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Semester: I

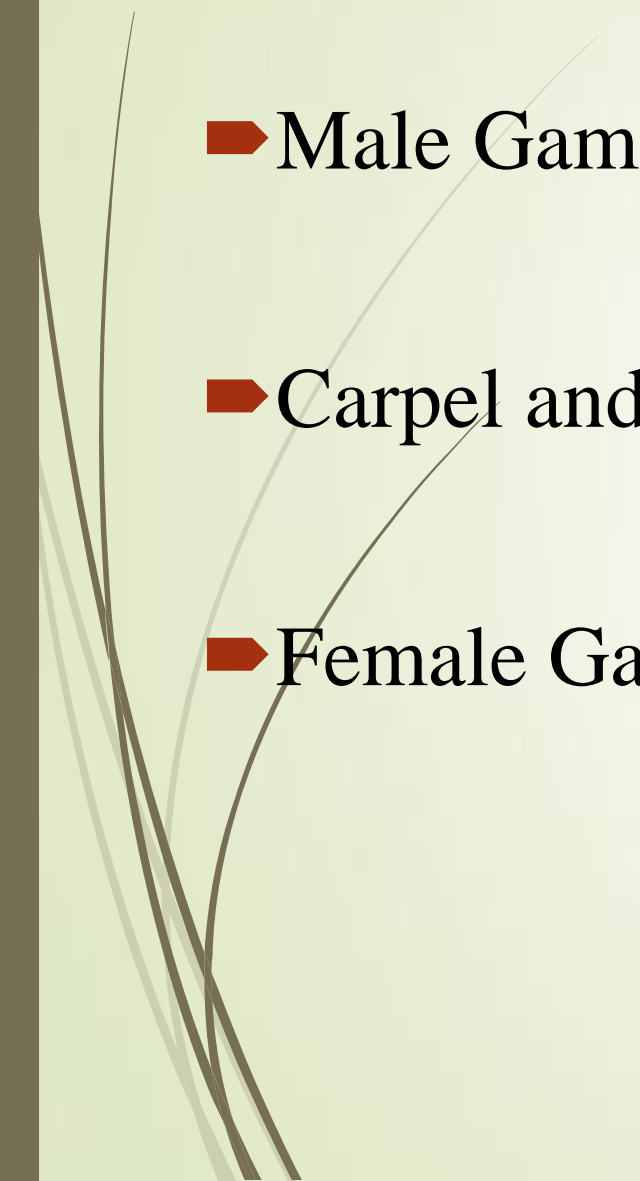
Paper: I

Bo: 112 Plant Morphology And Anatomy





Stamen and Microsporogenesis

- Male Gametophyte or male germ unit development
 - Carpel and megasporogenesis
 - Female Gametophyte or Female germ unit development
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Stamen and Microsporogenesis:

Stamens are the male reproductive structures in a plant. The structure of a stamen consists of 3 important parts:

Filament

- Stalk that bears anthers

Anther

- Bilobed, dithecous structure at the tip of filament
- Each lobe has 2 pollen sacs/ microsporangia
- A total of 4 microsporangia are present in a anther
- Each microsporangia produce spores, which later develop into pollen grains

Connective

Part attached to the back of anther

➤ **Microsporogenesis:**

The process of the formation and differentiation of microspores (pollen grains) from microspore mother cells (MMC) by reductional division is called microsporogenesis.

➤ If the transverse section of a microsporangium is observed carefully, it is seen that there are 4 layers surrounding the microsporangia:

