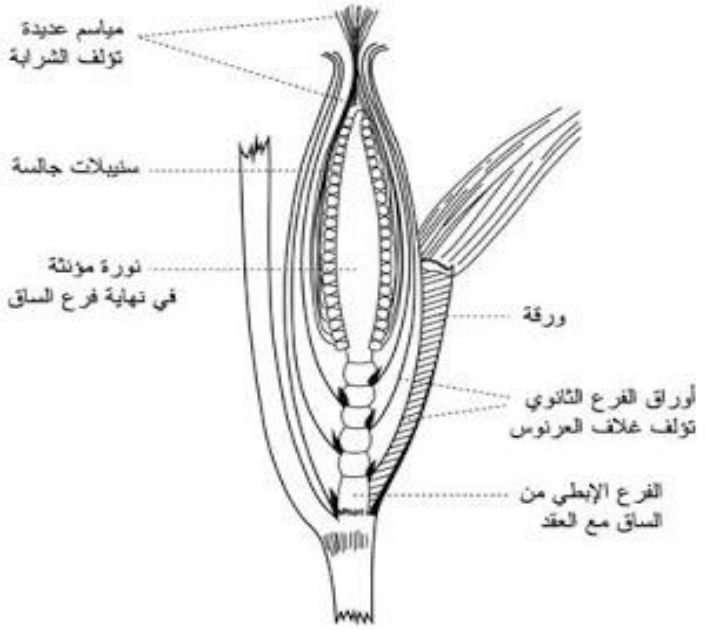


نخيل البلح

ملحوظة : يحمل نبات الذرة نوعين من النورات :

1. نورة طرفية فى نهاية الساق من نوع السنبلية المركبة وهى تحمل الأزهار المذكرة فقط .
2. نورات إبطية فى آباط بعض الأوراق وهن من نوع النورة الإغريضية وهنا تكون الأزهار مؤنثة فقط وتكون كل منهن بعد النضج (كوز الذرة الذى نأكله)

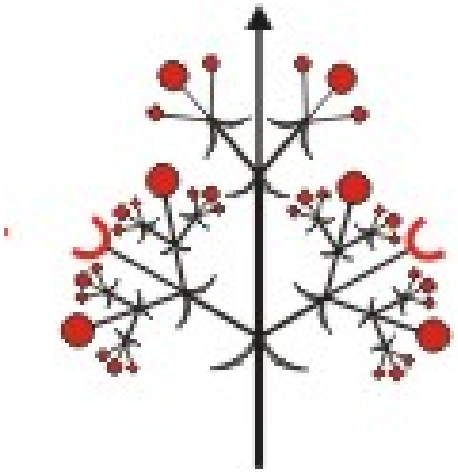




3- Mixed inflorescences نورات مختلطة

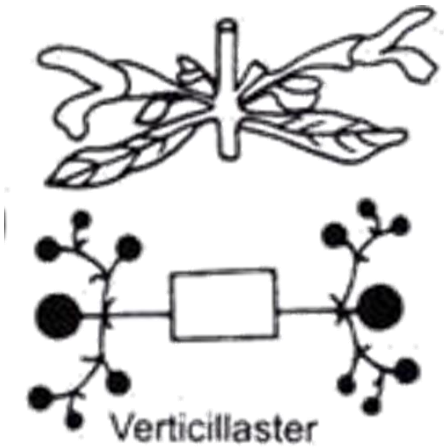
- In a mixed inflorescence, It is an inflorescence having a number of simple dichasial cymes arranged in a recemose manner on an elongated peduncle

1. **Thyrse**, is essentially a raceme of cymes, in which the main axis is indeterminate but the opposite, lateral, unit inflorescences are pedicellate cymes, typically either simple dichasia, compound dichasia, or compound cymes.



