# Sexual Reproduction in Flowering Plants
## Additional Notes

## Very Short Answer Questions (1 Mark)

1. **What is meant by asexual reproduction?**
   When reproduction does not involves sex organs or fusion of gametes, it is called asexual reproduction.

2. **What is vegetative reproduction?**
   The regeneration of plants from a portion of the vegetative part is called vegetative reproduction.

3. **Name any two plants that are propagated by underground modified stems.**
   Ginger, potato, onion, colocasia.

4. **Give examples of any two plants propagated by sub-aerial modification of stem.**
   Pistin, Chrysanthemum, Eichhornia.

5. **Name any two plants that are propagated naturally through roots.**
   Asparagus, Dahlia, Sweet potato and Tapioca

6. **Name any two plants that are propagated naturally through leaves.**
   Bryophyllum and Kalanchoe.

7. **Name any two plants that are propagated through special buds.**
   Agave, Oxalis, Wild yam.

8. **What is grafting?**
   Grafting is the art of joining parts of two different plants, such that they grow as one.

9. **What is meant by stock in grafting?**
   Stock is the basal or supporting part of the plant on which a scion is grafted.

10. **What is scion?**
    Scion is the part of the plant, which is grafted on the stock.

11. **When is gootee normally practised**?
    Gootee is normally practised during the early monsoon rains.

12. **Name two plants which are propagated by gootee**.
    Orange, Lemon, guava, litchi.

13. **Name the first cell of the female gametophyte of angiosperms**.
    The functional megaspore is the first cell of female gametophyte.

14. **What name is given to the female gametophyte of angiosperms**?
    Embryo sac is the female gametophyte of angiosperms.

15. **How many nuclei are present in a mature female gametophyte of angiosperm?**

Eight nuclei.

16. **Name two plants pollinated by birds.**
Butea monosperma, bottle-brush, coral tree.

17. **What is chiropterophily?**
When pollination is carried out by bats, it is called chiropterophily.

18. **Name two plants that are bat-pollinated.**
Adansonia and Kigelia.

19. **What is syngamy in plants?**
The fusion of a male and female gamete in the embryo sac, is called syngamy in plants.

20. **What is meant by sporophytic incompatibility?**
If incompatibility is due to the genotype of the stigmatic tissues, i.e., sporophytic tissue, is called sporophytic incompatibility.

21. **What is apomixis?**
Apomixis is a modified/special mode of reproduction, in which seeds are formed without fusion of gametes.

22. **What is parthenogenesis in plants?**
Parthenogenesis is a form of reproduction where seeds develop from unfertilized female gametes.

23. **Define parthenocarpy.**
Parthenocarpy is defined as the process of fruit formation without fertilization.

24. **Name a plant where parthenocarpy has been induced.**
Tomato

25. **What is gametophytic incompatibility?**
If incompatibility is due to the genotype of the pollen, it is termed gametophytic incompatibility.

26. **Where do hypocotyls and radicle develop from, in the embryo?**
Hypocotyl and radicle develop from the cells of the proembryo, nearest to suspensor.

27. **What do the integuments form in the seed?**
Integuments become the seed coat.

28. **What is the function of suspensor?**
Suspensor pushes the embryo deeper into the endosperm, for deriving nutrition.

29. **Name two plants where sporophytic budding occurs.**
Orange, Mango, Onion, Opuntia.

30. **Define polyembryony.**
Polyembryony is defined as the presence of more than one embryo in a seed.

