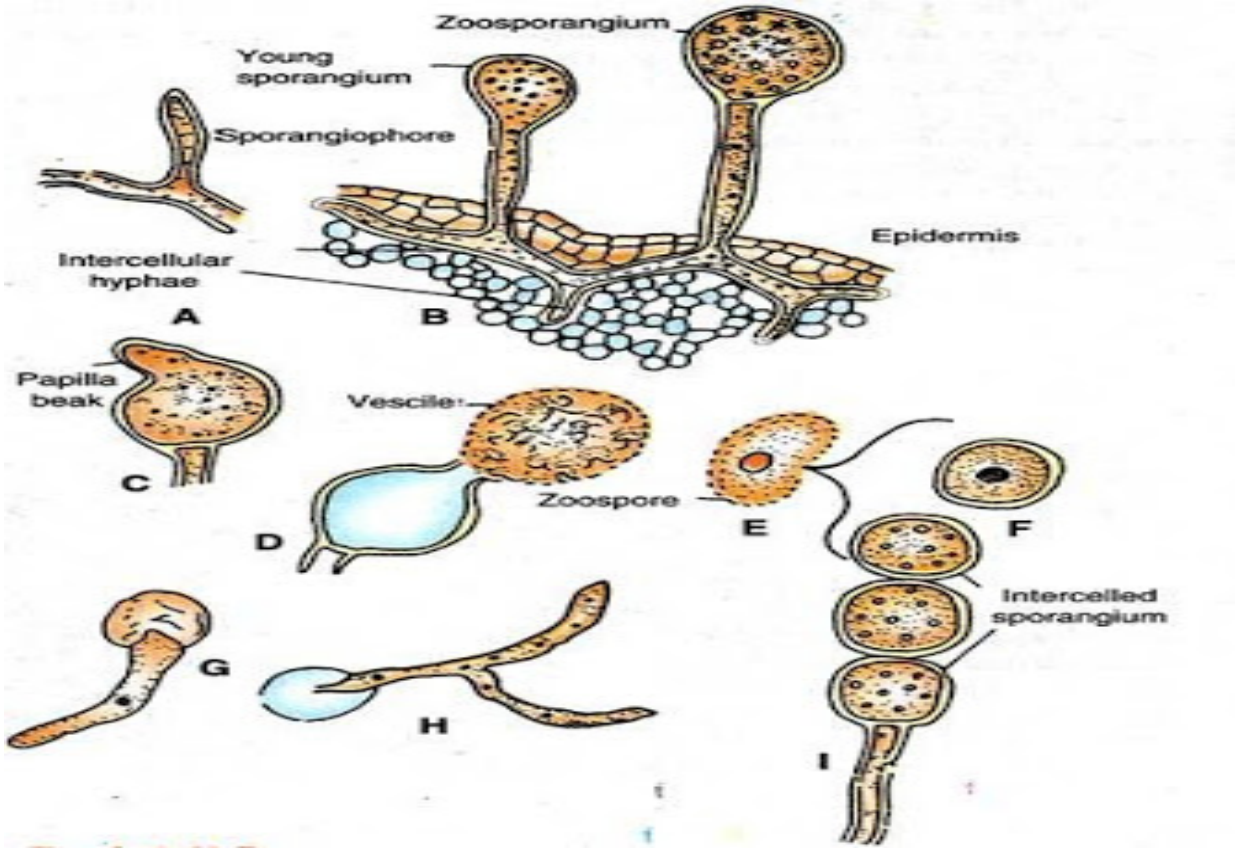
Bhagalpur National College, Bhagalpur

(A Constituent unit of Tilka Manjhi Bhagalpur University, Bhagalpur)

