BIOLOGY

PLANT MORPHOLOGY

(Flower, Fruits, Seeds)

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Plant Morphology

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1. **Flower** is defined as highly condensed and modified reproductive shoot.
2. The part from where flower arise is called **bract.**
3. Flower has short or long flower stalk which is called **pedicel.**
4. The upper part of pedicel is swollen, spherical shaped or conical which is called **thalamus / Receptacle.**
5. **Calyx** is the sepals of a flower, typically forming a whorl that

encloses the petals and forms a protective layer around a flower in bud.

6. The **corolla** of a flower is the structure and pattern made up by its petals. This is usually a **circular ring** around the center of the flower with one or more layers of petals.

7. The **stamens** of a flower collectively known as **Androceium**. It is the **male par**t of the flower.

8. **Gynoceium** the **female part** of a flower, consisting of one or more **carpels.**

9. When the thalamus is convex or elongated, the carpel occupies the top most position on it. The other floral members (sepals, petals, and stamens) are placed below them. This mode of arrangement is called **hypogyny**.

10. When the thalamus is cup shaped, the lower part of the ovary situated at thebottom of the cup and also fused with the inner wall of thalamus. The other floral members appear to be inserted upon the ovary is called **Epigyny.**

11. The receptacle is flat or slightly cup-shaped. The carpels are situated at its centre and other floral members are inserted on its margin is called **Perigyny**

12. The **perianth** (**perigonium**, **perigon** or **perigone**) is the non-reproductive part of the flower, and structure that forms an envelope surrounding the sexual organs, consisting of the calyx (sepals) and the **corolla (petals).**

13. Complete Flower – When calyx, corolla, androecium and gynoecium are present.

14. **Incomplete Flower** –Flower with one of the four whorls missing.

15. **Bisexual Flower** – Both gynoecium and androecium present in the same flower.

16. **Unisexual Flower** – Androecium (staminode flower) or gynoecium (Pistillate flower) any one of them are present in the flower.

17. **Monoecious Plant** –When both male and female flowers are present on the same plant. eg. Cocos, Ricinus, Colocasia, Zea, Acalypha.

18. **Dioecious Plant** – When male and female flowers are present on separate plant eg. Mulberry, Papaya.

19. **Polygamous Plant** – When unisexual (male or female), bisexual and neuter flowers are present on the same plant eg. Mango, Polygonum.

20. **Monocarpic Plant** –The plant which produces flowers and fruits only once in life eg. Pea, Mustard, Bamboo, Agave.

21**. Polycarpic Plant** – The plants which produces flowers and fruits many times in life, eg. Pear, Mango.

22. **Achlamydeous Flower** – Flowers are naked without sepals and petals eg. piperaceae.

23**. Monochlamydeous Flower**: Only one accessory whorl is present (Perianth) eg. Polygonaceae, Liliaceae.

24. **Dichlamydeous Flower**: Both accessory whorls present in flower.

25. **Hemicyclic or Spirocyclic Flower**: Some of the floral parts are incircles and some are spirally arranged. eg. Ranunculaceae.

26. **Cauliflory:** Production of flowers on old stem from dormant buds eg. Artrocarpus, Ficus.

27. If the floral leaves are cyclic arranged in a flower, then it is called **cyclic flower.**

28. If floral leaves are spirally arranged then it is called **spiral flower.**

29. When flower is divided by any vertical plane into two equal halves, then it is called **actinomorphic flower** eg.

Mustard, China rose, Datura, Chilli.

30. When the flower is divided into two equal halves only by one vertical plane, then it is called **zygomorphic flower** eg. Pea, Bean, Gulmohur, Cassia.

31. When the flower cannot be divided into two equal halves from any plane, then it is called **asymmetrical flower.** eg. Canna.

32. Internode between calyx and corolla is called **anthophore**. egSilane

33. Internode between corolla and androecium is called **androphore.** eg. Passiflora

34. Internode between androecium and gynoecium is called **gynophore.** eg. Capparis.

35. When both androphore and gynophore both conditions are found in same flower then this condition is called **gynandrophore** or **androgynophore.** eg. Cleome gynandra.

36. **Carpophore** -Elongation of thalamus beyond carpels. eg. Coriandrum

37. **Bracts** are specialized leaves present in axis of flower.

38. The flower which have bract is called **bracteate flower.**

39. Thewhorl of bract surrounding peduncle is called **involucre.**

40. Group of bracteole is called **involucel.**

41. In flowers when large bract completely encloses whole inflorescence, then it is called **spathe**. eg. Banana, Maize.