thyrse

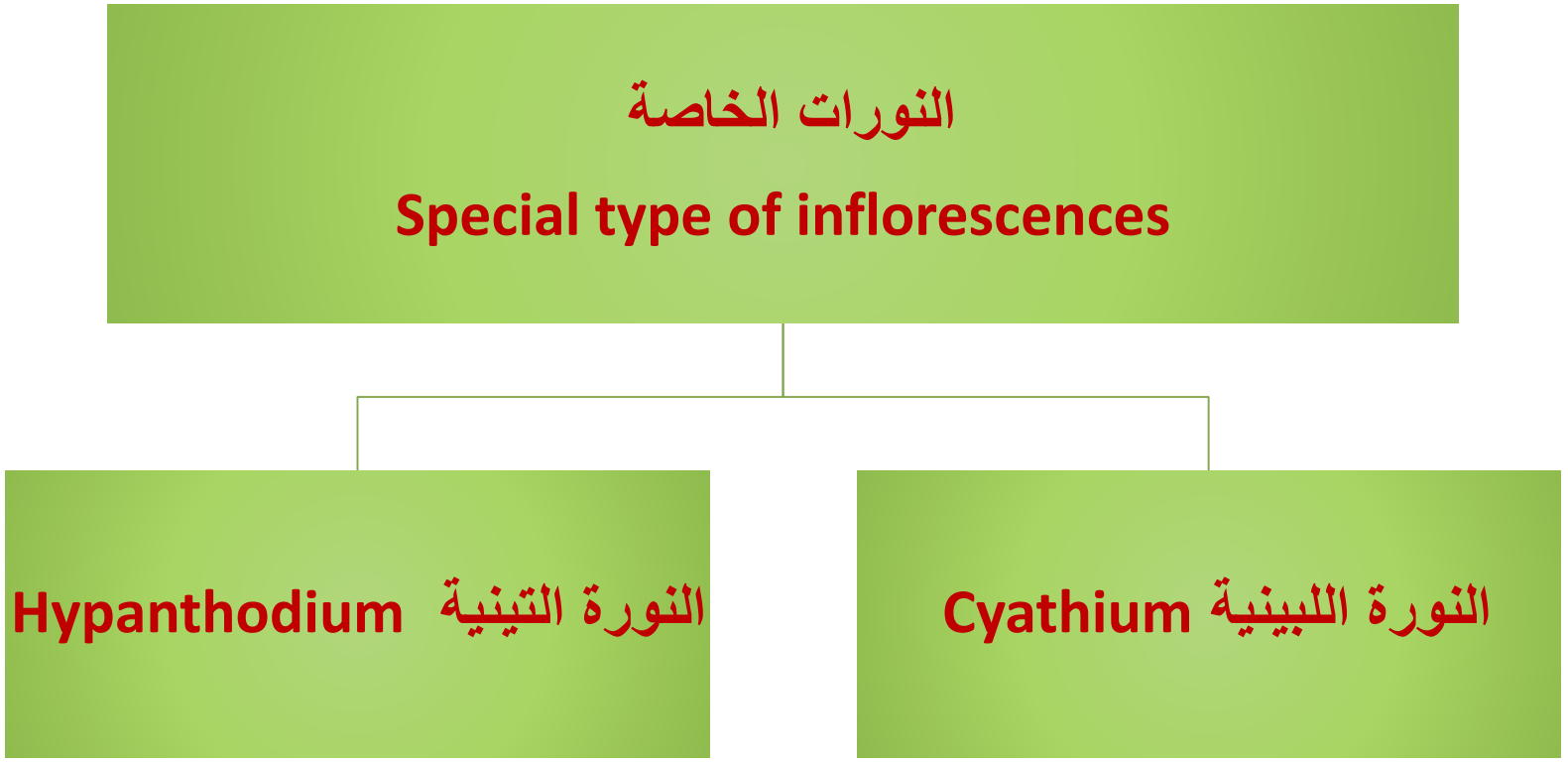
2. **Verticillaster:** is a mixed type of inflorescence. At each node of the stem two axillary opposite cymose inflorescences develop on either side. The cyme in the axil of each leaf, starts as a dichasial cyme but subsequently become monochasial scorpioid cyme. As a result the cyme bends round the stem on either side and meets a similar cyme from the opposite side. Hence, at each node there is a cluster of flowers completely surrounding the stem.. It is found in the family Labiatae. Eample: *Ocimum* sp.



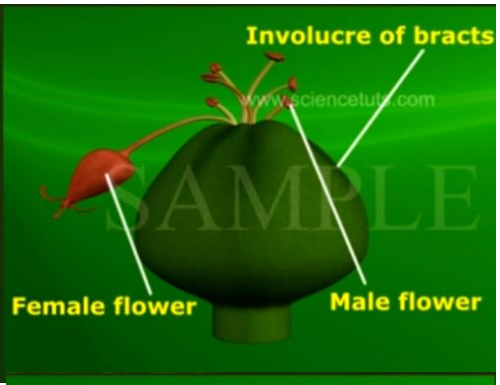
***Ocimum* sp.**

4- Special type of inflorescences النورات الخاصة

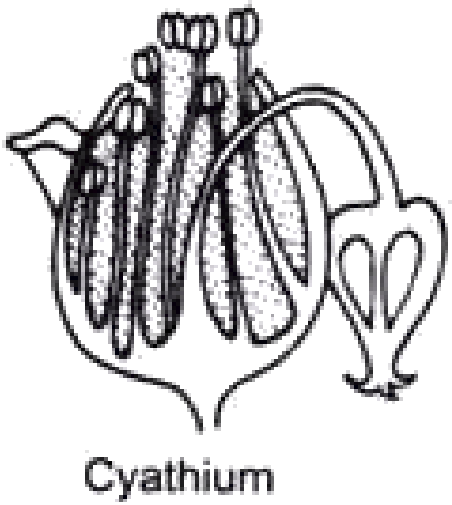
In these inflorescences the arrangement and opening of flowers remain special due to the occurrence of modifications.



