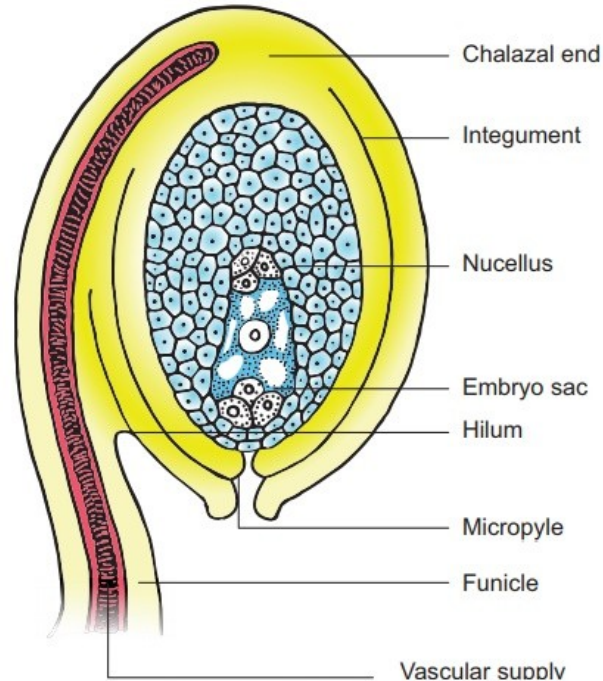


MEGASPOROGENESIS



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AP in Botany

(1) Structure of ovule (Megasporangium):

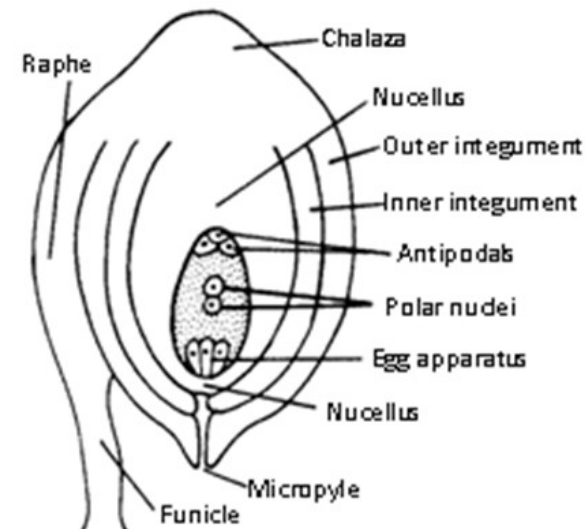
Ovule is considered to be an integumented megasporangium.

The ovule consists of the **stalk** and the **body**.

The stalk is called *funicle*.

One end of the funicle is attached to placenta and the other end to the body of the ovule.

The body of the ovule shows two ends: the basal end is called the **chalazal** end and the upper end is called **micropylar** end.



Structure of ovule

The main body of the ovule is covered with **one or two envelopes** called ***integuments***.

These leave an opening at the top of the ovule called **micropyle**.

The integuments enclose a large parenchymatous tissue known as ***nucellus***.

The residual part of nucellus in the mature seed is called **perisperm**.

In the centre of the nucellus is situated a **female gametophyte** known as ***embryo sac***.

Ovule and types of integuments:

(i) **Unitegmic:** Ovule with a single integument.

E.g., sympetalous or gamopetalous dicotyledons.

(ii) **Bitegmic:** Ovule with two integuments.

E.g., Polypetalous dicotyledons and monocotyledons.

(iii) **Aril:** This is a collar-like outgrowth from the base of the ovule and forms third integument as called **Aril**. *E.g. Litchi, Nutmeg.*

(iv) **Caruncle:** It is formed as an outgrowth of the outer integument in the micropylar region.

*E.g., Family Euphorbiaceae. Castor plant (*Ricinus*).*

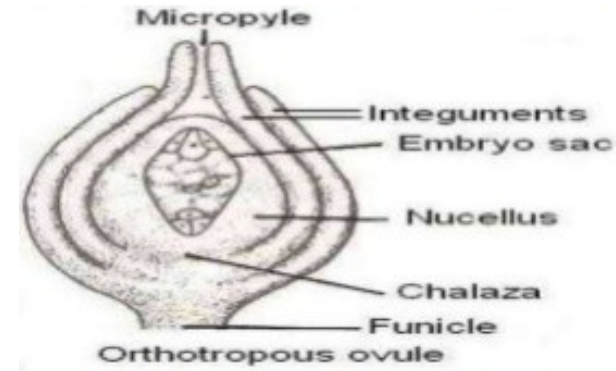
(1) Orthotropous / Straight

In this type the ovule is erect or straight.

