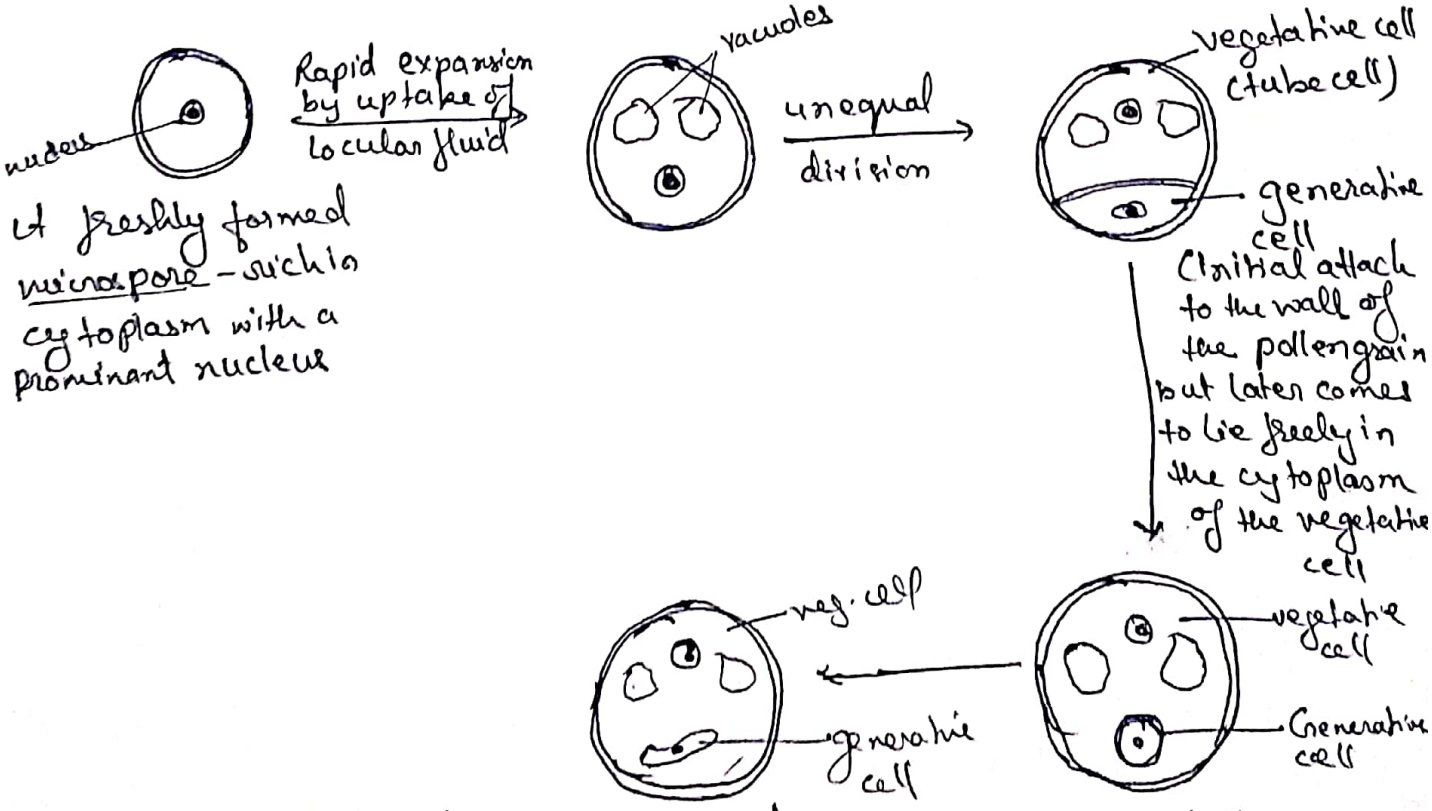
① Male Gametophyte Development (Microgametogenesis)

→ Formation of pollen grains

→ Microspores represent the beginning of the male gametophytic generation. Older microspores particularly after their release from the tetrads are referred as pollen grains. During gametogenesis, the pollen nucleus divides to form a large vegetative cell and a small generative cell. Generative cell undergoes another mitosis to form two sperms (male gametes). The generative cell may divide inside the pollen grain or in the pollen tube, after the pollen has germinated.



