



LECTURE 7



Theme:

Generative organs of plants. Flower morphology. Flower formula and diagram. Inflorescences. The importance of flowers's and inflorescences's structure in the plant identification.

GENERATIVE ORGANS

lat. «generare» – capable of producing or originating

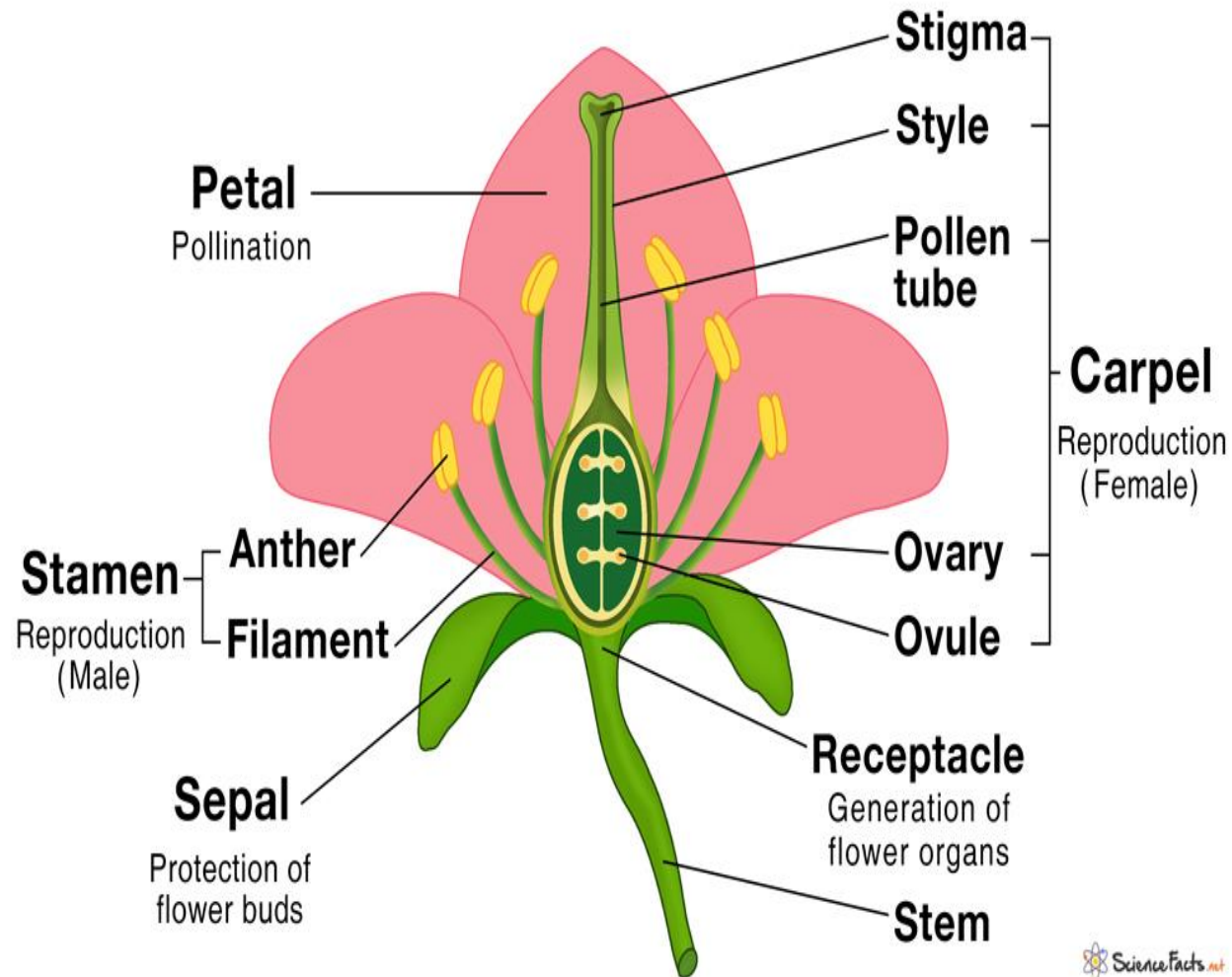
- Flower(Flos)
- Fruit (Fructus)
- Seed (Semen)



This organ is highly specialized shoot = stem + leaves

Flowers are only found in angiosperms, a group of plants commonly known as flowering plants. Flowers are involved in plant reproduction, produce the eggs and sperm of the plant, are the site of sexual reproduction, and attract pollinators that transfer the sperm among the flowers.

Parts of a Flower



MONOECIOUS AND DIOECIOUS PLANTS

Monoecious plants - plants in which same-sex flowers male (staminate) and female (pistillate) are on the same plant. . For example, cucumber and corn are monoecious plants.

Poplar, hemp, willow are **dioecious plants**.

They have staminate flowers on some plants, and pistillate flowers on others.