The funicle, chalaza, micropyle are in a straight line.

This ovule – primitive type.

Family members: Polygonaceae and Piperaceae.

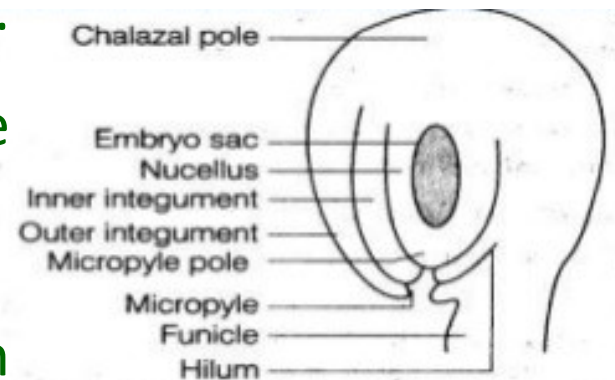


(2) Anatropous / Inverted

In this type the ovule bends along the funicle.

The micropyle lies close to the hilum. The chalaza lies at the other end.

This is the common type of ovule found both in monocots and dicots.

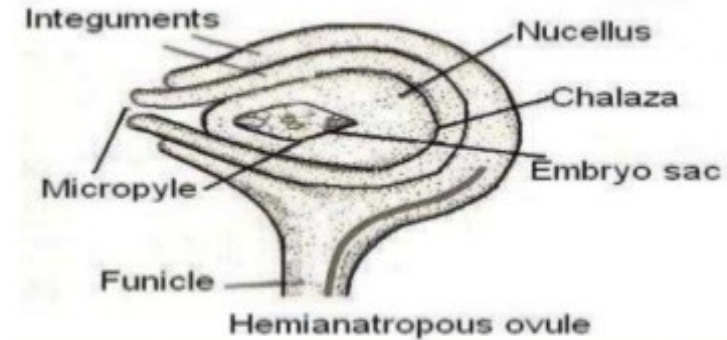


(3) Hemitropous / Hemianatropous

In this type ovule is turn at 90° angle upon the funicle.

The chalaza, micropyle line is at right angle to the funicule.

It is found in *Ranunculus*.

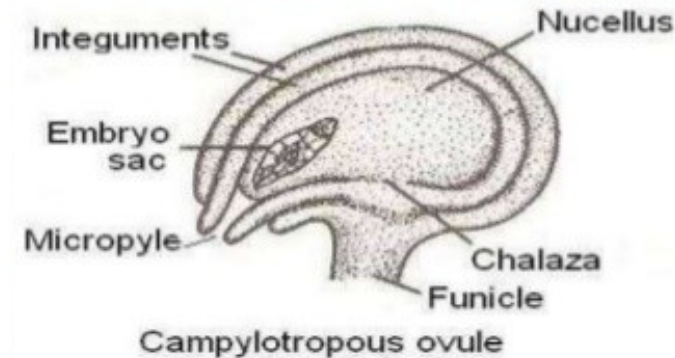


(4) Campylotropous / Curved

In this type ovule is curved more or less at right angle to funicle.

Micropylar end is slightly bend down side.

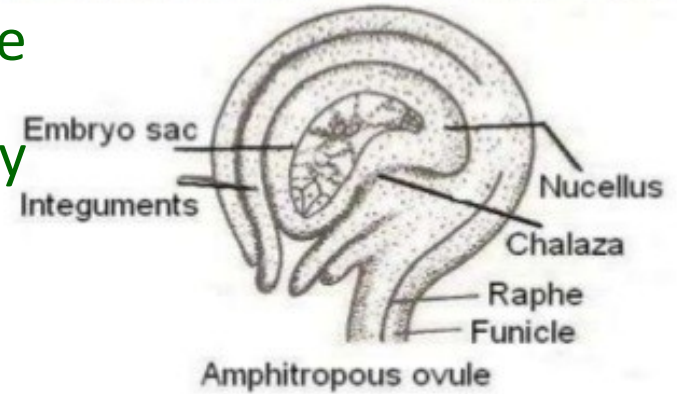
e.g. *Cappsr*, *Cruciferae* , *Mirabilis jalapa*.



