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Subject: Botany
Class: Deg.-II (H &S)
Paper: IV
Topic: Polyembryony
Lecture no. 25

Date: 4/05/2020

Polyembryony: Types and Practical Value

Polyembryony may be defined as occurrence of two or more embryos in one ovule. This was noticed for the first time by Leeuwenhoek (1719) in the seeds of orange.

In a seed with many embryos, usually one embryo matures and rest degenerate during course of development. According to Ernst (1918) and Schnarf (1929), ployembryony may be true or false depending upon whether the embryos arise in the same embryo sac or in different embryo sacs in the same ovule.

Various type of true ployembryony are:

1. Cleavage polyembryony:

It results from the cleavage of the zygote or earlier stages of its development (proembryo) into two or more units e.g. *Nicotiana rustica, Isotoma longiflora, Lobelia, Erythronium*. Cleavage polyembryony is common in gymnosperms, but it is of rare occurrence in angiosperms.

In *Erythronium americanum*, first division of the zygote is normal. From embryonic mass, many cells at distal end form separate embryos (Fig. 2.35).

In Isotoma and Exocarpus, additional embryos are formed from suspensor cells of proembryo.

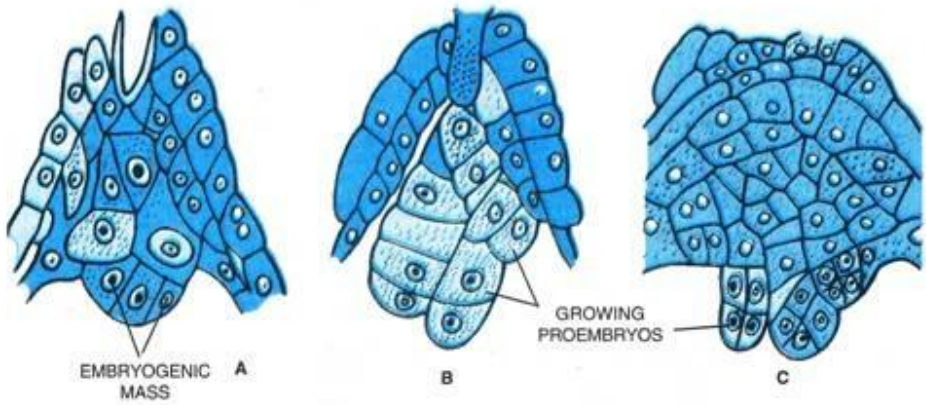

Fig. 2.35. A-C. Cleavage polyembryony : **A.** Embryonic mass formed by the basal cell of the zygote in *Erythronium americanum*, **B-C.** Differentiation of embryos from the cells of the embryonic mass.

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

The embryo may appear from synergids and antipodal cells in the embroy sac. The synergids may be fertilized by sperms from an additional pollen tube or develop without such fusion. In *Argemone mexicana* and *Phaseolus vulgaris*, additional embryos may appear from unfertilized synergids and hence haploid in nature. Embryos from antipodal cells (Fig. 2.36) develop less frequently (e.g. *Ulmus Americana*, *Allium odorum*). All the antipodal embryos may not remain viable.

3. Embryos arising from the cells outside embryo sac:

Cells of the nucellus and integuments have also been observed to develop into embryos e.g. *Citrus*, *Eugenia* and *Mangifera*. In *Spiranthes*, additional embryos

have been reported to be developing from inner cells of inner layer of integument (Swamy, 1948). Such embryos subsequently come to lie in the embryo sac and are nourished by the endosperm.

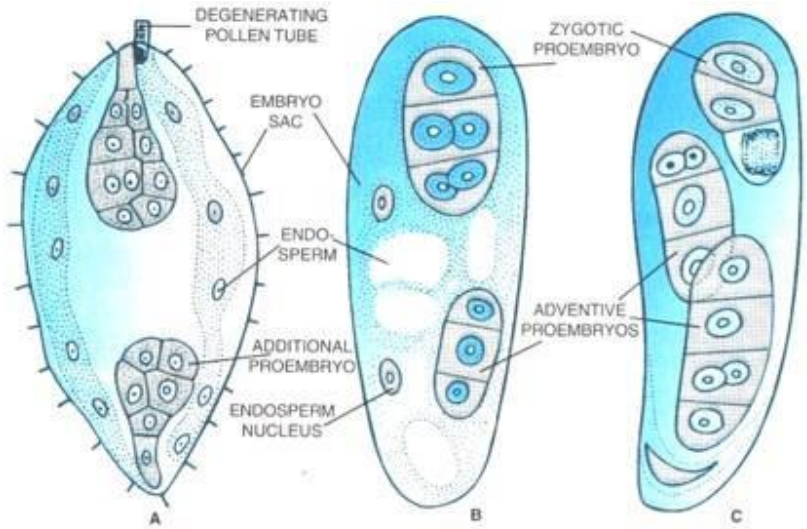

Fig. 2.36. Polyembryony : A. Development of embryo from antipodal cells. B-C. Adventive pro-embryos developed from the cells of nucellus (they grow along with the zygotic embryos).

4. Embryos from endosperm:

Embryos developing from endosperm have been reported in *Balanophora* (Treu, 1898), Alnus (Woodworth, 1930). However, Ernst (1913) found that such embryos develop from egg, got embedded in cellular endosperm.

Spontaneous and induced polyembryony:

Polyembryony may be spontaneous which includes instances of naturally occurring polyembryony. Induced polyembryony includes instances of experimentally used cases.

Yakovler (1967) has distinguished two types of spontaneous polyembryony:

(a) Gametophytic:

Arising from gametic cell of embryo sac.

(b) Sporophytic:

Arising from zygote, proembryo or initial sporophytic cells of the ovule (nucellus, integuments). Embryo development can also be made in culture medium (induced polyembryony). The embryos developed in culture medium are known as adventitious embryos, somatic embryos, supernumerary embryos or embryoids.

Practical value of polyembryony:

Nucellar adventive polyembryony is of great significance in horticulture. The adventive embryos provide uniform seedlings of parental type.

Nucellar seedling of Citrus provides better clones than cuttings. Cuttings form lateral roots and nucellar seedlings develop tap roots (better root system). Nucellar seedlings show restoration of vigour. Moreover, nucellar embryos are free from disease.