1. **Cyathium:** it is a single flower-like inflorescence. It is covered by a cup-like involucre formed by the fusion of five bracts. In the outer surface of the deep cup, nectary glands are present. At the center of this cup, there is a long stalked single female flower, with tricarpellary syncarpous pistil. The male flowers are highly reduced and represented by a single stamen which are produced in a scorpioid manner from the axil of each bract. Many male flowers are encircled the female flower. It is found in the family **Euphorbiaceae**. Example: *Euphorbia* sp.

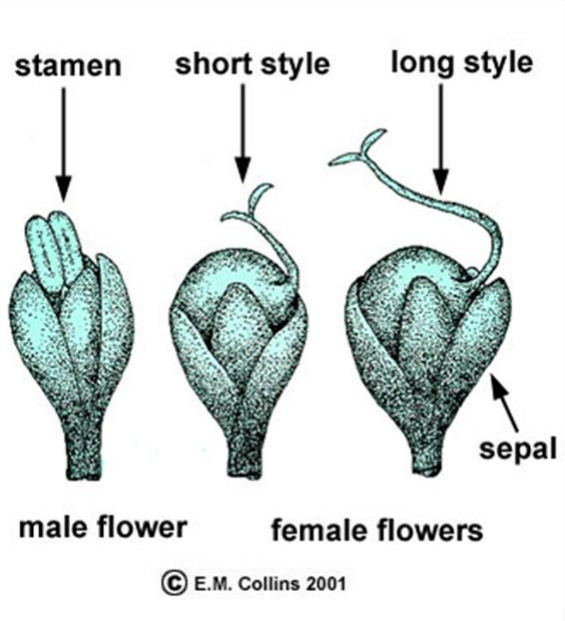


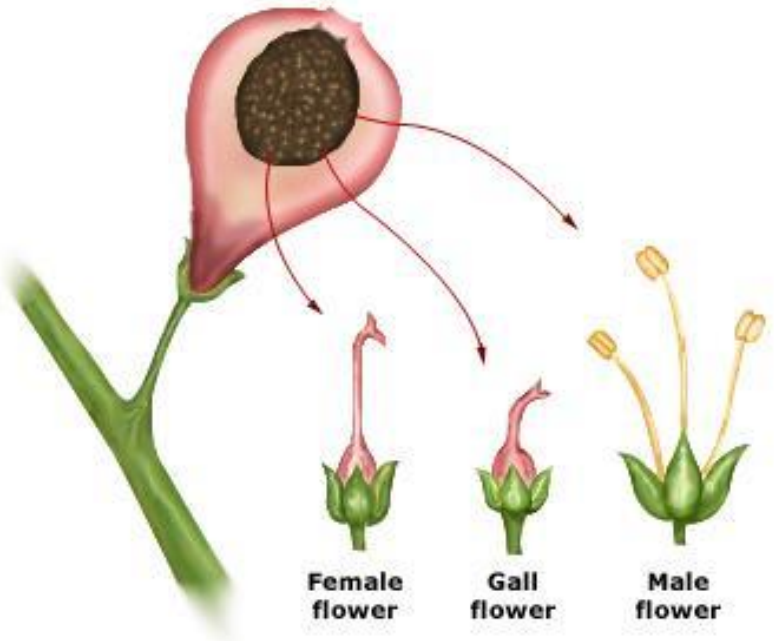
Euphorbia peplus



2. **Hypanthodium or Syconium:** it is a fruit-like inflorescence.