The types of the symmetry of the flower

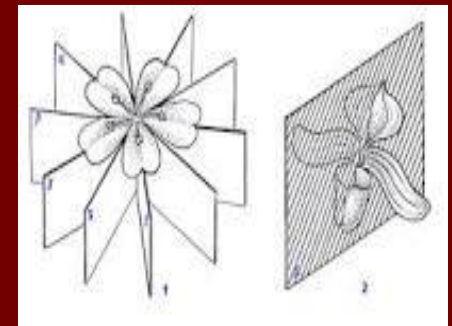
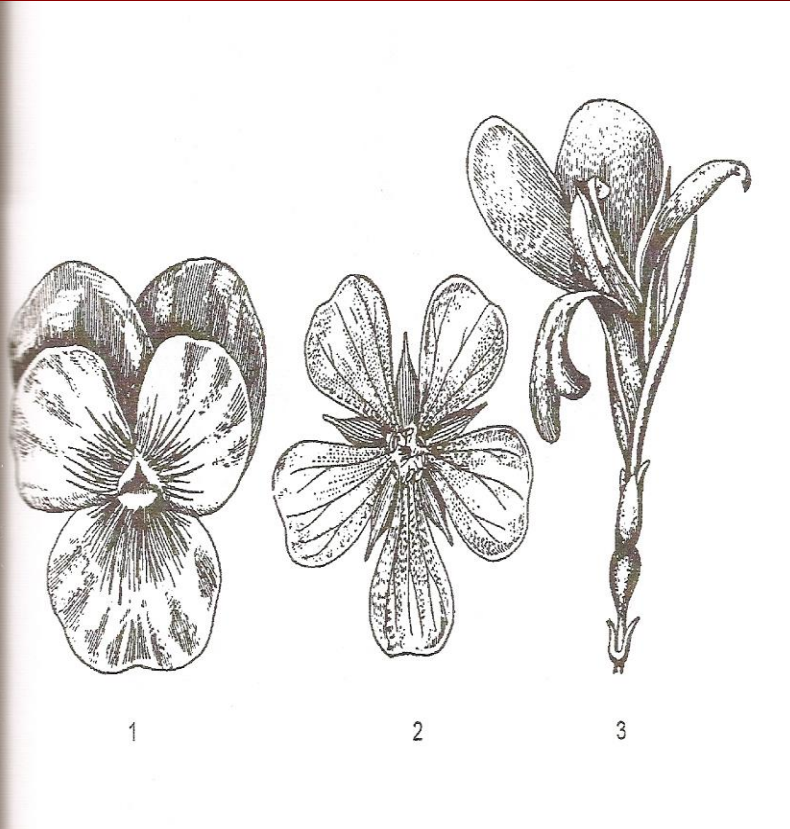
- Floral symmetry defines how flowers are divided into mirror-image parts.

It can be determined by the position and shape of the perianth. On the basis of symmetry, there are three conditions of flowers :

Actinomorphic- A flower with radial symmetry e.g., *Hibiscus*.

Zygomorphic- A flower with bilateral symmetry e.g., *Pisum*.

Asymmetric- a flower cannot be divided into two equal halves along any plane e.g., canna.



1- zygomorphic; 2-actinomorphic ; 3-asymmetric .

Non-reproductive part of the flower. Perianth.

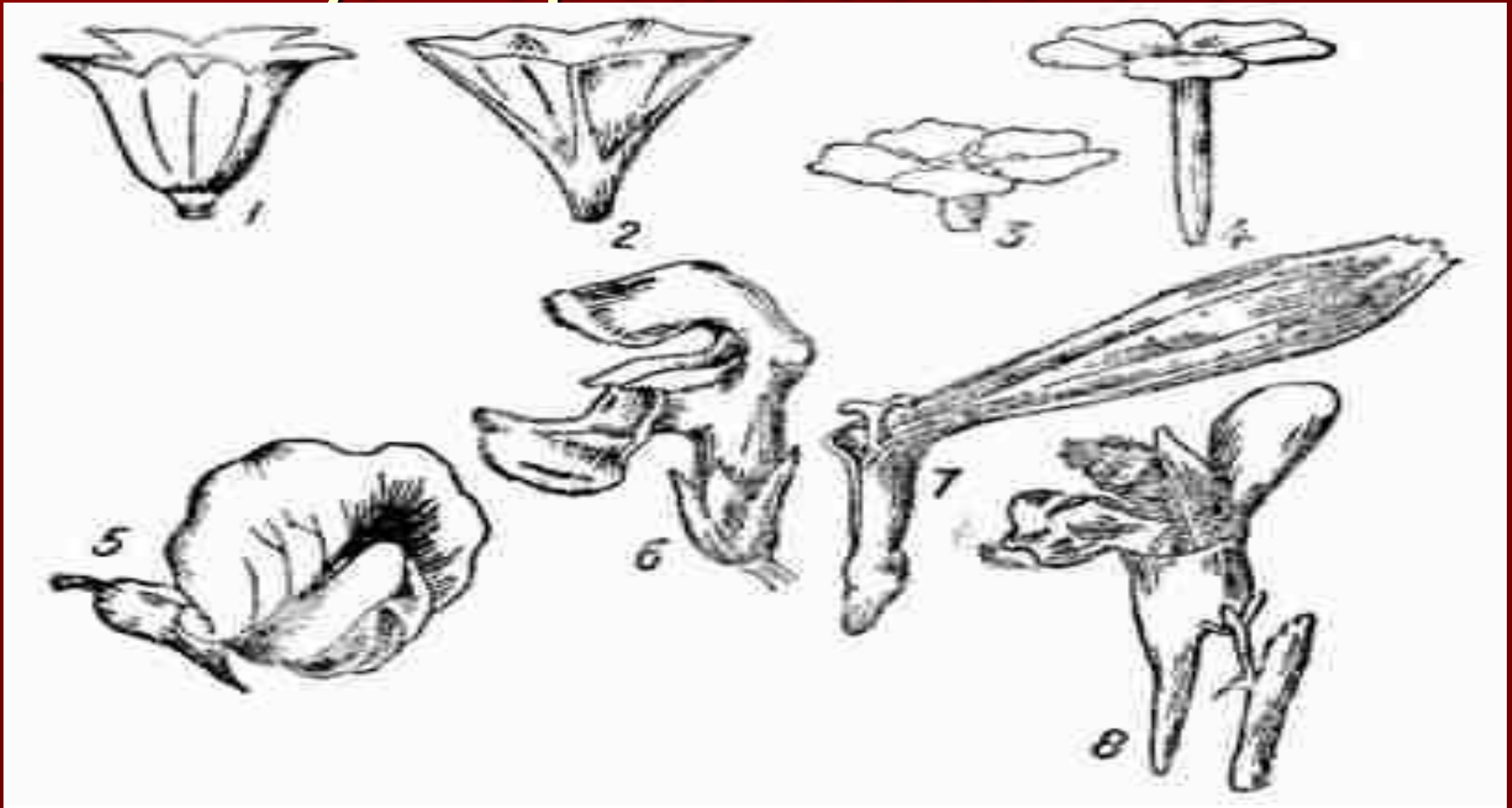
- The calyx and corolla comprise the non-reproductive portion of the flower and are together referred to as the **perianth**
- If the perianth consists of a circle of a calyx and a circle of corolla, it is called double or complex. The perianth, consisting of one circle, is called simple.