(5) Amphitropous / Transverse

Here, ovule and embryo sac also curved like horse shoe. Micropyle placed transversely at a right angle to funicle.

E.g. *Alismaceae* , *Butomaceae*.



(6) Circinotropous Type

Initially the ovule is Orthotropous type but with continuous unilateral growth the ovule becomes Anatropous and subsequently the micropyle again points upward in fully mature Ovule.

E.g. *Opuntia* and *Plumbago*.



Development of Megasporogenesis

Ovule is developed from megasporangium.

The archesporial cell often divides once into outer primary parietal cell and inner primary sporogenous cell.

Primary parietal cell may divide one or more times.

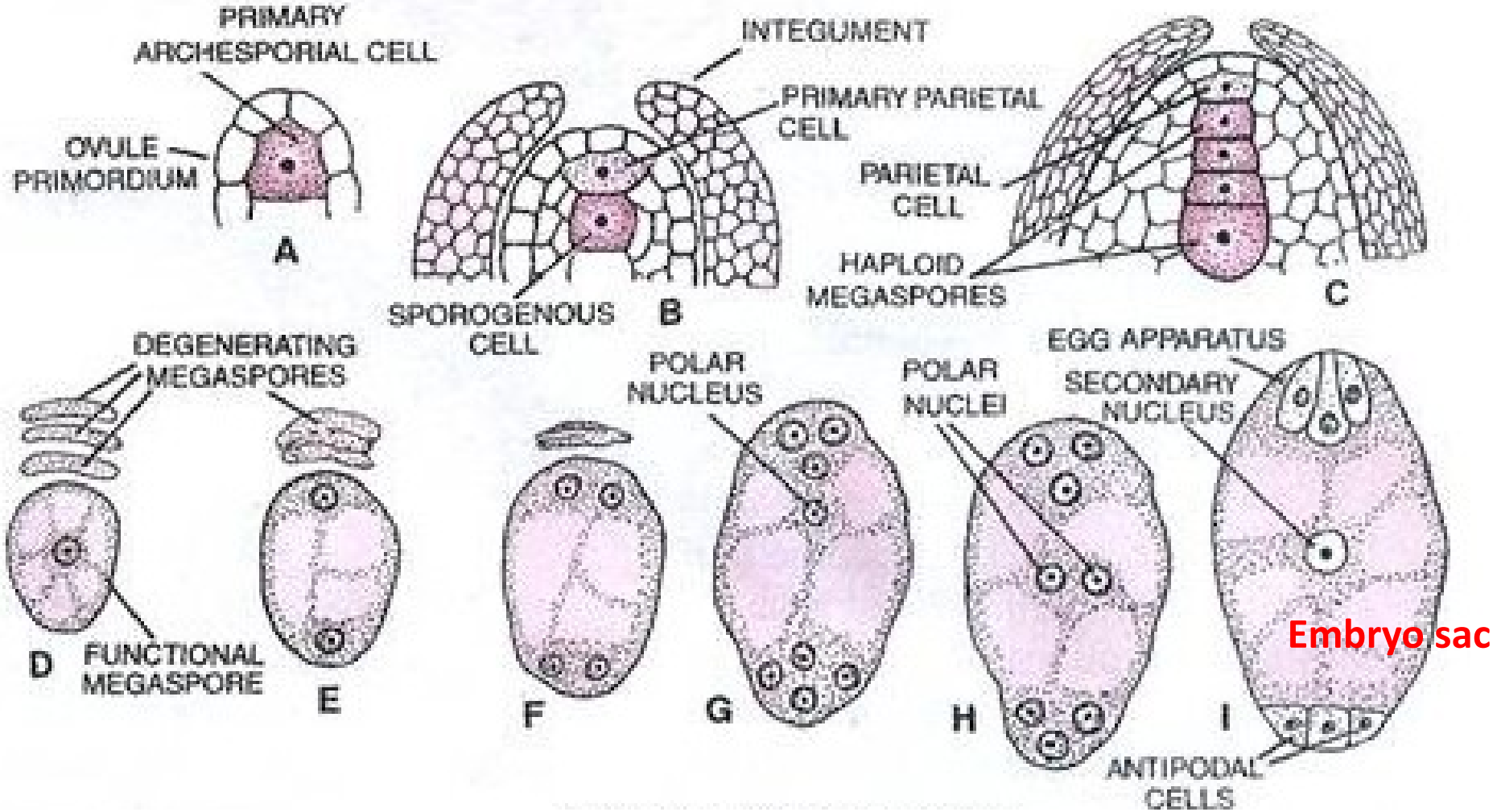
The primary sporogenous cell commonly functions directly as **diploid megaspore mother cell** or **megasporocyte**.

