



## Polyembryony

[Introduction; Classification; Causes and applications]

*As per the name Polyembryony – it refers to the development of many embryos.*

- Occurrence of more than one embryo in a seed is called polyembryony.
- When two or more than two embryos develop from a single fertilized egg, then this phenomenon is known as Polyembryony.
- In the case of humans, it results in forming two identical twins. This phenomenon is found both in plants and animals.
- The best example of Polyembryony in the animal kingdom is the nine-banded armadillo. It is a medium-sized mammal found in certain parts of America and this wild species gives birth to identical quadruplets.

### Polyembryony in Plants

- The production of two or more than two embryos from a single seed or fertilized egg is termed as Polyembryony.
- In plants, this phenomenon is caused either due to the fertilization of one or more than one embryonic sac or due to the origination of embryos outside of the embryonic sac.
- This natural phenomenon was first discovered in the year 1719 by Antonie van Leeuwenhoek in Citrus plant seeds.

### Types of Polyembryony



There are two different types of polyembryony:

1. **Induced Polyembryony** – experimentally induced
2. **Spontaneous Polyembryony** – naturally occurring

According to Webber, polyembryony is classified into three different types:

1. **Cleavage Polyembryony:** In the case of this type, a single fertilized egg gives rise to a number of embryos.
2. **Simple polyembryony:** In this type, a number of embryos develop as a result of the fertilization of several archegonia.
3. **Rosette polyembryony:** Additional embryos develop from the rosette cells in certain gymnosperms, this type of polyembryony is termed rosette polyembryony.

**Causes According to Frusato et al 1957 Factors causes polyembryony**

- **Age of the tree:** increasing in older trees
- **Fruit set:** higher in years have higher fruit set.
- **Nutritional status of plant:** decreasing with reduced food supply.
- **Orientation of the branch of tree**

**Polyembryony in Different Groups of Gymnosperms**

- **Polyembryony in Cycadales**

In Cycadales, polyembryony is not a usual phenomenon. But in 1964, Rao reported the occurrence of simple polyembryony in *Cycas Circinalis*. In this species, two adjacent archegonia



of the same ovule sometimes grow independently into two embryos and also rarely into two seedlings.

- **Polyembryony in Coniferales**

In Case of Coniferales, simple polyembryony occurs in the majority of its members and here the number of embryos varies from 2 to many. It has been reported that cleavage polyembryony occurs in several groups of Pinaceae, Taxodiaceae, Cupressaceae, and Podocarpaceae. In Cupressus, both simple and cleavage polyembryony are common.

- **Polyembryony in Taxales**

Various archegonia are present in the female gametophyte of Taxus. Simple polyembryony occurs due to the fertilization of many of the archegonia eggs. But, out of many, only a single embryo attains maturity. Cleavage of suspensor cells occurs. The suspensors separate from each other, and each of them may carry one or more embryonal units. Sometimes, groups of meristematic cells are observed at the base of the suspensor cells. These groups of cells are called the rosette embryos. Further development, however, does not take place in these embryos.

- **Polyembryony in Gnetales**

All Gnetales exhibit polyembryony. Polyembryony is found to be of very high order in Gnetum. In this group, there are not only several prothalli and zygotes in each seed, but there is a multiplication of embryos from each zygote by the branching of the primary suspensors.

### **Importance of Polyembryony:**

This phenomenon plays an important role in plant breeding and horticulture. Nucellar adventive polyembryony is of great value in horticulture, where the nucellar seedlings of Citrus



have been proved to be better clones of orchard stock than cuttings. On the other hand, the nucellar embryos are supposed to be free from disease, and the nucellar seedlings rejuvenate the vigour that is generally lost after continued cutting propagation. The adventive polyembryony is much useful in the propagation of the fruit trees, such as Citrus and Mango. The application of adventive embryos is also important for providing genetically uniform seedlings in fruit trees. The haploids can be used for the development of homozygous diploid, which are of much value. Due to the practical value of haploids in plant breeding, the methods have been recognized for the artificial production of these embryos from the eggs or synergids.

### References

- [www.biologydiscussion.com](http://www.biologydiscussion.com)
- [www.ncert.com](http://www.ncert.com)

[The information, including the figures, will be used solely for academic purpose.]