simple

double

Some forms of the gamopetalous corolla



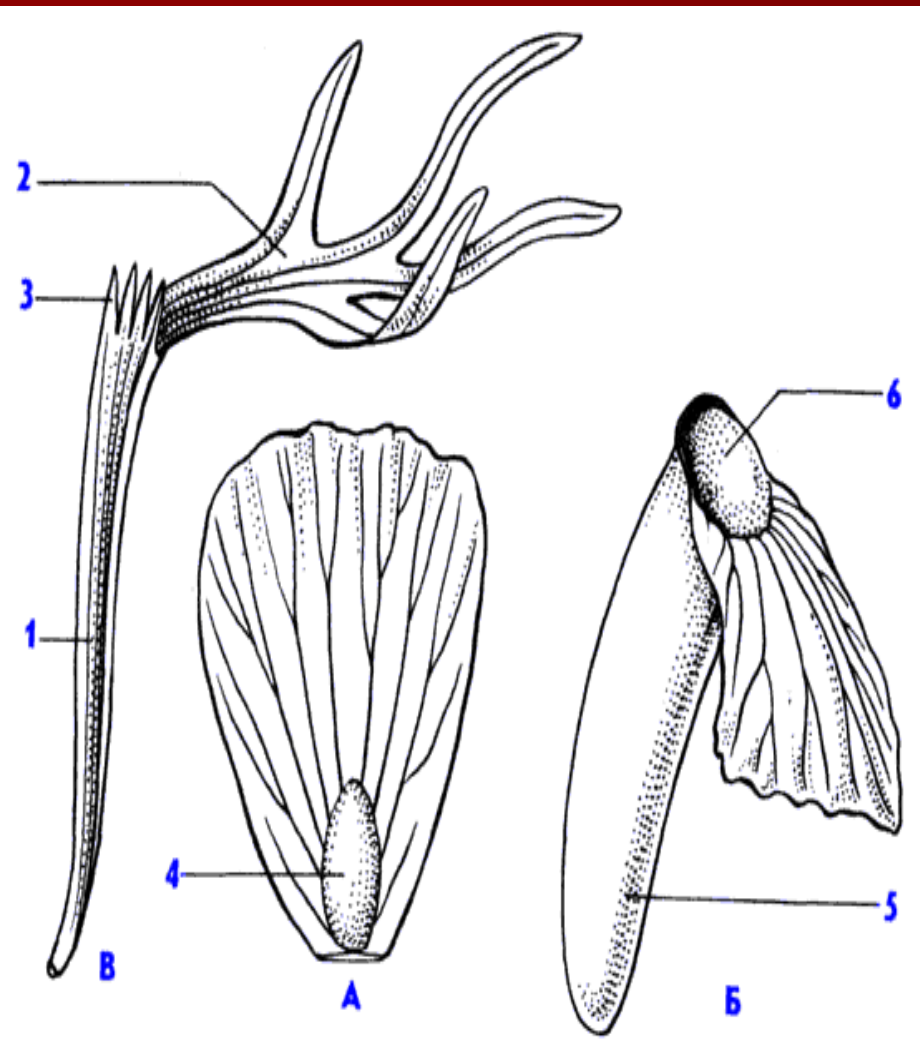
. 1 — campanulate; 2 — funnel-shaped; 3 — rotate; 4 — tack-shaped; 5 — papilionaceous 6 — bilabiate; 7 — ligulate; 8 — with spur.

Naked flowers. It has not a perianth and contain only stamens and a pestle.



Willow- Salix

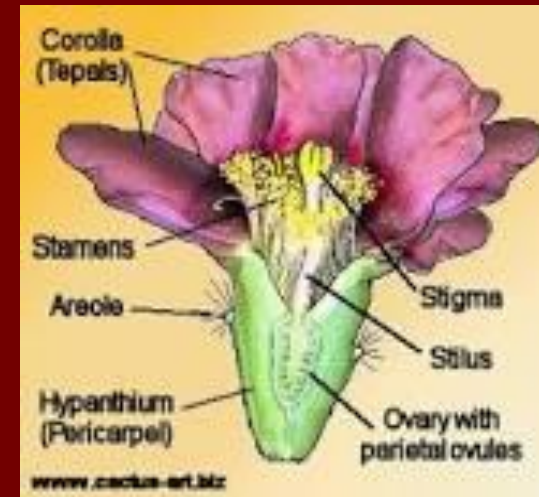
MODIFICATION OF PETALS



- Examples of petal modification (A - sessile petal of *Ranunculus ácris*, B - sessile petal of *Dactylorhiza incarnata*, B - unguiculate petal of *Coronaria floscuculi*).
- 1 - unguis, 2 - limb, 3 - appendage (lobe of the crown), 4 - squama covering the nectary, 5 - cylindrical spur, 6 - entrance to the spur.

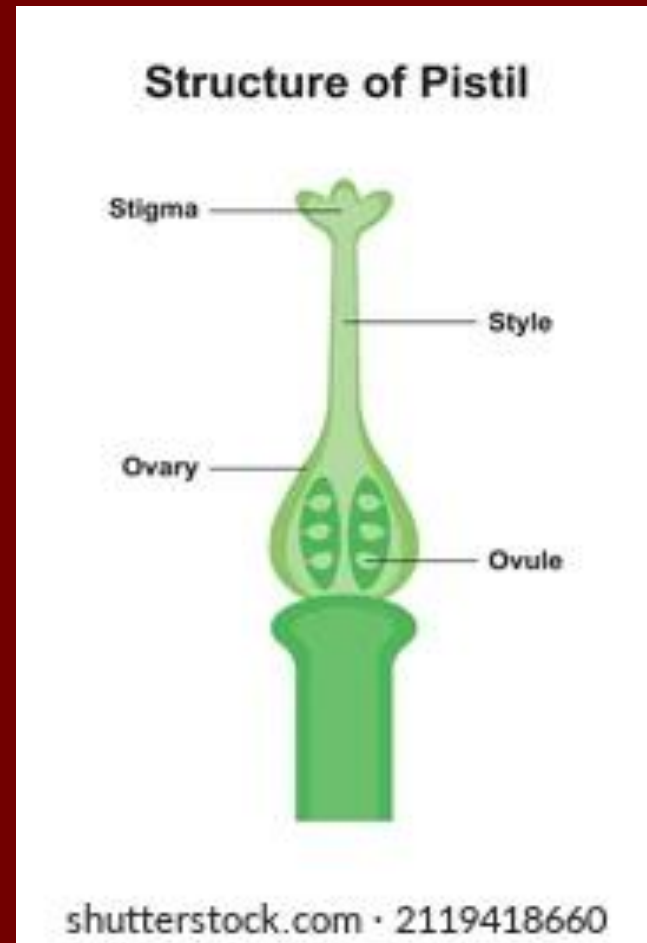
HYPANTHIUM

- In angiosperms, a hypanthium or floral cup is a structure where basal portions of the calyx, the corolla, and the stamens form a cup-shaped tube. It is sometimes called a floral tube, a term that is also used for corolla tube and calyx tube. It often contains the nectaries of the plant.



