Vivekanand College Kolhapur
(Autonomous)

Department of Botany

B.Sc. II

ENDOSPERM: TYPES AND FUNCTION

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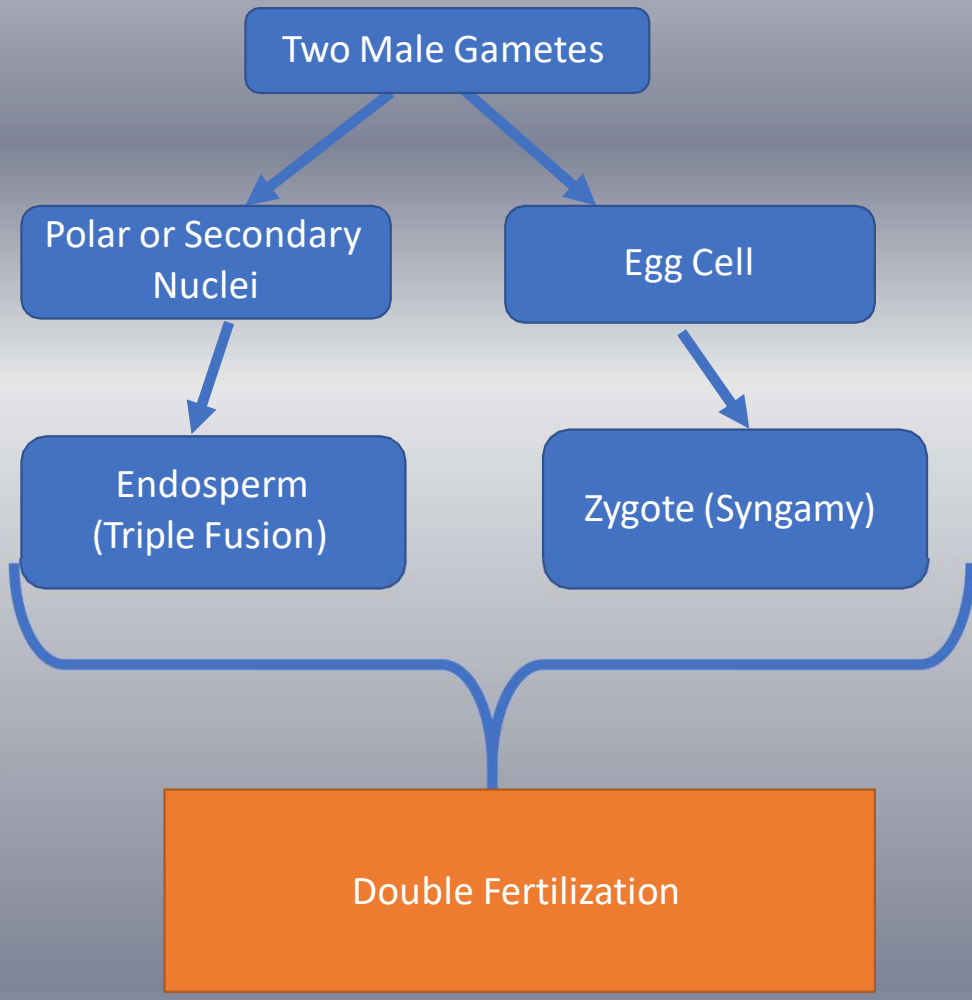
ENDOSPERM

- ✓Most important plant product on the earth for human being.
- ✓Two third of all human calories come from endosperm
- ✓Cereals – Wheat, rice, maize, barley, millets
- ✓Oils – Coconut, Corn oil, Palm, Caster,