↓ freshly formed microspore - with a cytoplasm with a prominent nucleus

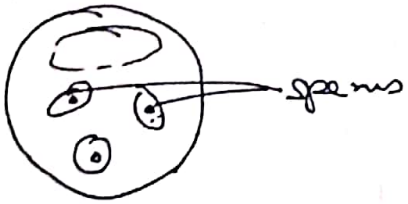
Immediately after becoming detached from the pollen wall, the generative cell is spherical. After that, it undergoes a lot of changes, usually the cell elongates, sometimes to such an extends that in mature pollen grain it appear vermiform (elongated) probably to facilitate movement into the pollen pollen tube

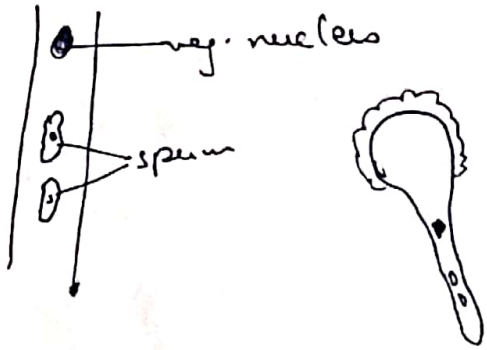
→ Synchrony in development within different microspores is not observed as now there is no connection between them

→ At the same time when these changes are going on, the microspore is also synthesing its wall.

Formation of sperms

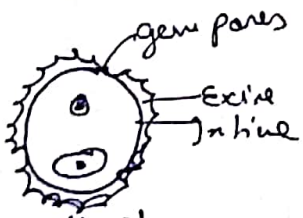
Sperms are formed by a mitotic division in the generative cell. This may take place while the pollen grains are confined to the anthers or it may take place after the release of the pollen. In the former condition the pollen are shed at the 3 celled stage and in the latter at the 2 celled stage. (60% in 2 celled)
In 2-celled stage the generative cell may divide inside the pollen grain after it has alighted on the stigma or in the pollen tube before it reaches the embryo sac (common)





Pollen wall

The wall of the mature pollen grain is stratified. It comprises two principal layers; the inner one is called intine & the outer exine. Exine comprises many sub layers



Intine — 1) is pecto cellulosic
2) presence of beads, ribbons or plates of enzymatic proteins particularly in the vicinity of germ-pore

→ Pollen wall show various sculpturing pattern. It is very thin, called germ pore (region where pollen tube come out) one or more loci

→ Exine — composed of sporopollenin, it is derived from carotenoids by oxidative polymerisation. Sporopollenin is resistant to physical & biological decomposition. Because of this property the pollen grains are often preserved for long periods in fossil deposits. wall protects pollen in its hazardous journey.

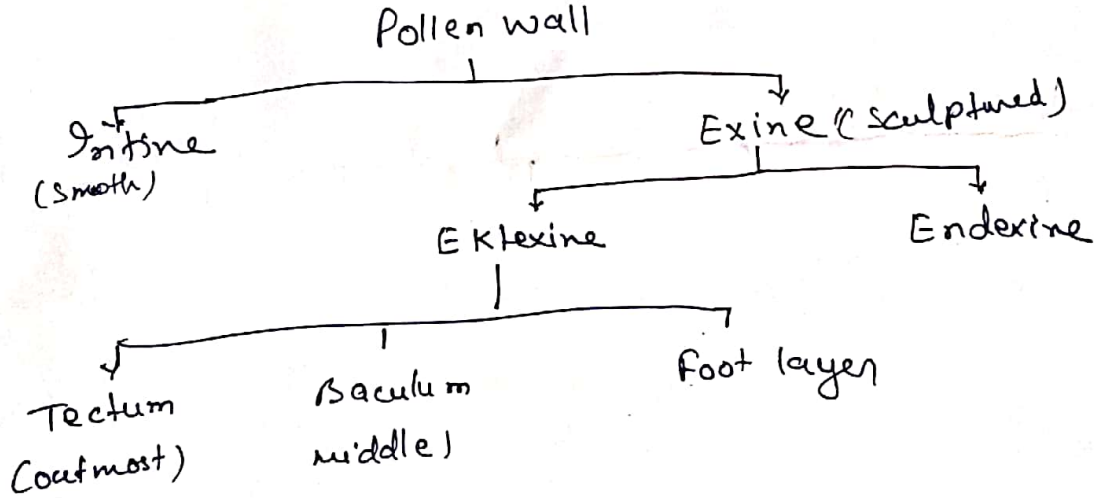
Different sculpturing patterns on the exine have proved of much taxonomic value. They usually permit the assignment of an individual grain to the family, genus or rarely to species.