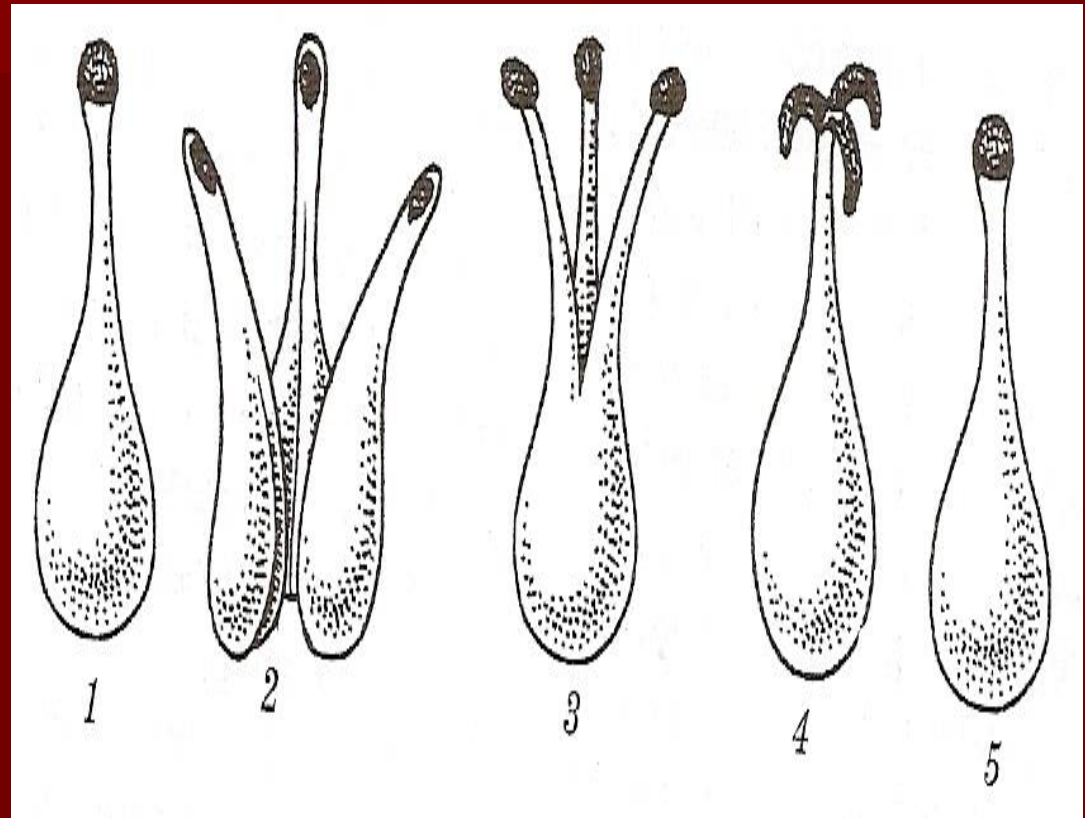
GYNOECIUM

- Gynoecium is most commonly used as a collective term for the parts of a flower that produce ovules and ultimately develop into the fruit and seeds.
- The gynoecium is the female part of the flower, consisting of one or more pistils (carpels).



Carpels

Carpels are the basic units of the gynoecium and may be free (distinct) or fused (connate). The term pistil is used in a similar manner to carpel – in some situations the terms are equivalent in meaning but not in others. For example, a flower represented by G 1 has a single carpel or a single pistil. A flower represented by G (3) represents three fused carpels but is only a single pistil (compound).



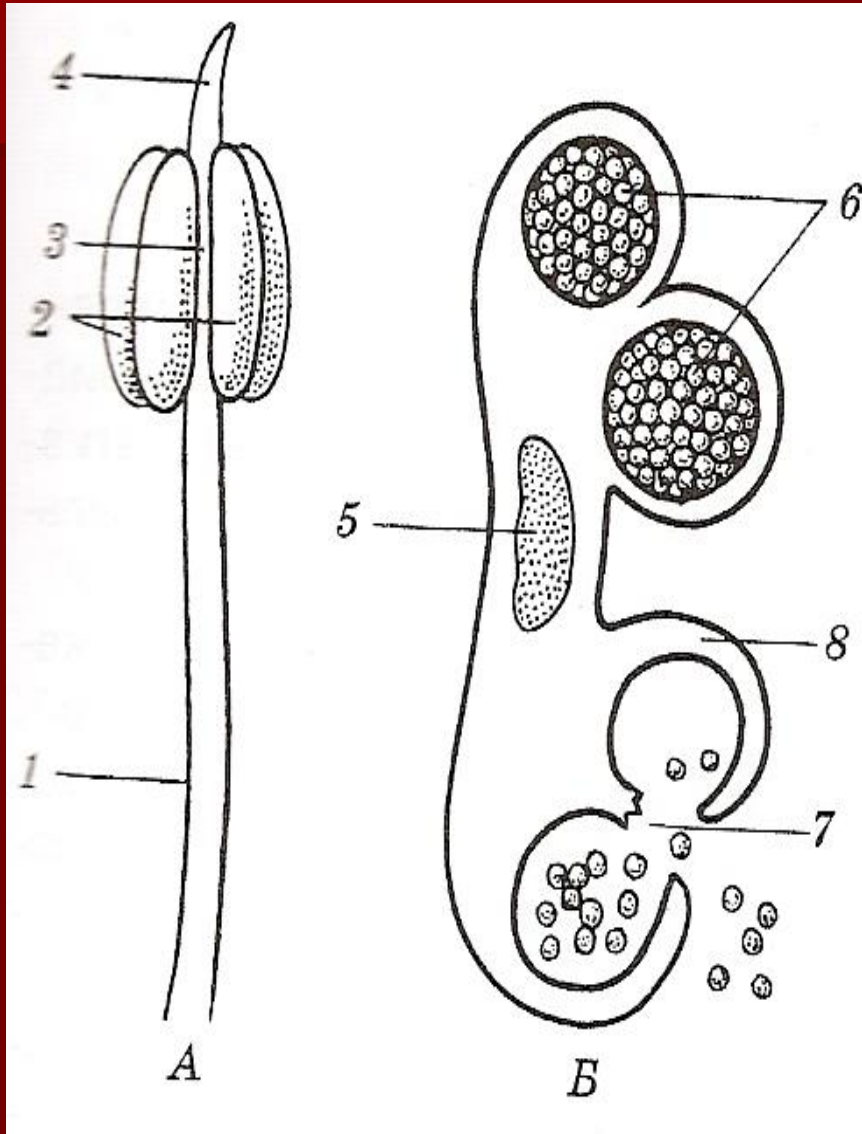
1 monocarpous –,
2 – apocarpous,
3, 4 – cenocarpous,
5 – pseudomonocarpous.