42. When the size of bract of flower is greater than size of flower and these are of various coloured then it is called **petaloid bract.** eg. Bougainvillea.

43. Small, dry, scaly bracts are called **Glumes.** eg. Wheat, Grass

44. when all the sepals are **free** from each other, then it is called **poly-sepalous** condition eg. Mustard, Radish.

45. When the sepals are **fused** each other, then it is called **gamosepalous condition** eg. Cotton, Datura, Brinjal.

46. **Caducous**– Sepals fall just at the time of opening of flower bud. eg. Poppy.

47**. Deciduous** – Sepals fall after pollination eg. Mustard

48. **Persistant –** If sepals do not fall and remain attached to fruit. eg. Tomato, Capsicum, Brinjal, Cotton, Datura.

49. **Cruciform** – **4 petals** are present in it. The lower narrow part of petal is called claw while

the outer broad part is called limb. These petals are arranged crosswise. eg. Radish, Mustard.

50. **Caryophyllaceous** – It consists of **5 petals** the claw of petals are short and the limb of petals from right angle to the claw eg. Dianthus.

51. **Rosaceous** – It consist of **5 or more petals**. Claws are absent in it and limbs are spread regularly outwards. eg. Rose, Coconut.

52. **Campanulate** – Five petals are arranged like **bell.** eg. Tobacco, Raspberry, Campanula.

53. **Funnel shaped or infundibuliform** – **Funnel** like petals arrangement eg. Datura, Railway creeper.

54. **Tubular** – Petals are like **tube** eg. Disc florets of sunflower.

55. The mode of **arrangement of sepals or petals** in floral bud with respect to the other members of the same whorl is known as **aestivation.**

56. **Clawed**: The petal is narrow and slender at the base as a claw eg. Petals of Cruciferae.

57. **Fimbriate**: Petals fringed with hairy, teeth like structure eg. Dianthus

58. **Laciniate**: Petal divided into several long more or less equal segments.

59. **Spurred**: Corolla with a long hollow projection called spur eg. Delphinium majus

60. **Saccate:** The lower part of the corolla tube gets dilated to form a sac- like structure eg. Antirrhinum.

61. **Valvate Aestivation**: Sepals or petals in a whorl just meet by their edges **without overlapping.** eg. Sepals of Hibiscus.

62. **Twisted Aestivation**: one margin of each sepal or petal overlaps the next one, and the other margin is **overlapped** by a preceding one. Here the over lapping is regular in one direction-clockwise or anticlockwise. eg. Petals of Hibiscus

63. **Imbricate Aestivation:** one sepal or petal is internal or being overlapped on both the margins and one sepal or petal is external with both of its margins overlapping. Of the remaining sepals or petals, one margin is overlapping and the other margin overlapped.

64. **QuincuncialAestivation: :** It is a modification of imbricate aestivation in which two petals are internal, two are external and the fifth one has one margin external and the other margin internal. eg. Guava

65. In some plants, a **stamen may not develop** any fertile anther. Such sterile stamens are called **staminodes** eg. Cassia.

66. **Adnate**– Filament runs through the whole length of the anther from the base to the apex. eg. Michelia (Champa), Magnolia.

67. **Basifixed** –Filament is attached to **anther** by its **base.** eg. Datura, Radish, Mustard.

68. **Dorsifixed** –The filament is attached at the **centre** to the back of the anther. eg. Passion flower

69. **Versatile** –Filament attached to the **back** of the anther at a point only, thus the anther can swing freely. eg. Wheat, grass, maize.

70. When the stamens of an androecium are free from one another, it is called **polyandrous condition.**

71. when stamens are united by their filament only, it is called **adelphous.**

72. **Monoadelphous**– When all the filaments are united into a **single bundle** but anthers are free from each other. eg. Cotton, Hollyhock, Ladyfinger.

73. **Diadelphous** – When the filaments are united in **two bundles** but the anther remains free eg. Gram, Pea, Bean

74. **Polyadelphous** – When filaments are united into **more then two bundles.** eg. Citrus, Castor.

75**. Synandrous** –When anthers as well as filaments of stamens are united through their whole length. eg. Colocasia, Alocasia, Momordica, Cucurbitaceae family

76**. Syngenesiou**s – In it only anthers are united in bundle but filaments remain free eg. Compositae family

77. When four stamens are present, out of them **two are long and two are short**, then it is called **didynamous.** eg. Labiatae family.

78. When there are six stamens and they are arranged in two whorls. In outer whorl, there are two short stamens while in inner whorl, there are four long stamens, this condition is called **tetradynamous.** eg. Cruciferae family.