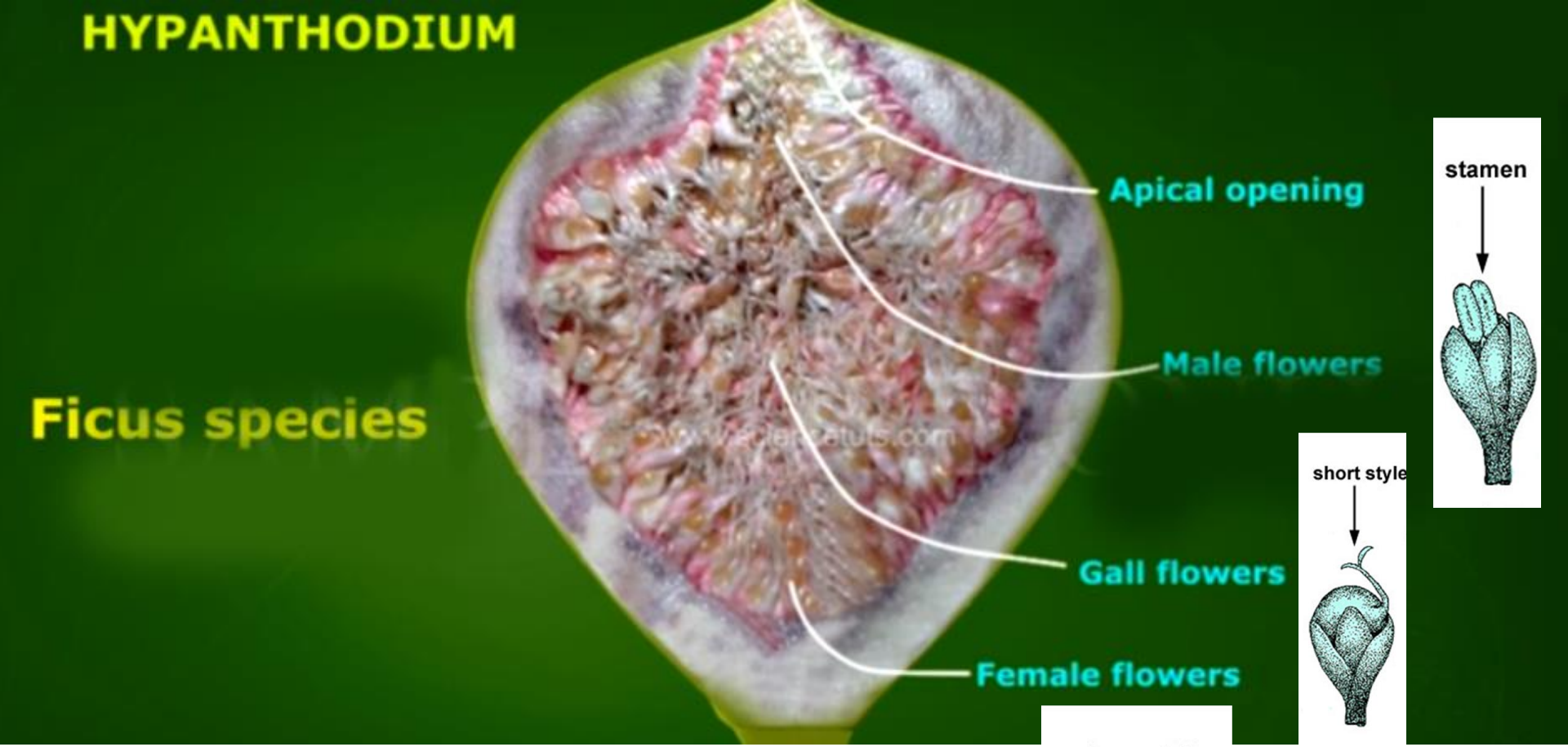
- They are cup-like fleshy structures composed of modified peduncular tissue, with an apical small opening (ostiole) guarded by dense, overlapping scales.
- Numerous minute, sessile, unisexual flowers develop on the inner wall of the cup.
- Male flowers are near the apical opening and female flowers (with long style) are at the base. In between the two types of flowers, some sterile female flowers (with short style) called **"GALL FLOWERS"** are present.



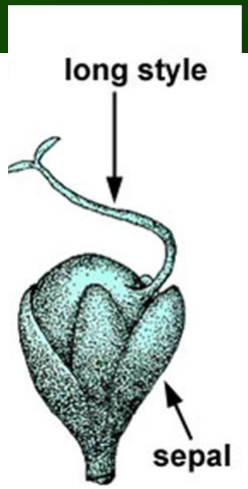


Hypanthodium inflorescence (ficus)

HYPANTHODIUM



Ficus species



DIFFERENCES BETWEEN CYATHIUM AND HYPANTHODIUM

CYATHIUM	HYPANTHODIUM
1.It is a single flower like special inflorescence	It is a fruit like special inflorescence
2.Involucre of bracts forms a cup like structure	Inflorescence axis forms a cup like structure
3.It has external nectaries	It does not possess external nectaries
4.It consists of a single female flower and many male flower	It consists of female flowers,male flowers and sterile flowers calld 'gall flowerrs'.
5.Flowers are achlamydeous. (Perianth absent)	Flowers are chlamydeous (Perianth present)
6.Flowers arranged in centrifugal manner eg: Euphorbia and Poinsettia	The arrangement of flowers is not in a definite order. e.g: Ficus.

THE END