

## UNIT VI : Reproduction in Plants

### Chapter

# 1

# ASEXUAL AND SEXUAL REPRODUCTION IN PLANTS

### MUST KNOW DEFINITIONS

<b>Polyembryony</b>	:	Occurrence of more than one embryo in a seed.
<b>Amphimixis</b>	:	Method of reproduction which involves fertilization.
<b>Apomixis</b>	:	Method of reproduction which does not involve fertilization.
<b>Endosperm</b>	:	A triploid nutritive tissue that nourishes the developing embryo.
<b>Microsporogenesis</b>	:	Stages involved in formation of haploid microspores from diploid microspore mother cells.
<b>Embryo sac</b>	:	Oval sac-like structure found in the nucellus of the ovule and acts as female gametophyte.
<b>Megasporogenesis</b>	:	The process of development of a megaspore from a megaspore mother cell.
<b>Pollination</b>	:	Transfer of pollen from anther to stigma.
<b>Self pollination</b>	:	Transfer of pollen from anther to stigma of the same flower.
<b>Cross pollination</b>	:	Transfer of pollen from anther of a flower to the stigma of another flower on the same plant or different plant of the same species.
<b>Double fertilization</b>	:	Fusion of one Female Gametes to two Male Gametes.
<b>Triple fusion</b>	:	Fusion of sperm with diploid secondary nucleus to form triploid endosperm nucleus.
<b>Radicle</b>	:	Embryonic root is called radicle.
<b>Plumule</b>	:	Embryonic shoot is called plumule.
<b>Apospory</b>	:	The process of embryo sac formation from diploid cells of nucellus as a result of mitosis.
<b>Budding</b>	:	A method of asexual reproduction where small outgrowth (Bud) from a parent cell are produced.
<b>Callus</b>	:	Undifferentiated mass of cells obtained through tissue culture.
<b>Clone</b>	:	Genetically identical individuals.
<b>Endothecium</b>	:	A single layer of hygroscopic, radially elongated cells found below the epidermis of anther which helps in dehiscence of anther.

<b>Fertilization</b>	:	The act of fusion of male and female gamete
<b>Grafting</b>	:	Conventional method of reproduction where stock and scion are joined to produce new plant.
<b>Horticulture</b>	:	Branch of plant science that deals with the art of growing fruits, vegetables, flowers and ornamental plants.
<b>Nucellus</b>	:	The diploid tissue found on the inner part of ovule next to the integuments.
<b>Pollenkitt</b>	:	A sticky covering found on the surface of the pollen that helps to attract insects.
<b>Regeneration</b>	:	Ability of organisms to replace or restore the lost parts.
<b>Sporopollenin</b>	:	Pollen wall material derived from carotenoids and is resistant to physical and biological decomposition.
<b>Tapetum</b>	:	Nutritive tissue for the developing sporogenous tissue.
<b>Transmitting tissue</b>	:	A single layer of glandular canal cells lining the inner part of style.

### TERMINOLOGIES & EXAMPLES

<b>Conidia</b>	:	<i>Aspergillus</i> and <i>Penicillium</i>
<b>Budding</b>	:	<i>Yeast</i> and <i>Hydrilla</i>
<b>Fragmentation</b>	:	<i>Spirogyra</i>
<b>Gemma</b>	:	<i>Marchantia</i>
<b>Regeneration</b>	:	<i>Planaria</i>
<b>Binary Fission</b>	:	<i>Bacteria</i>
<b>Buds in Roots</b>	:	<i>Murraya</i> , <i>Dalbergia</i> and <i>Millingtonia</i>
<b>Tuberous Roots</b>	:	<i>Ipomoea batatas</i> and <i>Dahlia</i>
<b>Rhizome</b>	:	<i>Musa paradisiaca</i> , <i>Zingiber officinale</i> and <i>curcuma longa</i>
<b>Corm</b>	:	<i>Amorphophallus</i> and <i>Colocasia</i>
<b>Tuber</b>	:	<i>Solanum tuberosum</i>
<b>Bulb</b>	:	<i>Allium cepa</i> and <i>Lilium</i>
<b>Runner</b>	:	<i>Centella asiatica</i>

