

S.Y.B.sc Botany CBCS Pattern

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BO241 PLANT ANATOMY & EMBRYOLOGY 2 CREDITS

CHAPTER NO 9 POLLINATION AND FERTILIZATION

Introduction and Definition –

Pollination is the process of transfer of pollen grains from an anther to the stigma of a flower .

Types of pollination –

1) Self pollination –

When the pollen grains are transferred from an anther to the stigma of the same flower ,the process is called self pollination .ig *Argemone Mexicana, Mirabilis jalapa* .The outcome of self pollination is a reduction in genetic diversity .

2) Cross pollination –

When the pollen grains are transferred from an anther of one flower to the stigma of another flower born on a plant of same or different species ,the process is called cross pollination ig *Michelia champaca*.The outcome of cross pollination is an increase in genetic diversity .

Mechanism of Pollination ---

There are several agents that flowering plants utilized to transfer pollen from one flower to another .These includes wind, water, insects ,birds, and animals .

1) Anemophily –

Pollination with the help of wind is called anemophily .The anemophilous plants have long stamens and pistils, they produced enormous amounts of small, light and non sticky pollen grains and the stigma is usually large and feathery which helps to capture the pollen grains .

2) Hydrophily-

In this pollination takes place through water .In this mechanism the pollen is passively carried to other flowers by water currents.

3) Zoophily –

When pollination takes place with the help of animals it is called zoophily .

4)Entomophily –

When pollination takes place with the help of insects it is called entomophily .The common insects pollinators includes bees, flies, moths, butterfly, beetles,etc.About 80% plants are carried out by bees .The entomophilous plants have special characters such as ; bright colour, fragrance, to attract the insects. The pollen grains of these flowers are sticky and spiny.

5) Malacophily –

When pollination takes place with the help of other animals like , snails , squirrels etc.it is called malacophily.

6) Ornithophily—

When pollination takes place with the help of birds it is called Ornithophily .ig Humming birds, honey bees .ie of plants are *Hibiscus* , *Erythrina*,these plants are having attractive yellow or red corolla. They produce large nectar.

7) Chiropterophily –

When pollination takes place with the help of bats it is called chiropterophily.

9.3) Germination of pollen—

Fertilization –

The fusion of male and female gametes ,during sexual reproduction to form a zygote which develops into an embryo ,is known as fertilization .

Germination of pollen grains –

When pollens lands on the surface of a stigma it rehydrates .Pollen grains are usually germinates on the stigma of the same species .Pollen wall ruptures .pollen tube is produced .

Pollen tube –

Pollen tube grows and enters into the stigma and approach the ovule .The male nuclei travel down to fertilize the ovules .

Growth of pollen tube—

The rate of growth of pollen tube is usually affected by

a) Environmental factors –

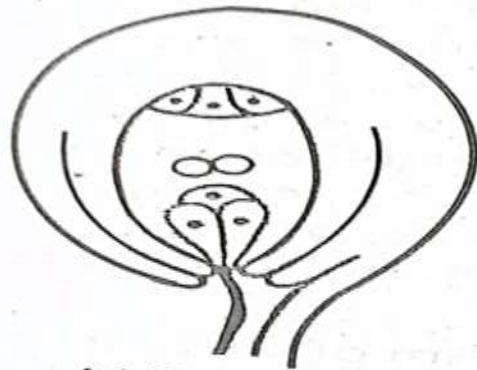
Temperature plays important role .

b) Compatibility –

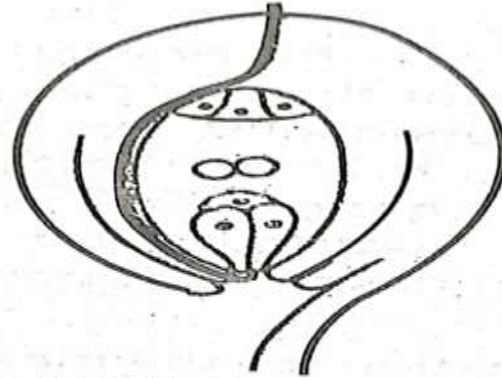
In compatible species ,rate of growth is rapid .

ENTRY OF POLLEN TUBE –

Pollen tube enter the ovule by three different mechanisms.-



(a) Porogamy



(b) Chalazogamy



(c) Mesogamy

Fig. 9.1: Entry of Pollen Tube

a) Porogamy –

When pollen tube enters the ovule directly through micropyle , then the mode of pollen entry is called porogamy .ie Most Angiosperms .

b) Chalazogamy –

When pollen tube enters the ovule directly through chalaza then the mode of pollen entry is called chalazogamy .

c) Mesogamy—

When pollen tube enters the ovule directly through funiculus or integuments then the mode of pollen entry is called mesogamy.

Mechanism of Fertilization –

When gametes are discharged inside the embryo sac, they have a distinct cytoplasmic sheath. When male gametes come in contact with egg nucleus or female gamete . Then male gamete gradually unites with the egg completely .Once it enters the egg, the chromatin material of the male gamete starts disintegrating .

Finally the nucleolus of male and female gamete combines with secondary nucleolus to form primary endosperm cell. Fusion of male gamete with secondary nucleus is known as double fertilization or triple fusion .

Double fertilization and its significance-

Double fertilization ---

S.G.Nawaschin (1898) was first to suggest that both the sperms released by pollen tube are involved in fertilization .They fertilize two different elements of the embryo sac .The phenomenon is called as double fertilization and it is unique in Angiosperms .

In double fertilization the nucleus of one sperm fuse with the egg nucleus and that of second fuses with secondary nucleus .In most of the plants ,this secondary nucleus possesses two polar nuclei .Further the secon fertilization involves fusion of 3 nuclei.The phenomenon is called as triple fusion .

Triple Fusion –

The remaining male gamete fuses with the secondary nucleus .The secondary nucleus is diploid (2n) Both these nuclei are haploid and have migrated from polar region of the embryo sac .These two nuclei fuses and become diploid .This diploid structure is called as secondary nucleus. One male gamete is haploid (n) and the secondary nucleus is diploid (2n) .The fusion of male gamete and secondary nucleus ie $n + 2n$ forms $3n$ structure hence this fusion is called as triple fusion .The triple fusion results into the formation of an endosperm .The endosperm is nutritive in function .

Significance of Double Fertilization /Triple Fusion –

- 1) Double fertilization plays role in the formation of seed in Angiosperms .
- 2) Endosperm which is form during fertilization provides nourishment to embryo .
- 3) Double fertilization prevents the unnecessary energy wastage .
- 4) Double fertilization has great significance in inducing and establishing seed habit in the plants .