MBOTCC-6
Unit-V

POLYEMBRYONY

M.Sc. Sem-II
(2018-20)

Introduction:

Polyembryony refers to the occurrence of two or more embryos in an ovule. This unusual phenomenon was first of all observed by Leeuwenhoek (1719) in the seeds of orange. In a seed with several embryos, usually one embryo matures while the rest degenerate during the subsequent course of development.

Ernst (1918) and Schnarf (1929) argued on the basis of their observations that polyembryony may be true or false depending on whether the embryos arise in the same embryo sac or in different embryo sacs in the same ovule.

Types of True Polyembryony:

1. Cleavage Polyembryony

(i) It develops from the cleavage of the zygote at the proembryo stage resulting in two or more embryos subsequently. eg. Nicotiana rustica, Isotoma longiflora, Lobelia, Erythronium, etc.

(ii) More common in gymnosperms and of rare occurrence in angiosperms.

(iii) In Erythronium americanum, first division of the zygote is normal. Many cells at the distal end of the embryonic mass give rise to separate embryos.

(iii) Additional embryos may be formed from the suspensor cells of the proembryo. e.g. Isotoma, Exocarpus, etc.

2. Embryos developing from the cells of the embryo sac other than the egg:

(i) Embryos may arise from the synergids and antipodal cells

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(ii) Synergids may be fertilized by male gametes from additional pollen tubes entering the embryo sac or additional embryos may arise without such fusion.

(iii) Extra embryos may develop from unfertilized synergids and, hence, are haploid. e.g., Argemone mexicana, Phaseolus vulgaris, etc.

(iv) Embryos from antipodal cells are quite infrequently reported. e.g., Ulmus americana, Allium odorum, etc.

- All antipodal embryos may not be viable.

3. Embryos developing from the cells outside the embryo sac:

(i) Embryos may develop from the cells of the nucellus or integuments, e.g., Citrus, Eugenia, Mangifera, etc.

(ii) Inner cells of the inner layer of integument may develop into extra embryos (Swamy 1948), e.g., Spiranthes. Such embryos have been found to shift subsequently into the embryo sac and obtain their nourishment from the endosperm.

(iii) Maheshwari (1950) called these cases as Adventive embryony.

4. Embryos developing from the endosperm:

(i) Such supernumerary embryos are reported in Balanophora (Treub, 1898), Alnus (Woodworth, 1930), etc.

(ii) Some other workers observed that such embryos actually develop from the usual zygote but later gets embedded into the cellular endosperm (Ernst, 1913).

Spontaneous & Induced Polyembryony:

(i) Polyembryony may develop spontaneously as a naturally occurring event.

(ii) Experimentally induced polyembryony forms a separate category. They are called embryoids.

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(iii) Two kinds of spontaneous polyembryony have been described by Yakovlev (1967):

(a) Gametophytic polyembryony - Extra embryos arise from the gametic cell of the embryo sac.

(b) Sporophytic polyembryony - It arises from the zygote, proembryo or initial sporophytic cells of the ovule (Nucellus or integuments)

Practical Significance of Polyembryony

(i) Nucellar adventive polyembryony is widely applicable in horticulture.

(ii) - Adventive embryos provide uniform seedlings of parental type.

(iii) - Nucellar seedlings provide better clones (eg., Citrus) than cuttings.

(iv) - Nucellar seedlings are capable of restoration of vigour and vitality

(v) Nucellar embryos are disease free.