➤ **Epidermis**

➤ **Endothecium**

➤ **Middle layers**

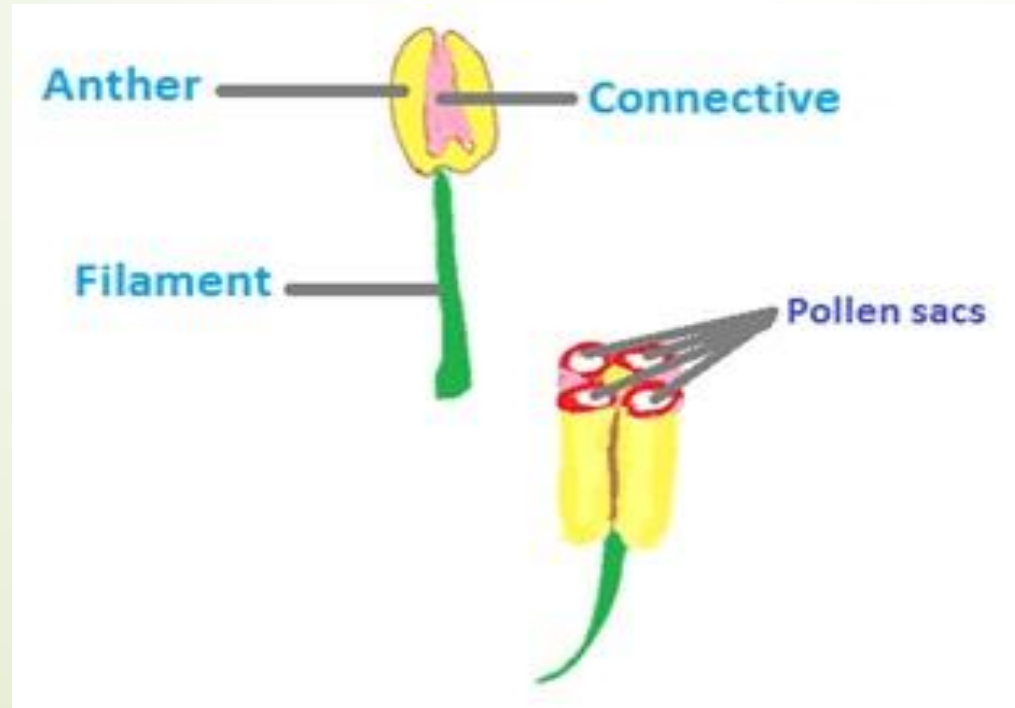
➤ **Tapetum**

➤ The first three ensure protection of the microsporangium, while the innermost layer, Tapetum provides nourishment to the pollen grains.

➤ Sporogenous tissue is present at the centre of each microsporangium.

Microsporogenesis is well studied under following heads :

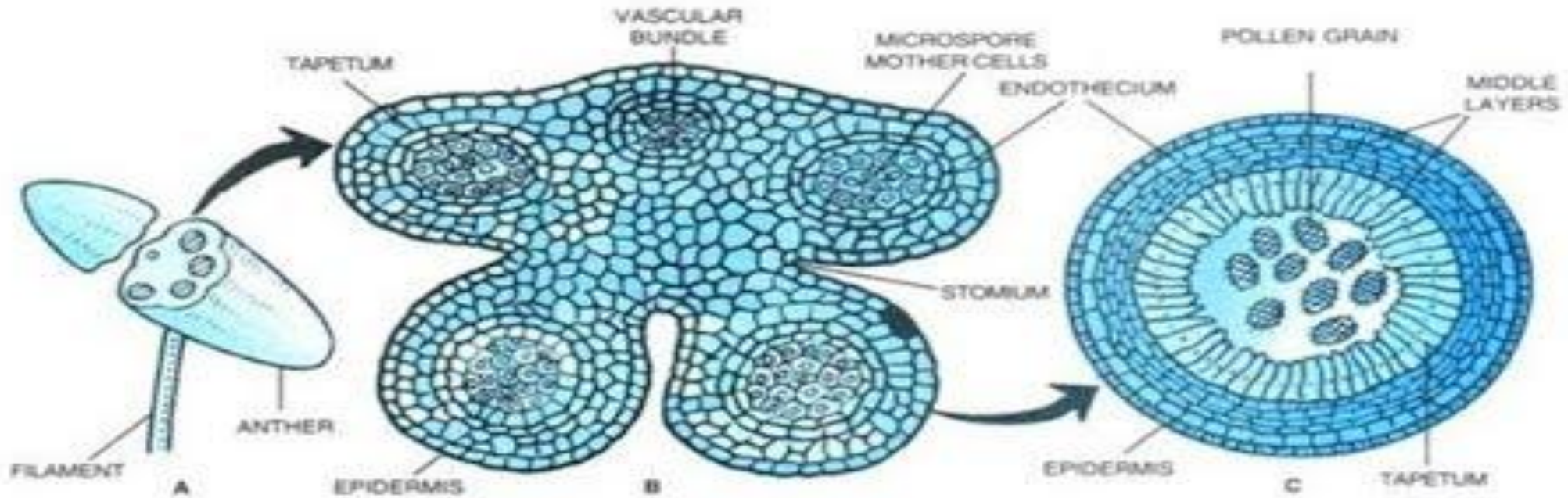
(1) **Structure of anther** : The fertile portion of stamens is called anther. Each anther is usually made up of two lobes connected by a *connective*. In turn each anther lobe contains two pollen chambers placed longitudinally. Each pollen chamber represents a *microsporangium* and is filled with a large number of *pollen grains* or *microspores*.