The **megaspore mother cell (MMC)** undergoes meiosis division to forms a **linear tetrad of 4 haploid megaspores**.

Formation of haploid megaspores from **diploid megaspore mother cell** is called **megasporogenesis**.

Commonly the chalazal megaspore remains functional while the other 3 degenerate.

Development of female gametophyte / Megasporogenesis



Figures: Megasporegenesis

Development of Female Gametophyte (Mega-gametogenesis):

The functional megaspore is the **first cell of female gametophyte (embryo sac)**.

Functional megaspore is take place first mitotic division to form **two nucleate** embryo sac.

The two nuclei shift to the **two ends** and both nuclei again divide by mitotic to forming **four nucleate**.

Then our four nuclei again take place mitotic division to form **eight nucleate structure** of embryo sac.

One nucleus from each side moves to the centre of embryo sac.

The centre of two nuclei as called **polar nuclei / secondary nucleus**.

Three antipodal cells at the chalazal end and remain three nuclei cells are present micropylar region (1egg +2 synergids).

Embryo sac developed from a **single megaspore** is called **monosporic**.

Structure of Embryo Sac (Female Gametophyte):

In angiosperms, the female gametophyte is called **embryo sac**.

Embryo sac is an **oval multicellular haploid structure** which is embedded in the nucellus towards micropylar half of the ovule.

It is covered over by a thin membrane derived from the parent megaspore wall.

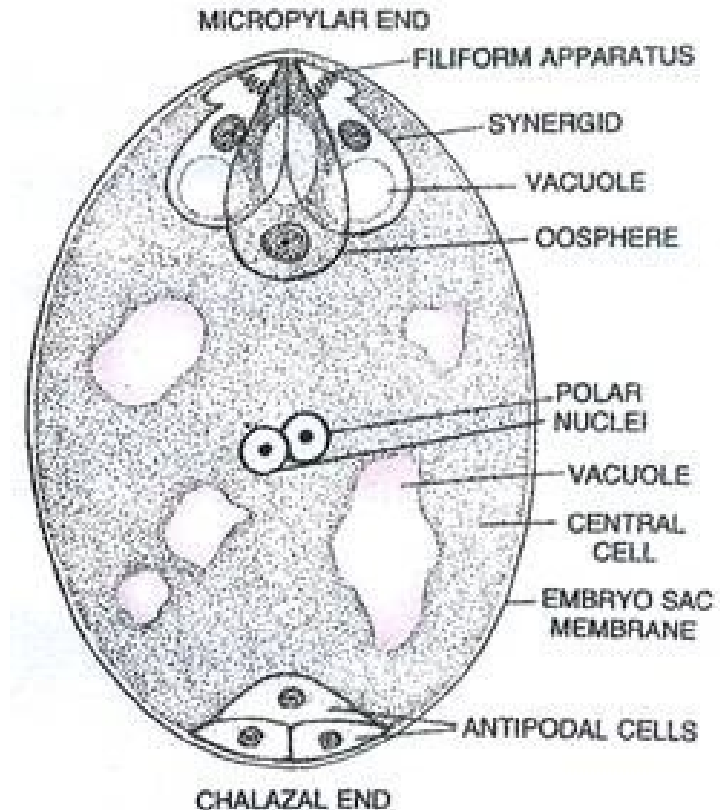
The typical and most common type of embryo sac, found in 80% flowering plants is **Polygonum type**.

Embryo sac have been 8 nucleus which is embedded in the nucellus.

Nucellus is nutritive tissue for growing egg and synergids.

Among 8 nucleus, two synergids and one egg nucleus are present in micropyle region, three antipodal cells are present in the chalazal end and two polar nuclei at the center of embryo sac.

Embryo sac



Thank You