STAMEN

- The **stamen** (plural **stamina** or **stamens**) is the pollen-producing reproductive organ of a flower. Collectively the **stamens** form the **androecium**.

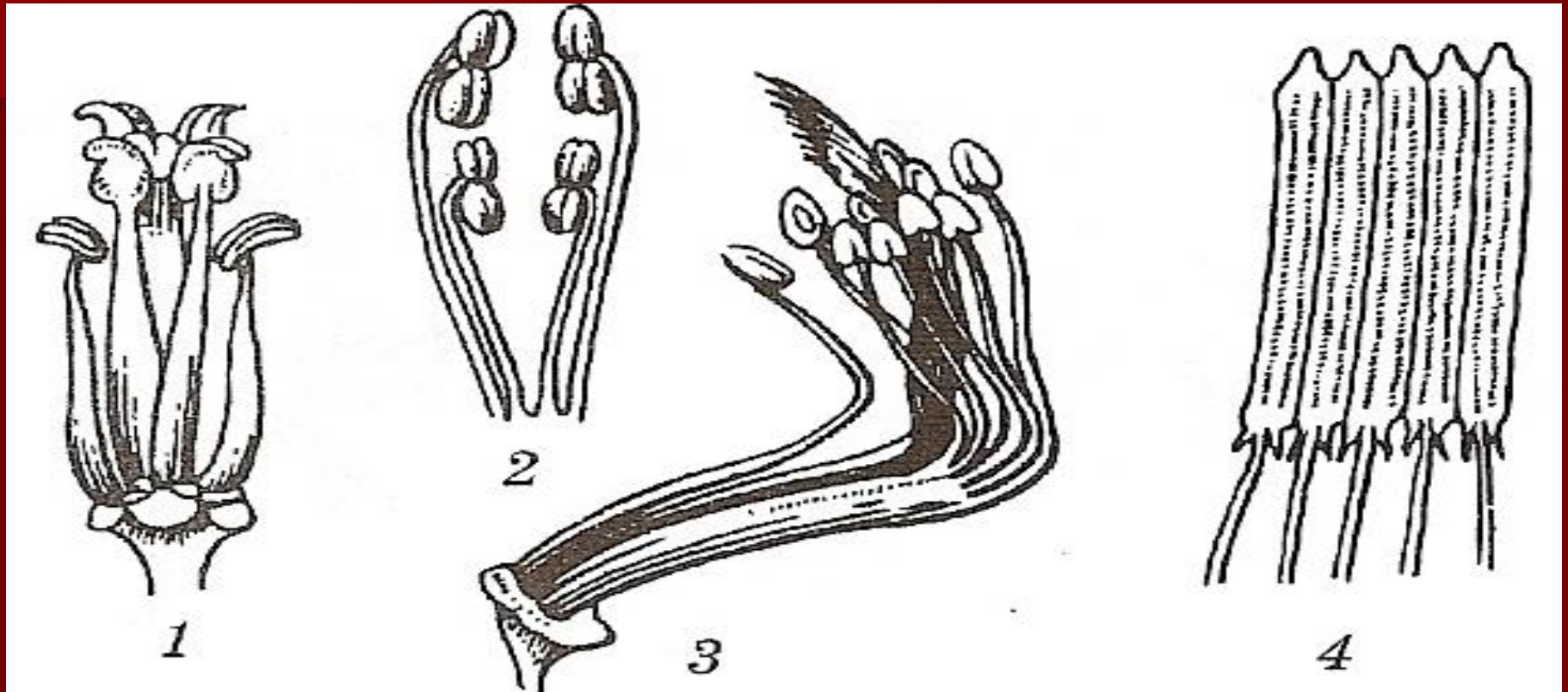


Schematic structure of stamens



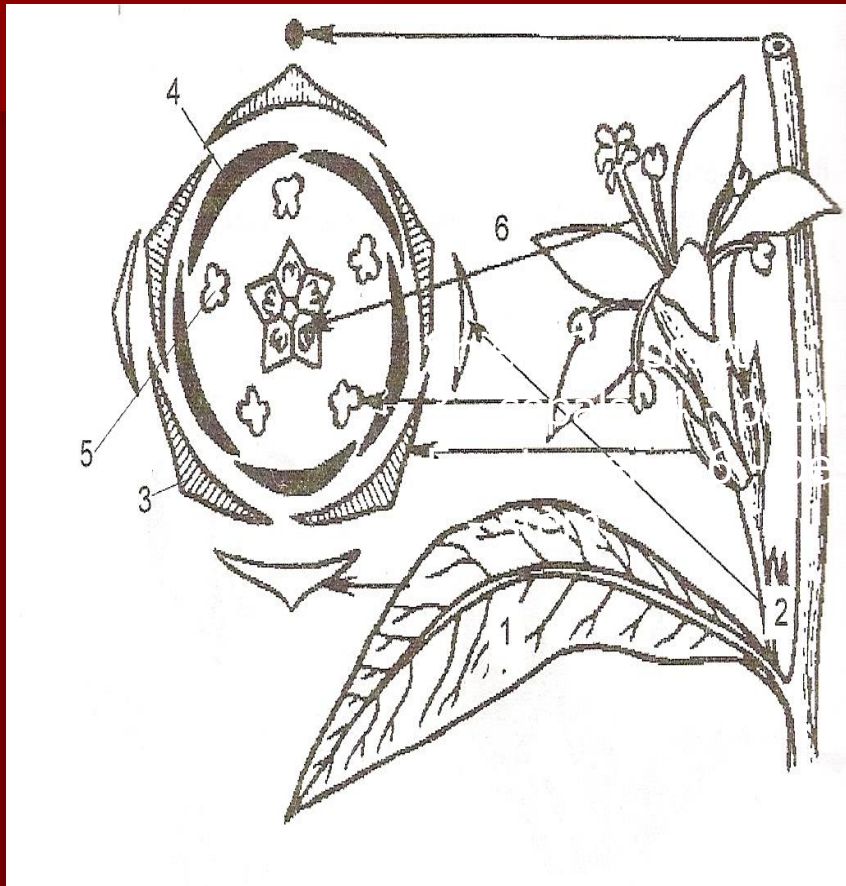
- 1-filament,
- 2 - anther
- 3 - connective,
- 4 - superconnection,
- 5 – conductive bundle,
- 6- pollen sacs
- 7-pollen grains,
- 8 - anther wall.

The types of androecium



- 1 – tetradynamous (Brassicaceae),
- 2 – didynamous (Lamiaceae),
- 3 – diadelphous (Fabaceae),
- 4 – stamens are stick together by anthers (Asteraceae).

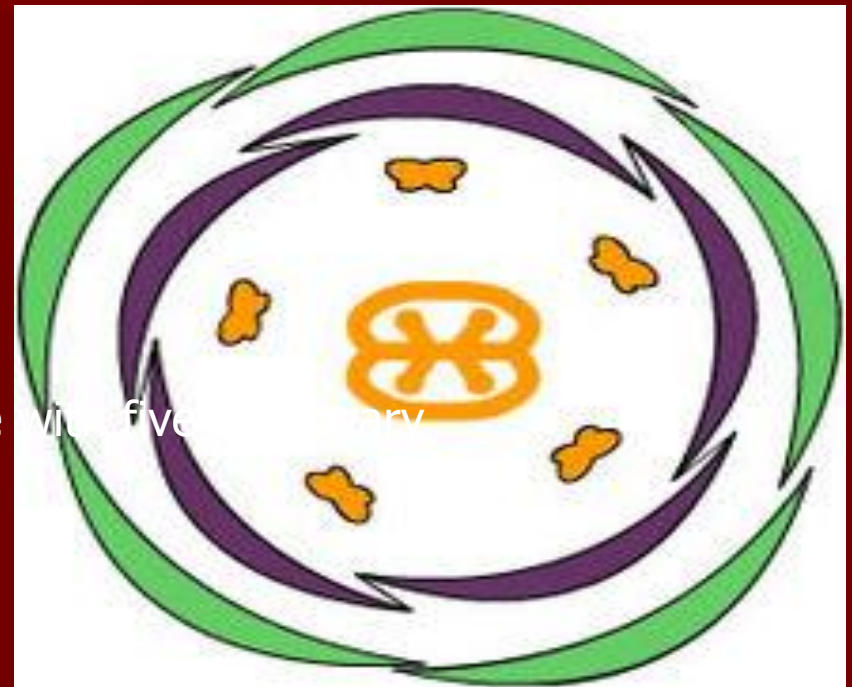
Formula and diagramma of flower



1 Cover leaf, 2 - bracts

3 - sepals; 4 - petals;

5 - stamens; 6 - pestle with five-star ovary 7 - stem



*K5 C(5) A5 G(2)

Convolvulus (corretjola)

Floral Formula

- Floral formulae are symbolic as well as numeric representations of different parts of a flower. It renders information on the type and number of organs, symmetry type, level of ovary, presence of fusions, and interrelationships of different floral parts which are corolla, calyx, androecium, and gynoecium.

tepals sepals petals stamens
 P K C A G

Symbols used in floral formula

Br.	Bracteate	C	Corolla-free (polypetalous)
Brl.	Bracteolate	(C)	Corolla-united (gamopetalous)
Ebr.	Ebracteate	Cx	Corolla-cruciform
Bbrl.	Ebracteolate	P	Perianth
♂	Male	A	Androecium-free
♀	Female	(A)	Androecium-united
♂ ♀	Bisexual	$\overset{\curvearrowright}{P \quad A}$	Epiphyllous
⊕	Actinomorphic	$\overset{\curvearrowright}{C \quad A}$	Epipetalous
† or %	Zygomorphic	G	Gynoecium-free
Ep	Epicalyx	(G)	Gynoecium-united
K	Calyx-free (polysepalous)	\overline{G}	Superior ovary
(K)	Calyx-united (gamosepalous)	$\overline{\overline{G}}$	Inferior ovary
		$\overset{\curvearrowright}{G \quad A}$	Gynostagium