<b>Stolon</b>	:	<i>Mentha</i> and <i>Fragaria</i>
<b>Offset</b>	:	<i>Pistia</i> and <i>Eichornia</i>
<b>Sucker</b>	:	<i>Chrysanthemum</i>
<b>Bulbil</b>	:	<i>Dioscorea</i> and <i>Agave</i>
<b>Epiphyllous Bud</b>	:	<i>Bryophyllum</i>
<b>Root Cutting</b>	:	<i>Malus</i>
<b>Stem Cutting</b>	:	<i>Hibiscus</i> , <i>Bougainvillea</i> and <i>Moringa</i>
<b>Leaf Cutting</b>	:	<i>Begonia</i> and <i>Bryophyllum</i>
<b>Grafting</b>	:	Citrus, Mango, Apple
<b>Layering</b>	:	<i>Ixora</i> and <i>Jasminum</i>
<b>Pollinium</b>	:	<i>Calotropis</i>
<b>Compound Pollen grain</b>	:	<i>Drosera</i> and <i>Drymis</i>
<b>Pollen-10 micrometer</b>	:	<i>Myosotis</i>
<b>Pollen-200 micrometer</b>	:	Cucurbitaceae and Nyctaginaceae

<b>Orthotropous Ovule</b>	: Piperaceae and Polygonaceae
<b>Anatropous Ovule</b>	: Dicot and Monocot
<b>Hemianatropous Ovule</b>	: Primulaceae
<b>Campylotropous Ovule</b>	: Leguminosae
<b>Amphitropous Ovule</b>	: Alismataceae
<b>Circinotropous Ovule</b>	: Cactaceae
<b>Monosporic megaspore</b>	: <i>Polygonum</i>
<b>Bisporic Megaspore</b>	: <i>Allium</i>
<b>Tetrasporic Megaspore</b>	: <i>Peperomia</i>
<b>Cleistogamous flowers</b>	: <i>Commelina, Viola</i> and <i>Oxalis</i>
<b>Homogamy</b>	: <i>Mirabilis jalapa, Catharanthus roseus</i>
<b>Monoecious flower</b>	: Coconut and Bitter gourd
<b>Dioecious flower</b>	: <i>Borassus</i> and <i>Carica papaya</i>
<b>Protandry</b>	: <i>Helianthus</i> and <i>Clerodendrum</i>
<b>Protogyny</b>	: <i>Scrophularia nodosa</i> and <i>Aristolochia bracteata</i>
<b>Distyly</b>	: <i>Primula</i>
<b>Tristyly</b>	: <i>Lythrum</i>
<b>Self sterility</b>	: <i>Abutilon</i> and <i>Passiflora</i>
<b>Anemophily</b>	: Grasses, Sugarcane, Bamboo, Coconut, Palm and Maize
<b>Hydrophily</b>	: <i>Vallisneria</i> and <i>Hydrilla</i>

<b>Epihydrophily</b>	: <i>Vallisneria spiralis</i> and <i>Elodea</i>
<b>Hypohydrophily</b>	: <i>Zostera marina, Ceratophyllum</i>
<b>Ornithophily</b>	: <i>Erythrina, Bombax, Syzygium, Bignonia</i> and <i>Strelitzia</i>
<b>Perianth (Fleshy and Edible)</b>	: Jack fruit
<b>Funiculus - fleshy structure</b>	: <i>Myristica</i> and <i>Pithecellobium</i>
<b>Nuclear Endosperm</b>	: <i>Coccinia, Capsella</i> and <i>Arachis</i>
<b>Cellular Endosperm</b>	: <i>Adoxa, Helianthus</i> and <i>Scoparia</i>
<b>Helobial Endosperm</b>	: <i>Hydrilla</i> and <i>Vallisneria</i>
<b>Ruminate Endosperm</b>	: <i>Myristica</i>
<b>Endospermous Seed</b>	: Wheat, Maize, Barley and Sunflower
<b>Non-Endospermous Seed</b>	: Bean, Mango, and Cucurbits.
<b>Bulbil</b>	: <i>Fritillaria imperialis</i>
<b>Adventive Embryony</b>	: <i>Citrus</i> and <i>Mangifera</i>
<b>Diplospory</b>	: <i>Eupatorium</i> and <i>Aerva</i>
<b>Apospory</b>	: <i>Hieracium</i> and <i>Parthenium</i>
<b>Parthenocarpic fruits</b>	: Banana, Grapes and Papaya
<b>Genetic parthenocarpy</b>	: <i>Citrus</i> and <i>cucurbita</i>
<b>Environmental parthenocarpy</b>	: Pear

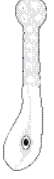
## PUBLIC EXAM FREQUENTLY ASKED QUESTIONS