79. **Inserted –** When the stamens are smaller than corolla. eg. Datura

80. **Exserted** – Stamens are longer than corolla and are radially outward. eg. Gulmohar.

81. **Diplostemonous –** The stamens are double the number of petals and present in two whorls. The outer whorl of stamens is

alternating with petals (alternipetalous), while inner whorl is opposite to petals (antipetalous). eg. Liliaceae family.

82. **Obdiplostemonous** – It is reverse of diplostemonous. The outer whorl of stamen is opposite to petals, while inner whorl of stamen is alternating with petals. eg. Caryophyllaceae.

83. **Isostemonous or Haplostemonous** – In such type of condition stamens are present in single whorls. No. of stamens is equal to no. of sepals and petals and generally whorl of stamens is alternating with petals.

84. **Heterostemonous** –Stamens are of different length in some flowers.

85. The ovules are attached on ovary walls on one or more cushion called **placenta.**

86. The arrangement of ovule within ovary wall is known as **placentation**

87. Superficial placentation is found in multicarpellary syncarpous gynoecium. The ovules are attached on the walls of locule eg. Nymphea (Water lily).

88. **Basal placentation:** The ovary is unilocular and a single ovule is borne at the base of ovary.

eg. Marigold, Sunflower (Asteraceae family).

89. **Marginal placentation** is found in **unilocular ovary**. The placenta forms a ridge along the ventral suture of the ovary and the ovules are borne on this ridge forming two rows. eg. Leguminosae

90. **Parietal placentation** is found in **unilocular syncarpus ovary.** In it the ovule develops on the innerwall of the ovary or on peripheral part. Ovary become bi or multilocular due to formation a false septum eg. Cucurbita, Argemone, and Cruciferae family (Mustard)

91. **Axile placentation** is found in **multicarpellary syncarpous gynoecium**. The fusion margin of carpels grown inward and meet in the centre of the ovary. eg. Potato, China rose, Onion, Lemon,

92. **Free central placentation** is found in **syncarpous gynoecium**. In it, the ovary is unilocular and the ovules are borne on the axis in the centre of the ovary. septum are absent in ovary. eg. **Primrose, Dianthus (Caryophyllaceae)**

93. Fertilized and ripened ovary is **fruit**

94. If a fruit is formed without fertilization of the ovary it is known as **parthenocarpic fruit**

95. Pericarp: After ripening, the ovary wall change into pericarp. This pericarp may by thick and fleshy or thick and hard or thin and soft.

96. When the fruit is developed only from the **ovary,** the fruit is called as **true fruit**. eg. Mango, Coconut, Zizyphus

97. In some fruits, in place of ovary, some other parts of flower like

thalamus, inflorescence, calyx are modified to form a part of fruit. These types of fruit are called **false fruits**. eg. Apple, Strawberry, Pear.

98. When single fruit develops from a **single ovar**y of a single flower, it is called **simple fruit.**

99. Fleshy fruits are broadly divided into two kinds, **baccate** and **drupaceous.**

100**. Baccate fruits** are fleshy fruits with no hard part except the seeds**.**

101**.** When **pericarp** is thick and fleshy, it is differentiated into the **outer**

epicarp, the middle mesocarp and the inner endocarp

102. **Drupe fruit** develops from mono or multicarpellary, syncarpous, superior ovary. In these fruits endocarp is hard and stony so these

fruits are also called stony fruits. eg. Mango, coconut almond, Peach walnut, plum.

103. **Brachysclereids** are present in endocarp.

104. In mango edible fleshy part is **mesocarp** and the part where seed is protected is called as **endocarp.**

105. In **ber**, epicarp and mesocarp both are edible part.

106. The **rind of Almond and walnut** are endocarp and their edible part is seed.

107. In **coconut epicarp** is hard and thin while mesocarp is thick and consist of hard fibers The endocarp is hard and seed is protected in it.

108. **Endosperm** is edible in coconut.

109. **Berry fruits** develop from mono or multicarpellary syncarpous ovary.

110. Plants with superior ovary = Tomato, Grapes, Brinjal.

111. Plants with inferior ovary = Guava, Banana

112. **Pepo fruit** develops from tricarpellary, syncarpous and inferior ovary eg. fruits of cucurbitaceae family.

113. **Pome fruit** develops from bi or multicarpellary syncarpous inferior ovary. eg. Apple, Pear.