TYPES OF ENDOSPERMS

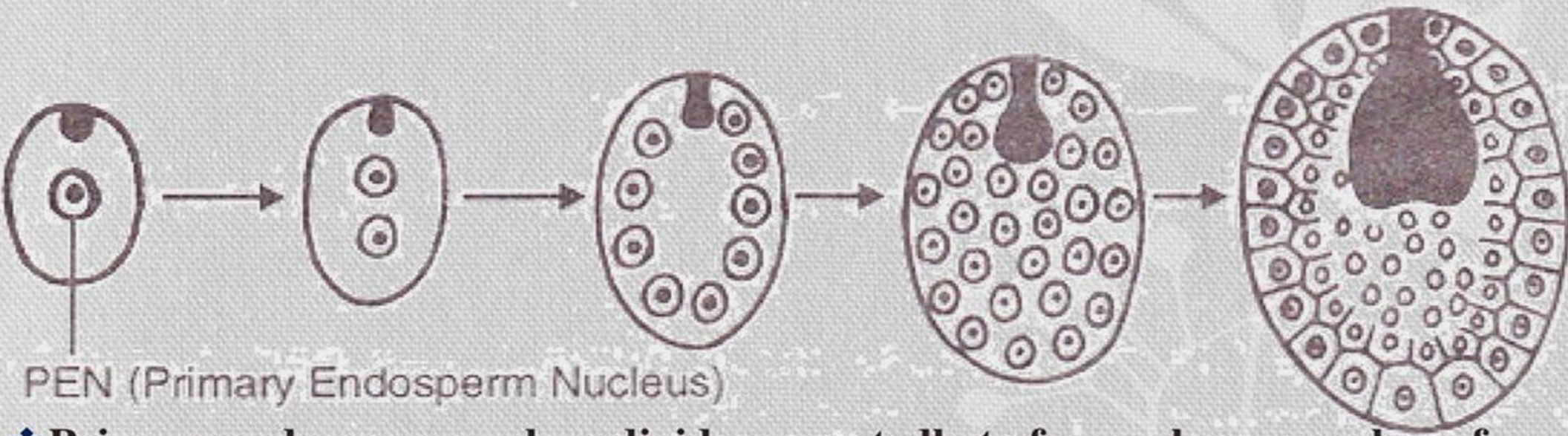
On the basis of their development, the following three types of endosperm have been recognised:

1) **Nuclear Endosperm**
2) **Cellular Endosperm**
3) **Helobial Endosperm**
4) **Mosaic Endosperm**
5) **Ruminate Endosperm**

Nuclear Endosperm

- **Most common, found in about 56% families.**
- **No cell wall formation during initial few divisions of the primary endosperm nucleus and nuclei are remain free in the cytoplasm of the embryo sac.**
- **The number of divisions depends on the size of embryo sac, larger size more division.**
- **The size of endospermic nuclei are not same. Usually the nuclei at the chalazal end are larger and at micropylar end are smaller.**

Nuclear endosperm



- Primary endosperm nucleus divides repeatedly to form a large number of free nuclei.
- No cell plate formation takes place at this stage and a central vacuole appears later.
- It is followed by cell plate formation which is centripetal.
- It is the most common type of endosperm e.g., Cotton, Maize, Capsella, Coconut (milk), wheat, etc .

In *Cocus nucifera* (Coconut) the milky or watery liquid endosperm, which fills the large embryo sac, contains numerous free nuclei. It is known as liquid syncytium. Besides free nuclei, syncytium also contains several multinucleate cell. These cells and the free nuclei gradually accumulate along the periphery towards the centre and formed coconut meat.

Endosperm haustoria:

The cellularization of endosperm is restricted to the micropylar end of the embryo sac.

The nuclei at the chalazal end are free and embedded in a common cytoplasm.

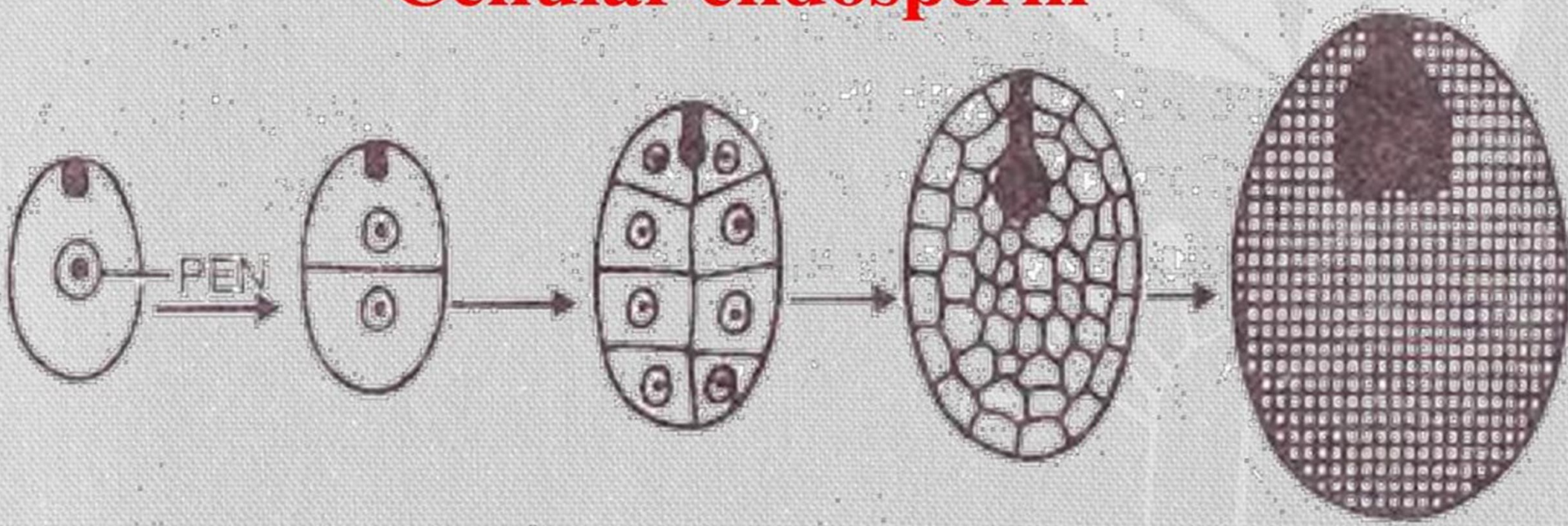
This chalazal coenocytic part of the embryo sac grows into a tubular haustorium.