## 1 Mark

## CHOOSE THE CORRECT ANSWERS

1. Identify the correctly matched pair [FRT-'22]  
 (a) Tuber – *Allium cepa*  
 (b) Sucker – *Pistia*  
 (c) Rhizome – *Musa*  
 (d) Stolon – *Zingiber*  
**[Ans. (c) Rhizome - Musa]**
2. Size of pollen grain in *Myosotis* [Govt.MQP-2019; Aug-2021]  
 (a) 10 micrometer (b) 20 micrometer  
 (c) 200 micrometer (d) 2000 micrometer  
**[Ans. (a) 10 micrometer]**
3. First cell of male gametophyte in angiosperm is [Mar-2020; May-'22]  
 (a) Microspore (b) Megaspore  
 (c) Nucleus (d) Primary Endosperm Nucleus  
**[Ans. (a) Microspore]**
4. In *Haplopappus gracilis*, number of chromosomes in cells of nucellus is 4. What will be the chromosome number in primary endosperm cell? [July-'22]  
 (a) 8 (b) 12  
 (c) 6 (d) 2 **[Ans. (b) 12]**
5. The scar left by funiculus in the seed is [May-'22]  
 (a) tegmen (b) radicle  
 (c) epicotyl (d) hilum  
**[Ans. (d) hilum]**
6. A plant called X possesses small flower with reduced perianth and versatile anther. The probable agent for pollination would be [QY-2019]  
 (a) water (b) air  
 (c) butterflies (d) beetles  
**[Ans. (b) air]**
7. Coelorrhiza is found in [July-'22]  
 (a) Paddy (b) Bean  
 (c) Pea (d) Tridax  
**[Ans. (a) Paddy]**

8. Parthenocarpic fruits lack [Aug-2021; FRT-'22]  
 (a) Endocarp (b) Epicarp  
 (c) Mesocarp (d) Seed  
**[Ans. (d) Seed]**
9. Which one of the following is not an advantage of micro propagation? [PTA-1]  
 (a) Plants produced are genetically identical  
 (b) Endangered plants can be propagated  
 (c) Sometimes undesirable genetical changes occur  
 (d) Disease free plants can be produced  
**[Ans. (c) Sometimes undesirable genetical changes occur]**
10. Which one of the following statements is not true regarding sporopollenin? [PTA-2]  
 (a) Sporopollenin is contributed by both pollen cytoplasm and tapetum  
 (b) It helps to withstand high temperature and is resistant to strong acid.  
 (c) Sporopollenin is derived from phycobilins  
 (d) It helps pollen during long period preservation in fossil deposits.  
**[Ans. (c) Sporopollenin is derived from phycobilins]**
11. In a male gametophyte, the chromosomal number of generative nucleus is (A) and tube nucleus is (B). [PTA-4]  
 (a) (A) – (n) (B) – (2n)  
 (b) (A) – (2n) (B) – (n)  
 (c) (A) – (2n) (B) – (2n)  
 (d) (A) – (n) (B) – (n)  
**[Ans. (d) (A) – (n) (B) – (n)]**
12. Which one of the following is a dioecious plant? [PTA-5]  
 (a) Coconut (b) Bitter gourd  
 (c) Pea plant (d) Date palm  
**[Ans. (d) Date palm]**

- 13. Eyes of potato are referred to** [PTA-6]  
 (a) adventitious roots (b) axillary buds  
 (c) terminal buds  
 (d) intercalary buds [Ans. (b) axillary buds]
- 14. Circinotropous ovule is found in the family :** [FRT-'22]  
 (a) Primulaceae (b) Alismataceae  
 (c) Cactaceae (d) Leguminosae  
 [Ans. (c) Cactaceae]
- 15. An example for Dioecious plant :** [FRT-'22]  
 (a) Carica (b) Castor  
 (c) Maize (d) Coconut  
 [Ans. (a) Carica]
- 16. From the following which one is the column of sterile tissue surrounded by the anther lobe :** [Mar-2020]  
 (a) periplasmodium (b) pollen chamber  
 (c) connective tissue (d) tapetum  
 [Ans. (c) connective tissue]
- 17. Cantharophily is :** [Sep-2020]  
 (a) Bees (b) Butterflies  
 (c) Flies (d) Beetles  
 [Ans. (d) Beetles]
- 18. \_\_\_\_\_ is popularly called "Terror of Bengal"** [FRT-'22]  
 (a) Murraya (b) Dalbergia  
 (c) Eichhornia crassipes (d) Pistia  
 [Ans. (c) Eichhorina crassipes]
- 19. Vegetative reproduction by root is found in \_\_\_\_\_** [FRT-'22]  
 (a) Bryophyllum (b) Curcuma longa  
 (c) Mentha (d) Murraya  
 [Ans. (d) Murraya]
- 20. \_\_\_\_\_ is an example for pollinium.** [FRT-'22]  
 (a) Drosera (b) Calotropis  
 (c) Drymis (d) Sporopollenin  
 [Ans. (b) Calotropis]
- 21. An example for cellular endosperm** [FRT-'22]  
 (a) Valisneria (b) Arachis  
 (c) Helianthus (d) Hydrilla  
 [Ans. (c) Helianthus]
- 22. Choose the correct pair:** [FRT-'22]  
 (a) Ovary - Seed  
 (b) Ovule - Zygote  
 (c) Egg - Fruit  
 (d) Nucellus - Perisperm  
 [Ans. (d) Nucleus - Perisperm]
- 23. The appropriate temperature used for cyopreservation:** [July-'22]  
 (a) 196°C (b) -196°C  
 (c) 100°C (d) -100°C  
 [Ans. (b) -196°C]
- 24. Identify the type of embryo state** → [HY-2019]  
 (a) Zygote  
 (b) Globular embryo  
 (c) Mature embryo  
 (d) 4 celled embryo  
 [Ans. (b) Globular embryo]
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- 25. The size of the pollen in "Myosotis" is** [FRT-'22]  
 (a) From 10 micrometers to 100 micrometers  
 (b) From 10 micrometers to 50 micrometers  
 (c) From 10 micrometers to 300 micrometers  
 (d) From 10 micrometers to 200 micrometers  
 [Ans. (d) From 10 micrometers to 200 micrometers]