FLORAL FORMULA

FABACEAE % ♀ K₍₅₎ C_{1·2·(2)} A_{(9)·1} G₁

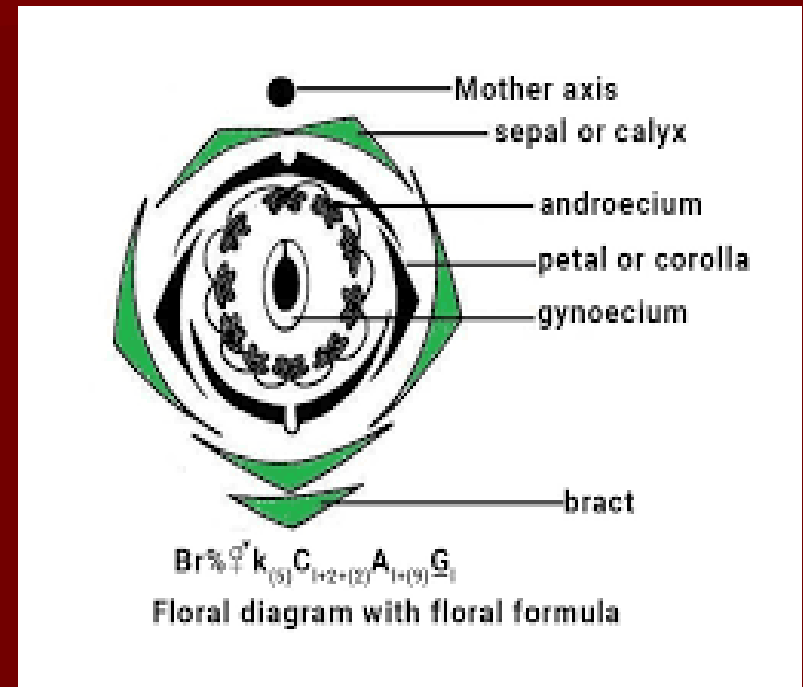
SOLANACEAE ⊕ ♀ K₍₅₎ $\overset{\curvearrowright}{C_{(5)} A_5}$ G₍₂₎

LILIACEAE ⊕ ♀ $\overset{\curvearrowright}{P_{3·3} A_{3·3}}$ G₍₃₎

RASSICACEAE ⊕ ♀ K_{2·2} C₄ A_{2·4} G₍₂₎

Floral diagram

- Floral diagrams are a graphical means to describe the flower. These pictures show a cross-section (or cross-sections) of a young flower or a bud, they can be also defined as a view of the flower perpendicular to its axis. They were introduced in the 19th century and are generally credited to August Wilhelm Eichler, a german botanist.



Inflorescences

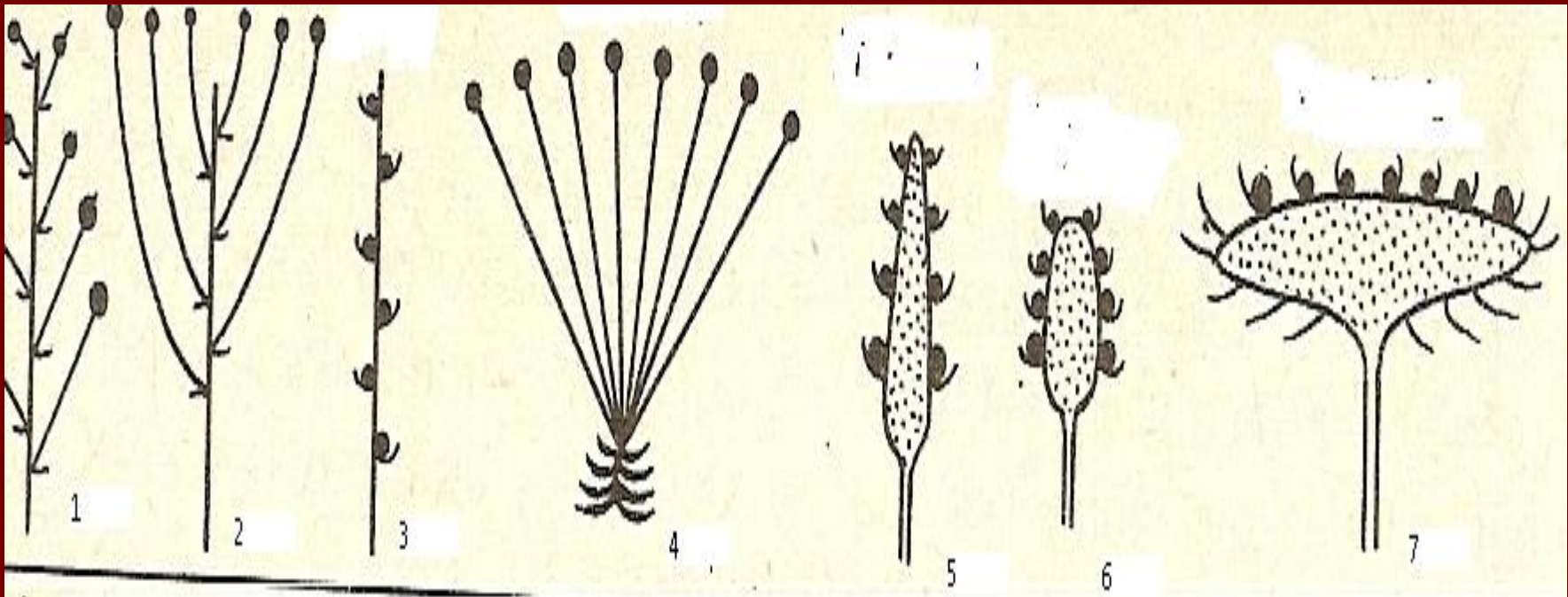
- An inflorescence is a group or cluster of flowers arranged on a stem that is composed of a main branch or a complicated arrangement of branches. Morphologically, it is the modified part of the shoot of seed plants where flowers are formed on the axis of a plant.