➤ The pollen sacs are surrounded by following 4 layers :

- (i) **Epidermis** : This is the outermost single layered and protective. The cells of epidermis develops a fibrous thickening and the epidermis is designated as exothecium.
- (ii) **Endothecium** : Inner to epidermis, there is a single layer of radially elongated cells. Cells of endothecium develop fibrous thickening (made up of cellulose with a little pectin and lignin) which help in the dehiscence of anther. In between these cells, a few cells without thickening are also present. These thin walled cells collectively form the *stomium*.
- (iii) **Middle layer** : Three to four layers of thin walled cells situated just below the endothecium are known as middle layers. Cells of this layer are ephemeral and degenerate to provide nourishment to growing microspore mother cells.
- (iv) **Tapetum** : This is the innermost layer of the wall. The cells are multinucleate(undergo endopolyploidy) and polyploid. Tapetal cells are nutritive.

Diagram- T.S. Anther Showing Stomium and Pollengrain:


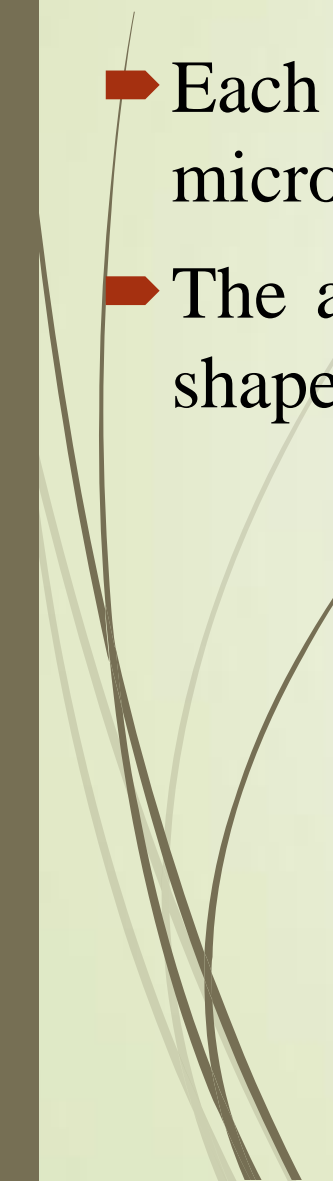


T.S. anther, showing stomium and pollen grains.

(2) Development of anther and formation of microspores (Pollen grains):

- (a) The young anther consists of homogenous mass of paranchymatous cells surrounded by epidermis. It soon becomes four lobed.
- (b) In each of the four lobes, some of the hypodermal cells begin to act as archesporial initials.
- (c) Each archesporial initial divides into an outer primary parietal cell and an inner primary sporogenous cell.
- (d) The primary parietal cell divides to form 3-5 wall layers, i.e., endothecium, middle layers and tapetum.

- (e) The primary sporogenous cells divide to produce a mass of sporogenous cells or microsporocytes.
- (f) Each microspore mother cell divides meiotically to form four haploid microspores or pollen grains and remains arranged in tetrads.
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- The primary parietal cell divides to form 3-5 wall layers, *i.e.*, endothecium, middle layers and tapetum.

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- ➔ The primary sporogenous cells divide to produce a mass of sporogenous cells or microsporocytes.
 - ➔ Each microspore mother cell divides meiotically to form four haploid microspores or pollen grains and remains arranged in tetrads.
 - ➔ The arrangement in the tetrads can be tetrahedral, isobilateral, linear, T-shaped and decussate. Now the microspores are separated from tetrad.
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Microsporogenesis

Sporogenous tissue in microsporangium ($2n$)

Each cell acts as

Microspore or pollen mother cell ($2n$)

Meiosis

Microspore tetrad (n)