**2 Marks**

- 1. Write short note on Pollenkitt.** (OR)  
**What is Pollenkitt?** [HY-2019; FRT-'22]
- Ans. (i)** It is an oily layer forming a thick viscous coating over pollen surface.
- (ii)** Pollenkitt is contributed by tapetum and coloured Yellow (or) Orange and is Chiefly made of Carotenoids or Flavonoids.
- (iii)** It attracts insects and protects damage from UV radiation.



2. What is Cantharophily? [FRT-'22]

**Ans.** The cross pollination of flowers by beetles is called cantharophily. These beetles feed on the pollen or on some juicy tissues of the flowers.

3. What is endothelium? [Aug-2021; May-'22]

**Ans. (i)** It is otherwise known as integumentary tapetum.

**(ii)** In some species, the inner layer of integument may become specialized to perform nutritive function for the **embryosac** and is called endothelium.

**Example :** Asteraceae.

4. 'The endosperm of angiosperm is different from gymnosperm'. Do you agree. Justify your answer. [Govt.MQP-2019]

**Ans.** Yes I agree.

	Endosperm of Angiosperm	Endosperm of Gymnosperm
1.	It is formed after fertilization.	It is formed before fertilization.
2.	It is a triploid tissue.	It is a haploid tissue.
3.	The function is to nourish the developing embryo.	It acts as the female gametophyte and later acts as nutritive tissue.

Thus the endosperm tissue is different in Angiosperms and gymnosperm.

5. What is Mellitophily? [May-'22; FRT-'22]

**Ans. (i)** Pollination of flowers by bees is known as mellitophily.

**(ii)** It is a type of cross-pollination by biotic agencies like bees.

6. List out the functions of Tapetum. [FRT-'22 ; May-'22]

**Ans. (i)** It supplies nutrition to the developing microspores.

**(ii)** It contributes sporopollenin through **ubisch bodies** pollen wall formation.

**(iii)** The pollenkitt material is contributed by tapetal cells and is later transferred to the pollen surface.

**(iv)** Exine proteins responsible for '**rejection reaction**' of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

7. Differentiate secretory and invasive tapetum. [Aug-2021]

**Ans.**

	Secretory tapetum (parietal/glandular/cellular)	Invasive tapetum (periplasmodial)
1.	The tapetum retains the original position and cellular integrity	The cells lose their inner tangential and radial walls.
2.	It nourishes the developing microspores.	The protoplast of all tapetal cells coalesces to form a periplasmodium.

8. Differentiate bisporic megaspore development from tetrasporic development. [PTA-1]

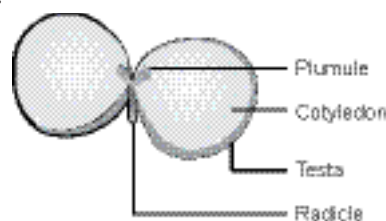
**Ans.**

	Bisporic megaspore development	Tetrasporic development
1.	Of the four megaspores formed, two are involved in Embryo sac formation.	All the four megaspores are involved in Embryo sac formation.
2.	Example: <i>Allium</i> .	Example: <i>Peperomia</i> .

9. Draw this diagram and label the parts. [PTA-3]



**Ans.**



10. Which method of artificial vegetative reproduction is good in plants? Give reason for your answer. [PTA-4]

**Ans. (i)** Different plants can be propagated.

**(ii)** The method used depends on type of plant, response of plant, economic reasons etc.

**(iii)** Therefore no specific method is said to be best. Both conventional and modern methods have advantages and disadvantages. Eg: Cutting, layering, grafting etc.