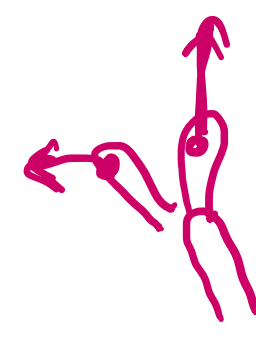
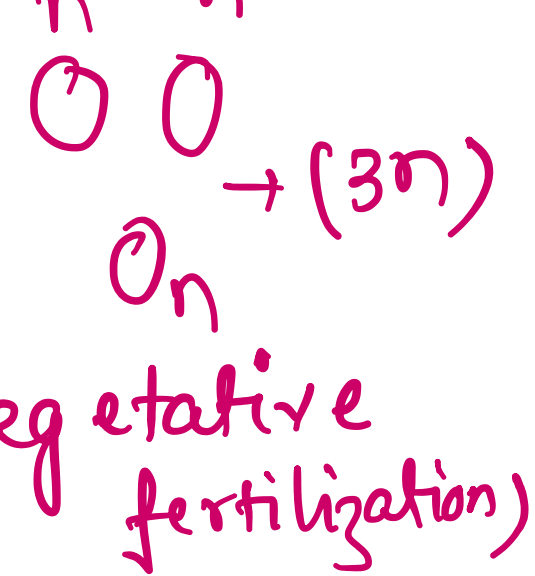


2.3 Double Fertilization: →

- * In seed plants the male gametes are brought to the egg containing female gametophyte by a pollen tube (Strasburger, 1884). The phenomenon is called siphonogamy. **
- * In ovule the pollen tube is attracted by secretion of synergids. Usually the pollen tube enters the embryo sac by passing into one synergids. The impact destroys that synergid.
- * After entering one of synergids, the pollen tube releases the two male gametes into the cytoplasm of synergids. **
- * One of the male gametes moves towards the egg cells and fuses with its nucleus thus completing the syngamy. (Generative fertilization). This results in the formation of a diploid cell, the Zygote.



- * The other male gamete move towards the polar nuclei located in the central cell and fuses with them to produce a triploid (3n) primary endosperm nucleus (PEN). **

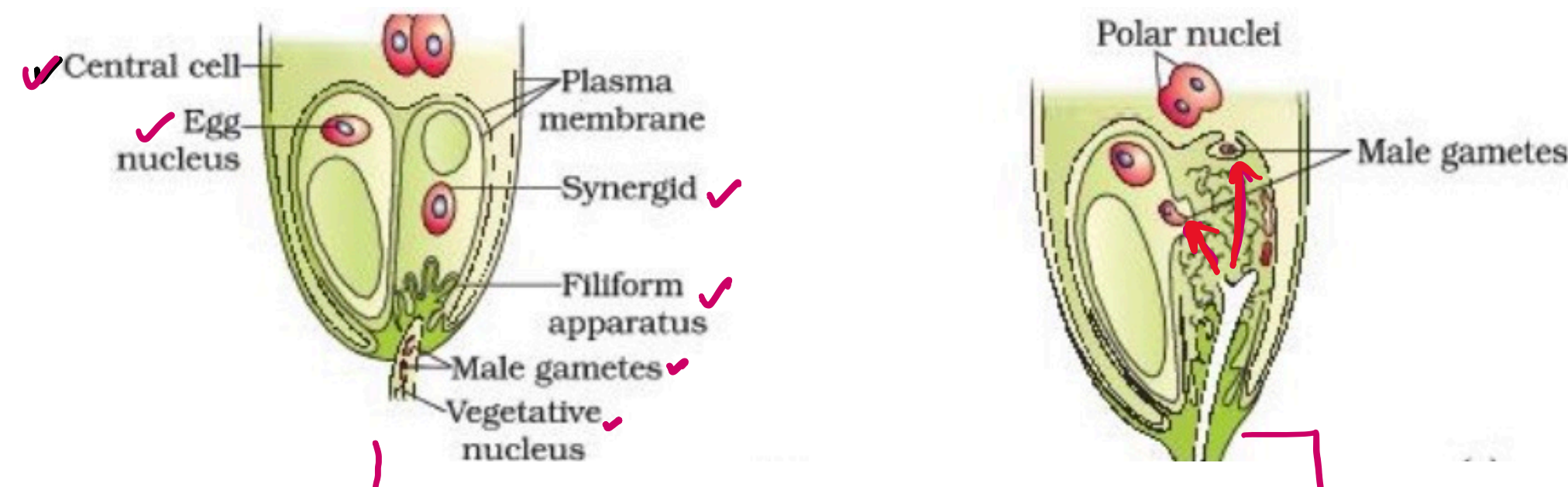


- * Since two fusion $\left\{ \begin{array}{l} \text{Syngamy (Generative fertilization)} \\ \text{Triple fusion (vegetative fertilization)} \end{array} \right.$ take place in embryo sac the phenomenon is termed as double fertilization. **

* This event is found only in angiosperm, where it was first discovered by Nawaschin in 1898 in Fatillaria and Lilium. **

Gymnosperm
 ↓
 Endosperm
 ↓
 (n)

- * cell cell after triple fusion becomes PEC - Primary Endosperm Cell (PEC) and develops into endosperm (3n)
- * Zygote develops into an embryo.