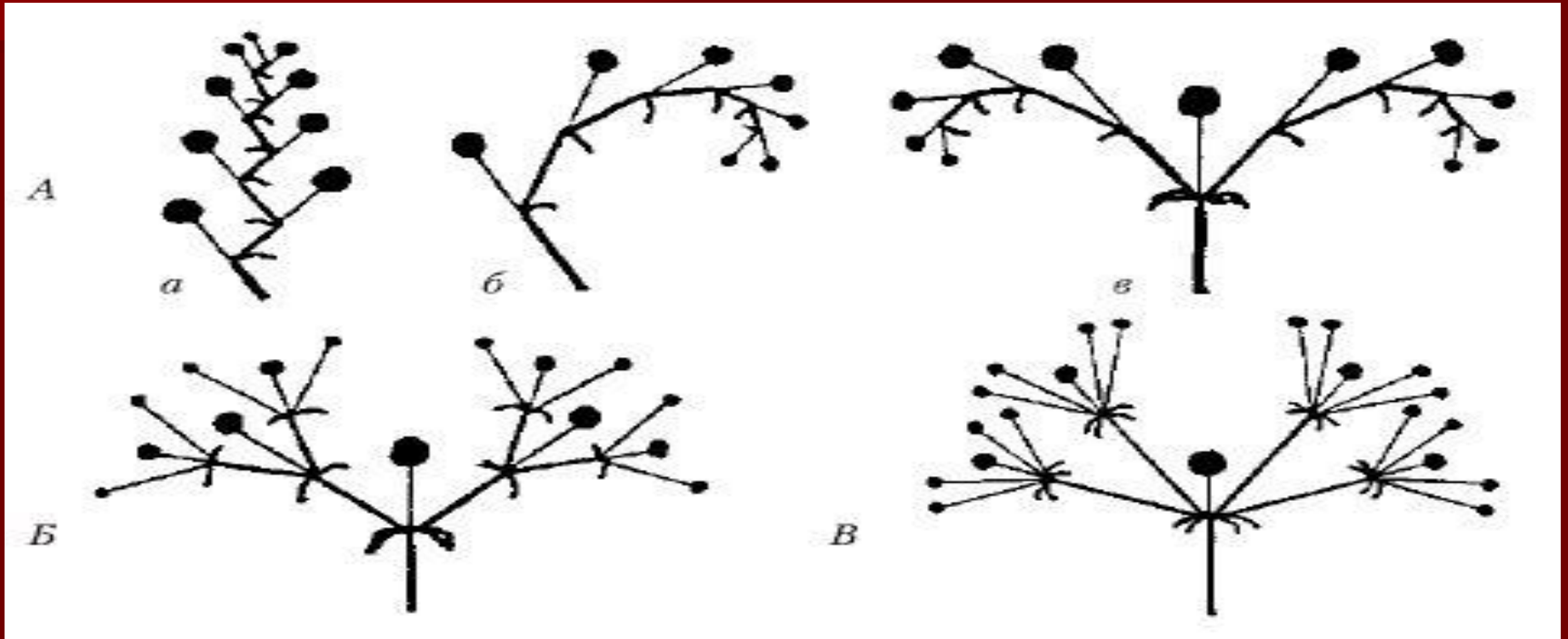
Inflorescences

Simple inflorescences (monopodial branching):

1- racemose, 2-cymose, 3-spike, 4-umbel, 5- spadix, 6-head, 7-capitulum.

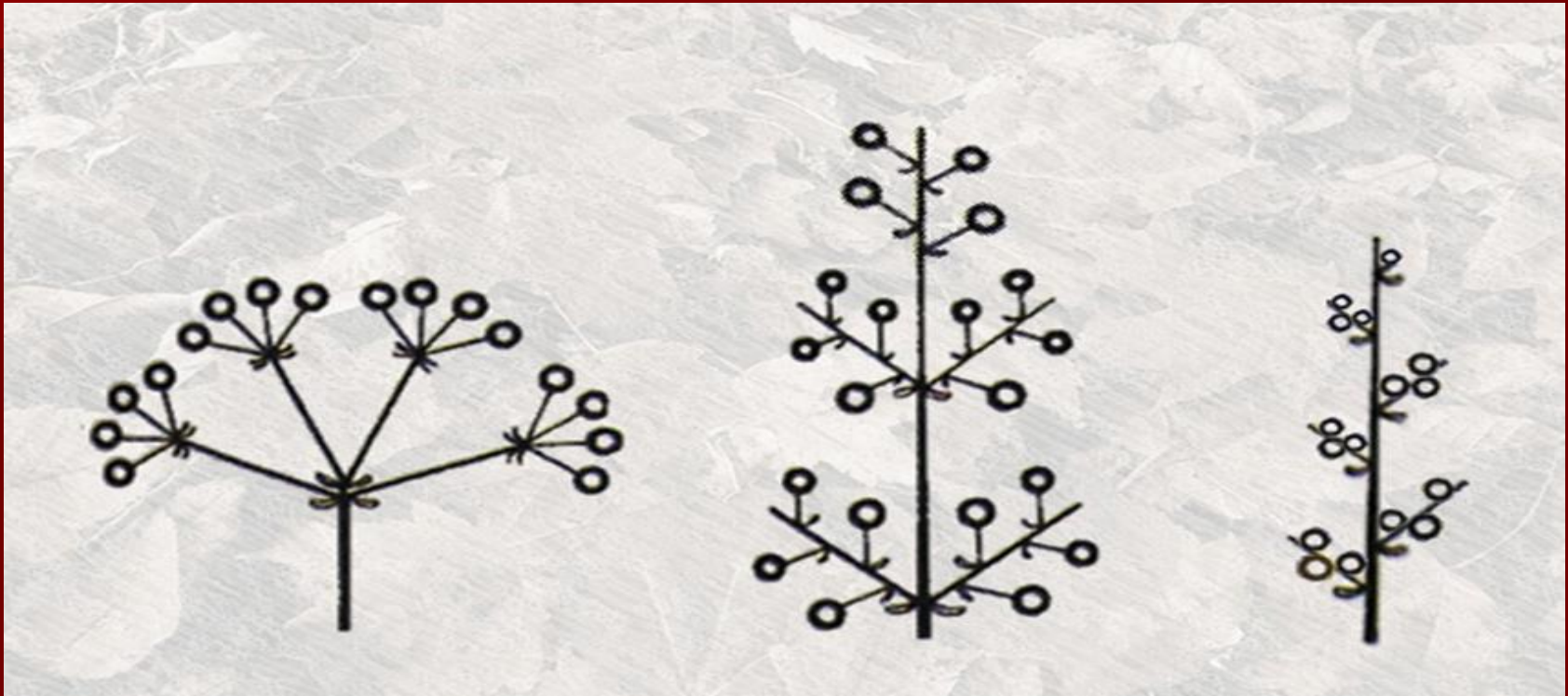


Cymose inflorescences (sympodial branching)



A. monochasiums a – b; B ; c; B. dichasium. B. pleiochasium

Compound inflorescences



1

2

3

1-Compound umbel , 2- panicle 3-
compound spike

Thank you for attention !

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