## Short Answer Questions (2 Marks)

**1. Differentiate between geitonogamy and xenogamy.**

| Geitonogamy | Xenogamy |
|---|---|
| 1. Geitonogamy refers to transfer of pollen grains from the anther of one flower to the stigma of another flower of the same plant. | 1. Xenogamy refers to transfer of pollen grains from the anther of one flower to the stigma of another flower on a different plant of the same species. |
| 2. It does not result in genetic variation. | 2. It results in genetic variation. |

**2. Differentiate between asexual reproduction and sexual reproduction in plants.**

| Asexual reproduction | Sexual reproduction |
|---|---|
| 1. It does not involve formation of gametes. | 1. It involves formation and fusion of gametes. |
| 2. It involves only one parent. | 2. It involves two parents. |
| 3. There is no genetic variation in the offsprings. | 3. There appears genetic variation in the offsprings. |

**3. Differentiate between cutting and layering.**

| Cutting | Layering. |
|---|---|
| 1. A portion of stem or root used for raising a new plant is put in moist soil. | 1. A lower branch of a plant is bent and the tip is covered by soil. |
| 2. Roots start appearing from the lower soil-covered portion. | 2. Roots and shoot arise from the nodes covered under soil. |
| 3. Chance of survival is comparatively less. | 3. Chance of survival is more. |

**4. Differentiate between stock and scion.**

| Stock | Scion. |
|---|---|
| 1. Stock is the basal part of a plant on which scion is grafted. | 1. Scion is the branch which is grafted on the stock. |
| 2. It is efficient in absorption and resistant to attack by pests. | 2. It is selected from a superior variety, with reference to the produce obtained. |

**5. Differentiate between autogamy and allogamy.**

| Autogamy | Allogamy |
|---|---|
| 1. It refers to the transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant. | 1. It refers to the transfer of pollen grains from the anther of one flower to the stigma of another flower on a different plant of the same species. |
| 2. No genetic variation appears in the progeny. | 2. Genetic variation appears in the progeny. |

**6. a. Who classified embryo sac/female gametophytes of angiosperms into certain categories?**
**b. What was the basis for such a classification?**
**c. Name the categories of embryo sac.**

a. Panchanan Maheshwari.

b. Depending on the number of megaspore nuclei involved in the development of female gametophyte the classification was made.

c. He classified them into monosporic, bisporic and tetrasporic embryo sac.

**7. Why are pollen grains produced in enormous quantity in maize?**

Maize is pollinated by wind and since it is not precise and involves movement of pollen grains to long distances, there is considerable amount of wastage, to compensate; pollen grains are produced in large numbers.

## Short Answer Questions (3 Marks)

**1. Describe the development of ovules of an angiosperm.**

a. The ovule at first arises as a protuberance on the placenta in the cavity of the ovary.

b. Due to the meristematic activity of the cells in the primordial, the protuberance becomes prominent and constitutes the nucellus.

c. The initials of the two integuments arise at the base of the nucellus and surround it except at the apex, which is the micropyle.

d. A hypodermal cell functions as the archesporial cell and divides to form an outer primary wall cell and an inner primary sporogenous cell.

e. The sporogenous cell functions as the megaspore mother cell and undergoes meiosis to form four potential megaspores.

f. The megaspores become arranged in a linear tetrad.

g. Only one of the megaspores becomes functional, while the other three degenerate.

h. The nucleus of the functional megaspore undergoes three successive mitoses and form eight nuclei.

i. Three at the chalazal end become organised into antipodal cells, while three at the micropylar end become the egg apparatus, consisting of one female gamete and two synergids.

j. The nuclei in the centre fuse to form a secondary nucleus.

k. The eight-nucleate embryo sac is the fully-developed female gametophyte in the ovule of angiosperms.

**2. Trace the events that would take place in a flower from the time the pollen grains of the same species have fallen on the stigma, upto the completion of fertilization.**

1. The pollen grain starts in germination in the presence of moisture and certain nutrients on the stigmatic surface

2. A short cytoplasmic outgrowth, called germ tube, emerges from the pollen grain.

3. The generative cell undergoes mitosis to form two male of gametes.

4. The vegetative nucleus enters the pollen tube followed by the two male gametes.

5. As the pollen tube grows, it produces enzymes to digest the tissues to stigma and style.

6. It grows chemotropically and intercellularly in the style due to a concentration gradient of calcium-boron-inositol-sugar complex.