enlarged view of an egg apparatus showing entry of pollen tube into synergids.

discharge of male gamete into a synergid and the movements of the sperm, one into the egg and the other into central cell.

significance of double fertilization :-

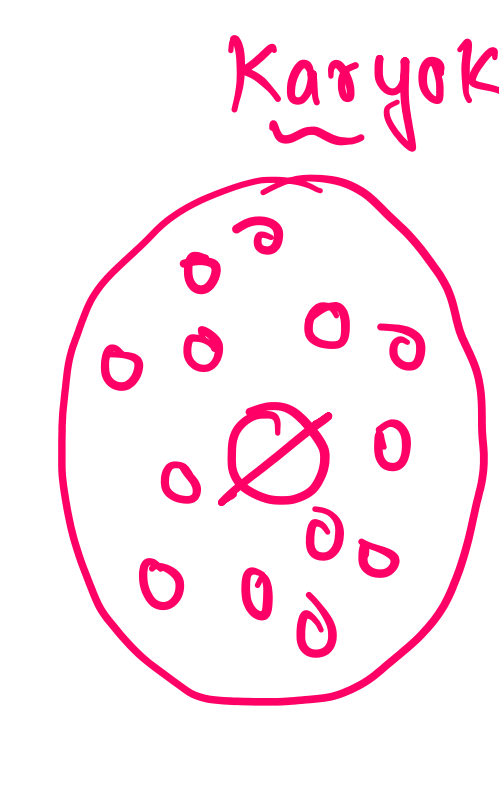
- * Double fertilization ensures that the nutritive tissue is formed only when the formation of embryo has taken place by fertilization of oosphere. Angiosperm are \therefore economical and more specialised to gymnosperms where a large nutritive female gametophyte is formed long before fertilization. If fertilization fails, the energy spent on forming it shall go waste.
- * It provide male characteristic to plant as well as nutritive tissues.
- * Due to triploid nature of nutritive tissue, it shows high physiological activity, grow faster and accumulate nutrients.

2.4 Post-fertilization: Structures and Events

- following double fertilization, events of
 - ✓ endosperm development
 - ✓ embryo development
 - ✓ maturation of ovules into seeds
 - ✓ ovary into fruit
 are collectively termed Post-fertilization events.

2.4.1 Endosperm :-

- * Endosperm development precedes embryo development because the cells of endosperm provide nutrition to the developing embryo.
- * Depending upon the mode of its formation, angiospermic endosperm is of three types.
 1. Nuclear endosperm
 2. cellular endosperm
 3. Helobial endo. (PEC)
- * The primary endosperm cell divides repeatedly and forms a triploid endosperm tissue.
- * The cells of this tissue are filled with reserve food materials and are used for nutrition to the developing embryo.
- * In most common type of endosperm (Nuclear endosperm) development, the PEN undergoes successive nuclear divisions to give rise to free nuclei. This stage of endosperm development is called free-nuclear endosperm. Subsequently cell wall formation occurs and endosperm becomes cellular. The number of free nuclei formed before cellularization varies greatly.

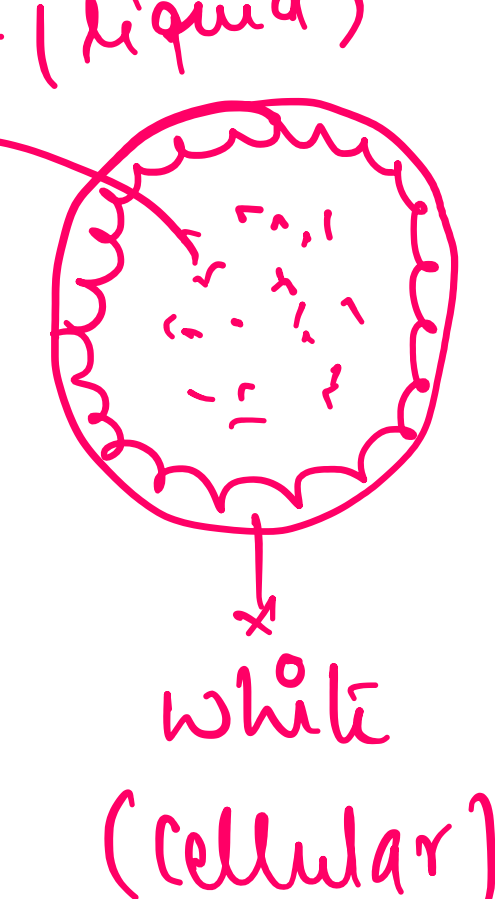


* for Example :- Coconut has multicellular endosperm white kernel ← (coconut meal) in the outer part and free nuclear as well as vacuolated endosperm made up of thousand of nuclei ← (called coconut milk) in the centre. **

fluid test

fate of endosperm :-

- * Endosperm may be completely consumed by the developing embryo & the food reserve gets stored in the cotyledons. Such seeds are called Non-endospermic or exalbuminous. eg. Pea, Bean, Sunflower groundnut.



- * Endosperm may persist in mature seed and be used up during seed germination. such seeds are known as endospermic or albuminous eg. Castor, cereals (wheat, rice and maize), coconut, barley.
- * Albuminous seed retain endosperm as it is not completely used up during embryo development

Pulses grain

grain