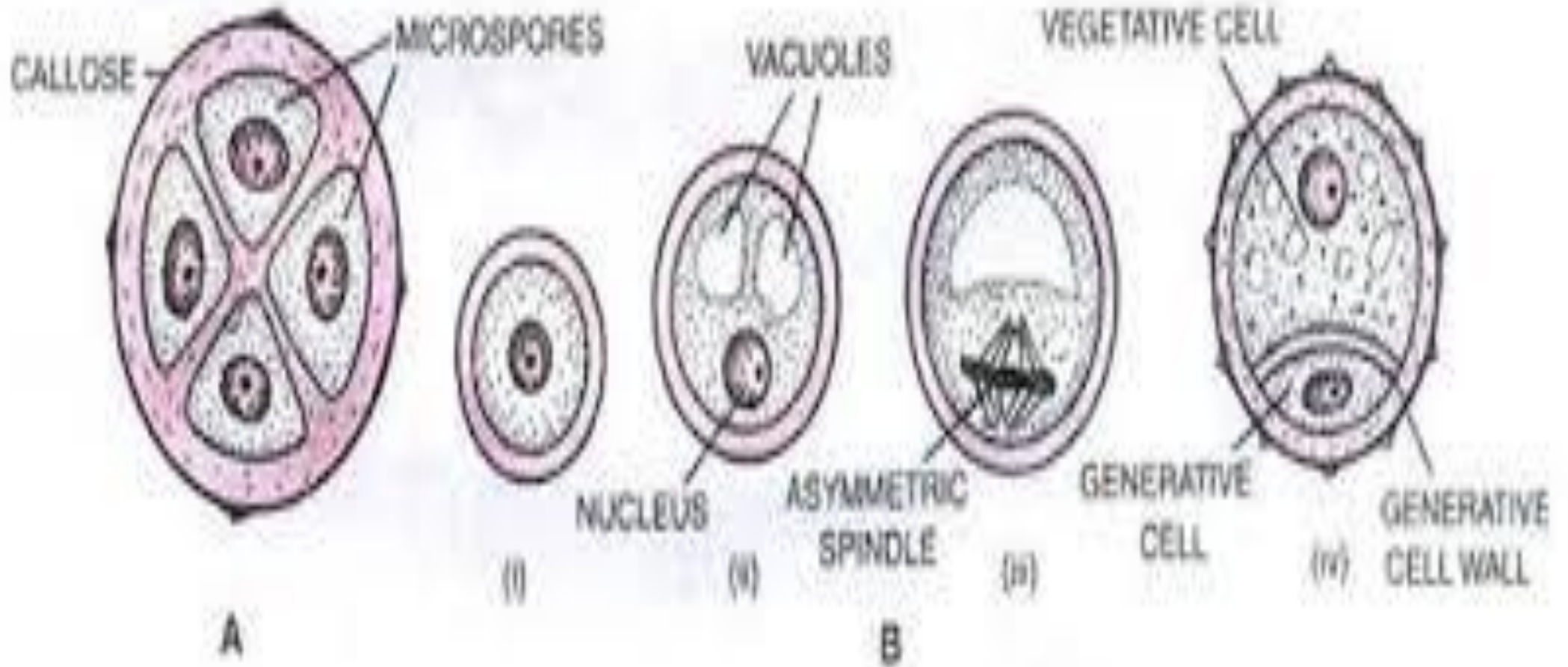
As the anthers mature and dehydrate, the microspores dissociate from each other and matures into

Pollen grains (n)

Microsporogenesis



Diagram- Microsporogenesis



Microsporogenesis. A, a microspore tetrad. B, a microspore maturing into a pollen grain.