114. **Hesperidium** develops from multicarpellary, syncarpous, superior ovary. This fruit is specialy found in plants of Rutaceae family. eg. Orange, Lemon, Citrus fruit

115. An **aggregate fruit** develops from a single flower, with multicarpellary, apocarpous, superior ovaries and each of them develops into simple fruitlets. An aggregate fruit, therefore consists of a collection of simple fruits as in **Polyalthia.**

116. **Multiple or composite fruit** is formed by all the flowers of a whole inflorescence grouped together to give a single big fruit. In a sense, multiple fruits are false fruits.

117. **Sorosis:** A multiple fruit that develops form a spicate inflorescence. eg. Ananas sativus (Pineapple).

118. **Monocotyledon seed** having embryo with **one cotyledon only,** eg. maize, rice, wheat and onion.

119. **Dicotyledon seed** having embryo with **two cotyledons,** eg. pea, gram, beanand castor.

120**. Non-endospermic or ex-alubuminous seeds:** In gram, pea and bean the cotyledons are thick and fleshy. They store food material for these of embryo during its germination.

121. **Endospermic or albuminous seeds**: In seeds like castor, maize and other cereals, the cotyledons are thin and membranous. In such seeds food is stored in the endosperm. Cotyledons act as absorbing organs. They absorb food from the endosperm and supply it to the growing embryo. Some edible fruits and parts.

Fruit	**Type of Fruit**	**Edible part**
Abelmoschus esculentus / Lady's Finger	Capsule	Whole fruit (vegetable)
Achrus sapota / Cheeku	Berry	Mesocarp and endocarp
Aegle marmelos / Wood Apple	Amphisarca	Pulpy endocarp (inner pericarp) and placentae.
Anacardium occidentale / Cashewnut	Nut	Cotyledons and Peduncle
Ananas comosus / Pineapple	Sorosis	Outer fleshy axis, bracts fused perianth & Pericarp

Annona squamosa / Custard Apple	Etaerio of Berries	Mesocarp (Pericarp)
Arachis hypogea / Ground nut / Peanut	Lomentum	Seeds / Cotyledons
Areca catechu / Betel or Areca Nut	Berry	Seed / Endosperm
Artocarpus integrifolia / Jack Fruit	Sorosis	Bracts, perianth and seeds
Carica papaya / Papaya	Berry	Mesocarp and Endocarp
Cereals, Avena sterilis (Oat), Oryza Caryopsis sativa (Rice), Hordeum vulgare (Barley), Triticum duram (Durum Wheat), Triticum aestivum (Bread Wheat), Zea mays (Maize)	Caryopsis	Whole fruit
Citrus reticulate / Orange, Citrus sinensis / Sweet	Hesperidium	Glandular hair

Orange, Citrus aurantifolia / Lime		
Cocos nucifera / Coconut	Drupe	Endosperm
Cucumis melo / Musk Melon	Pepo	Mesocarp, Endocarp & seeds
Cucumis vulgaris / Water melon	Pepo	Mesocarp, Endocarp & seeds
Cucumis sativus / Cucumber	Pepo	Mesocarp, Endocarp and Young seed
Ficus carica / Fig / Anjeer	Syconus	Fleshy receptacle
Fragaria vesca / Strawberry	Etaerio of achenes	Fleshy thalamus
Grewia asiatica / Dhamin / Phalsa	Drupe	Mesocarp
Juglans regia / Walnut	Drupe	Lobed cotyledons
Litchi chinensis / Litchi	Nut	Aril
Lycopersicon esculentum / Tomato	Berry	Pericarp and placenta

Pyrus malus (M. sylvestris) / Apple	Pome	Thalamus
Mangifera indica / Mango	Drupe	Mesocarp
Morus alba, M. nigra / Mulberry	Sorosis	Fleshy perianth, Fleshy axis
Phoenix dactylifera / Date	Berry	Pericarp
Prunus amygdalus / Almond	Drupe	Seed (Cotyledons and embryo)
Musa paradisiaca / Banana	Berry	Less developed Mesocarp and well developed endocarp
Psidium guajava / Guava	Berry	Thalamus, pericarp and placenta
Pulses	Pod / Legume	Seed
Punica granatum, Pomegranate / Anar	Balausta	Testa
Pyrus comunis / Pear	Pome	Fleshy thalamus
Solanum melongena / Brinjal	Berry	Pericarp & Placenta

Tamarindus indica / Tamarind	Lomentum	Pericarp (Mesocarp)
Trapa bispinosa / WaterChestnut / Singhara	Nut	Seed
Vitis vinifera / Grape	Berry	Pericarp and placenta
Zizyphus mauritiana / Jujube / Chinese Dates / Ber	Drupe	Epicarp and mesocarp