7. The pollen tube enters the ovule through micropyle and discharges the two male gametes into the embryo sac.

8. One of the male gametes fuses with the egg, resulting in the production of a zygote; it is called syngamy.

9. The other male gamete fuses with the diploid secondary nucleus, producing a triploid primary endosperm nucleus; it is called triple fusion.

10. Thus in an embryo sac, there occur two fusions and the phenomenon is called double fertilization.

**3. Describe the development of endosperm of angiosperms.**

1. The endosperm develops from the primary endosperm nucleus, by its

repeated mitotic divisions.

2. Its development begins just before the embryo development

3. The development is of three types namely nuclear, cellular and helobial.

**Nuclear type**

1. In the nuclear type, the nucleus undergoes repeated free-nuclear divisions.

2. The nuclei get arranged along the periphery, leaving a large central vacuole.

3. Cytokinesis occurs from the periphery towards the centre, making it cellular at maturity.

**Cellular type**

In this type, every nuclear division is immediately followed by cytokinesis making it cellular from the beginning

**Helobial type**

1. In this type, the first nuclear division is followed by cytokinesis forming two unequal cells.

2. Subsequent divisions in the two compartments are free-nuclear.

3. Cytokinesis later occurs from the periphery to the centre and finally making it cellular.

**4. Describe the development of embryo from the zygote.**

1. The zygote divides transversely by mitosis, forming a hypobasal cell towards the micropyle and an epibasal cell towards the chalaza.

2. The epibasal cell divides repeatedly forming a row of 4-8 cells.

3. The terminal cell divides in various planes to produce a cluster of cells, forming the proembryo.

4. The hypobasal cell and the remaining cells produced from epibasal cell, together form the suspensor.

5. Suspensor pushes the embryo deeper into the endosperm to enable it to derive nutrients from the endosperm.

6. A few cells of the proembryo nearest to the suspensor, develop into hypocotyls and radicle.

7. The other cells give rise to epicotyl, plumule and cotyledons.

8. In dicots, two cotyledons develop and in monocots one cotyledon become suppressed at an early stage and only one continues to develop.

9. As the embryo and endosperm are developing, the integuments become hard and provide the protective covering of the seed, the seed coat.

**5. What happens to the megaspores formed by the meiotic division in the megaspore mother cell?**

1. Of the four megaspores formed, three degenerate and only one is functional.

2. The functional megaspore is the first cell of female gametophyte and enlarges in size.

3. Its nucleus divides by three successive mitoses and an eight-nucleated female gametophyte called embryo sac is formed.

4. Three nuclei get organised as antipodal cells at the chalazal end.

5. Three nuclei get organised as egg apparatus consisting of a female gamete and two synergids, at the microphylar end.

6. The polar nuclei in the centre fuse to form a diploid secondary nucleus.

**6. Describe the structure of a mature pollen grain.**

1. Initially a pollen grain is uninucleate, but soon the nucleus divides by mitosis into two.

2. A large cell called vegetative cell and a smaller cell called generative cell, are formed.

3. A mature pollen grain at the time of liberation is two-celled and has a two-layered wall.

4. A mature pollen grain is uninucleate with a two-layered cell wall.

5. The inner layer is made of cellulose and the outer layer is made of sporopollenin.

6. At certain places, the exine is thin or absent giving the appearance of a pore, which is called germ pore.

7. There are generally three germ pores in dicots and one in monocots.

**7. Write an account on micropagation.**

1. In micropropagation, the cells or tissues or organs to be propagated, are detached from the parent plant.

2. These explants are grown in vitro on a suitable medium.

3. They develop into callus i.e., undifferentiated or unorganized mass of parenchymatous cells.

4. The callus can be made to differentiate into shoots and roots with hormones like auxins and cytokinins.

5. By this method an unlimited number of plantlets can be raised in a limited space within a short period of time.

6. Virus or pathogen-free plants can be grown by meristem culture.

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