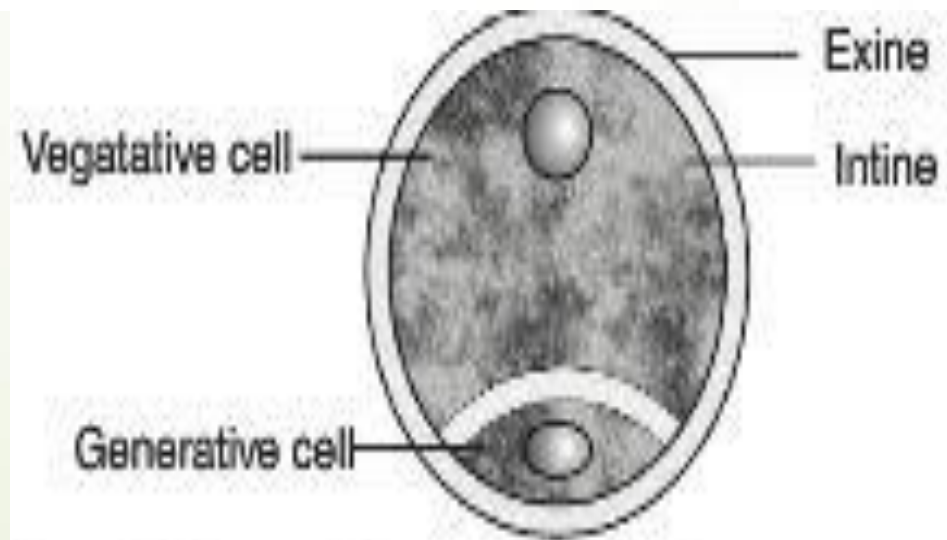
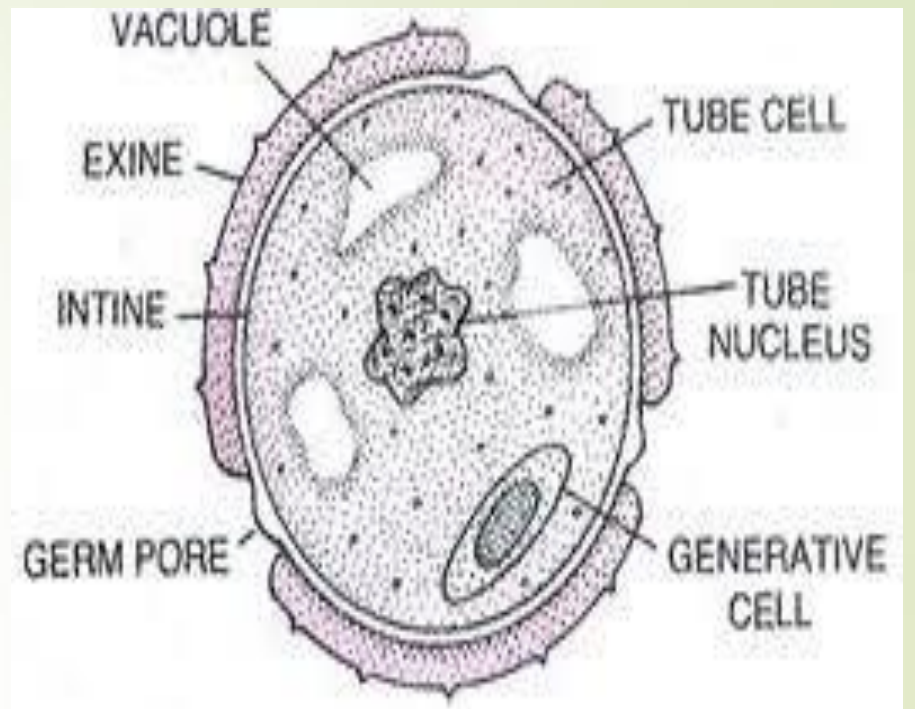
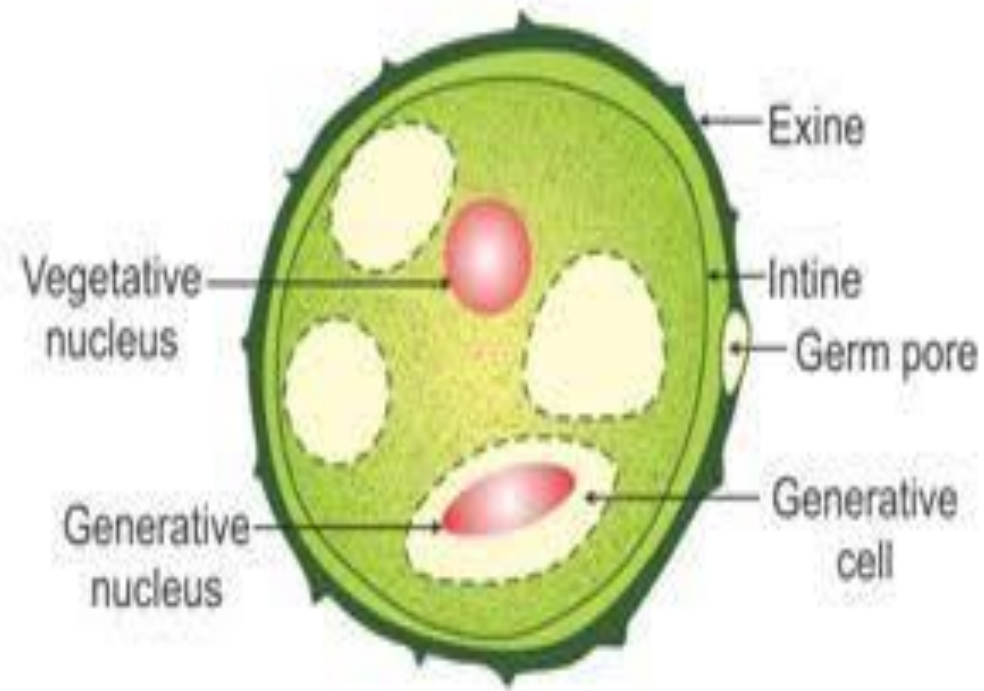


Fig. : Mature pollen grain of angiosperms



Thank you.....