Tubular haustoria is found in families like Cucurbitaceae, Fabaceae and Proteaceae.

Cellular Endosperm

- Found in 25% families, generally in dicots
- No free nuclear phase at any stage.
- Wall formation begins with 1st division of primary endosperm nucleus.
- Cellular endosperm has been further divided based on the orientation of walls following the first two or three divisions-

Cellular endosperm



- **Cell wall formation** occurs immediately after division
- Subsequent divisions also accompanied by **cell plate formation.**
- As a result, the **endosperm becomes cellular** from the beginning
- Eg: - Di-cotyledons, Balsam, Petunia, Utricularia,

Endosperm Haustoria:

- Characteristic feature of cellular endosperm.
- One or more cells becomes specialized to function as haustoria.
- The haustoria are formed at micropylar or chalazal or at both the ends and penetrate the nucellar tissue to absorb nutrition.
- Some secondary haustoria are also formed in addition to micropylar and chalazal haustoria. Example- *Alectra*
- Multinucleated chalazal endosperm haustorium occurs in *Magnolia obovata*

Helobial Endosperm

- Found in the members of the order Helobiales and confined only on some monocot families.
- Intermediate between the nuclear and the cellular types.
- After triple fusion, the primary endosperm nucleus migrates to the chalazal end.
- The wall formation after 1st division of the endosperm nucleus results into large micropylar and a small chalazal endosperm chamber.
- The nuclear divisions takes place in the micropylar chamber, while the nucleus of the chalazal chamber remains undivided or may undergoes few divisions.
- In micropylar chamber regular wall formation takes place and it becomes multicellular but there is no wall formation in chalazal chamber.

Endosperm haustoria

- Haustoria develops from the micropylar tissue. They are tubular, unicellular and having extensive outgrowths which penetrate the nucellus at the chalazal end.

Mosaic Endosperm

- Endospermic tissue lack uniformity.
- For example endosperm of *Zea mays* shows two distinct colour regions which form a mosaic pattern, part of endospermic tissue is yellow and other are white.
- This may be due to failure of triple fusion, male gamete does not fuse with polar nuclei. The male gamete and polar nuclei divide independently providing nuclei of two distinct characters interspread during the free nuclear stage.
- At maturity when the endosperm has become cellular, it gives a mosaic or variegated appearance.

Ruminate Endosperm

- The endosperm with uneven or irregularities on its surface is known as ruminate endosperm.
- Ruminate endosperm is found in Annonaceae, Myristicaceae, Araliaceae and Arecaceae family.
- The ruminate character reflects the activity of endosperm as well as seed coat.

Functions of Endosperms

1. An important nutrient medium for the successful development of the embryo.
2. Rich in fat, carbohydrates and proteins which are used in the establishment of the seedling during seed germination.
3. At the time of fertilization little nutrition available in the embryo sac. But with the formation of endosperm enough food becomes available for the developing embryo.
4. The division of zygote usually begins after the endosperm is sufficiently grown. Even if the zygote and primary endosperm nucleus divide simultaneously, the endosperm grows more rapidly.
5. Juice of immature endosperm of a plant is used as nutrition for the developing embryo of the other plant. For example coconut milk is used as nutrient medium in in vitro embryo culture.

Thank You