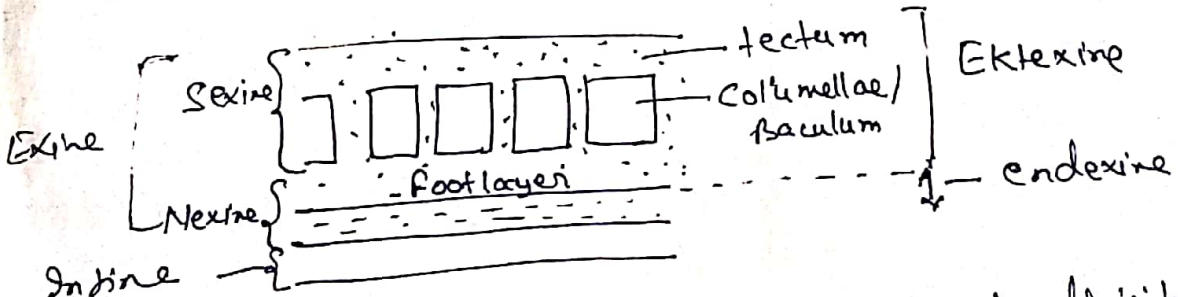
The study of external morphological features of mature pollen grains is referred as Palynology.

(5) Pollen wall

→ wall material is contributed by the cytoplasm of the spore as well as tapetal cells.
→ callose wall digested by callase
→ Ubisch bodies (Lipid) appear in tapetal cell, get coated by sporopollenin & are involved in external thickening of exine

Pollenkitt – is an oily layer found on the outside of the mature pollen grains of many insect pollinated sp. (entomophilous) Comprises lipid & carotenoids (for colour) ! forms a homogeneous coating on exine rendering the pollen sticky
acting as an insect attractant, protecting pollen against the damaging effects of UV radiation, adherent to insect body





→ Exine stratification – Morphologically the exine is divisible into 2 distinct layers a) outer sculptured layer called sexine b) inner non-sculptured layer nexine. The sexine further comprises an internal layer of upright rod-like element, the columellae (bacula) covered over by a roof like layer, the tectum. The exine is thus, typically 3-layered consisting of tectum, columellae & nexine. The tectum may be smooth or have various types of processes Chemically the exine is differentiated into two layers called ektexine and an inner layer endexine.

(4)

→ Exine structure - Structurally the exine is of 3 basic type
a) Tectate — tectum is continuous
b) Semitectate — tectum is perforated
c) Intectate or atectate — no tectum, columellae are free & exposed

→ Exine sculpturing - The exposed surface details of the pollen wall constitutes the sculpturing. Some of the important types are: psilate (smooth), foveolate (pitted), fossulate (grooved), scabrate (very fine projections), verrucate (warty), baculate (rod like), echinate (spiny) etc.

→ Shape and Size of pollen — various types → flat, round, oval, elongated
size — smallest 10uM (Myosotis)
largest - 200uM (Cucurbitaceae, Nyctaginaceae)

→ Apertures — weak area on the pollen surface, which is directly or indirectly associated with its germination. Long apertures (slit like) are called Colpi and pore like, Porate

→ NPC-System: NPC refers to Number (N), Position (P) and Characters (C) of aperture. A system to classify pollen grains on the basis of aperture.
Some examples :-
Pollen grains without aperture - Atreme (N_0), Monotreme (N_1), Ditreme (N_2) .... Polytreme
Position of Aperture — Catatreme: when on proximal face
Anatreme — on distal face

many more ----