PPT Presentation for B.Sc. I- Life Cycle of Pythium



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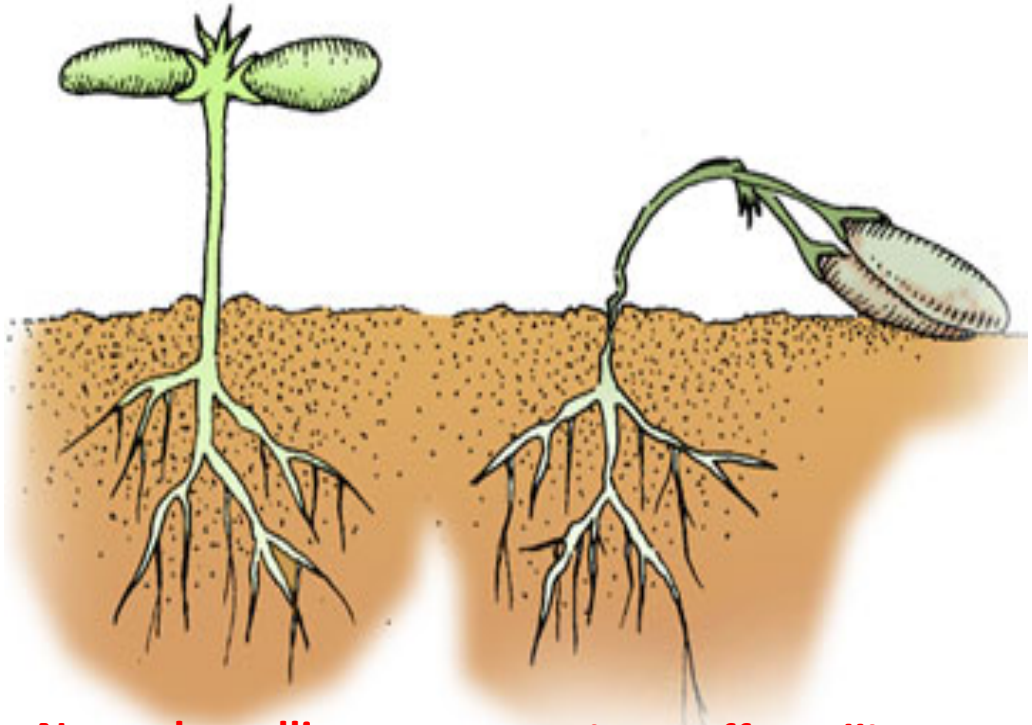
Pythium

Kingdom- Fungi
Division- Eumycota
Sub Div-Mastigomycotina
Class –Oomycetes
Order- Peronosporales
Family- Pythiaceae
Genus- Pythium

- The genus *Pythium* (Gr. pythein — to cause to rot) is represented by 92 species, of which 28 species are reported from India.
- Several species of *Pythium* grow as sapro-phytes in soil, in water; on decaying matters, but some are facultative parasites causing root rot (root tips), fruit rot (watery fruits) and damping off of both pre-emergent and post-emergent seedling of numerous angiospermic plants.
- *P. debaryanum*, *P. ultimum*, *P. aphanidermatum* and *P. irre'gulare* cause damping off of seedling, of which P. *debaryanum* is very common and causes damping-off of seedling of tobacco, chilli, tomato and mustard. P. gracilis grows as parasite on *Vaucheria.*



Normal seedling

Damping – off seedling

Damping – off seedling

Pre-emergence damping-off: Seeds may rot before germinating or seedlings may die prior to emergence.

Post-emergence damping-off: Young seedlings develop a rot at the crown; later, the tissue becomes soft and constricted and the plants wilt and fall over.

List of the pathogens along with diseases caused by them is given in Table

Table 4.1 : Important diseases caused by different species of *Pythium*

Causal Organism	Disease
1. *Pythium debaryanum*	"Damping-off" of tobacco, tomato, castor, chilli and cress (*Lepidium*).
2. *P. aphanidermatum*	"Rhizome rot" of ginger, "Foot rot" of papaya (*Carica papaya*), "Damping off" of potato and "Fruit rot" of cucurbits.
3. *P. myriotylium*	"Rhizome rot" of ginger.
4. *P. graminicolum*	"Rhizome and root rot" of turmeric.
5. *P. indicum*	"Fruit rot" of lady's finger (*Hibiscus esculentus*).
6. *P. butleri*	"Fruit rot" of cucurbits.

Vegetative structure

- The mycelium represents the vegetative or somatic phase of the fungus.
- It is well developed, and coenocytic. It presents a white, fluffy appearance and consists of long rather slender, hyaline much branched.
- Septa are formed at the time reproduction.
- The hyphae which lie within the host tissues are both intracellular and intercellular.
- Hyphal wall consists of cellulose.
- The hyphal cytoplasm contains numerous small randomly dispersed nuclei, mitochondria and dictyosomes.
- The endoplasmic reticulum, and cytoplasm ribosome are abundant and in the young hyphae.
- The reserve food is in the form the glycogen and there oil globules in addition.
- No haustoria are developed.

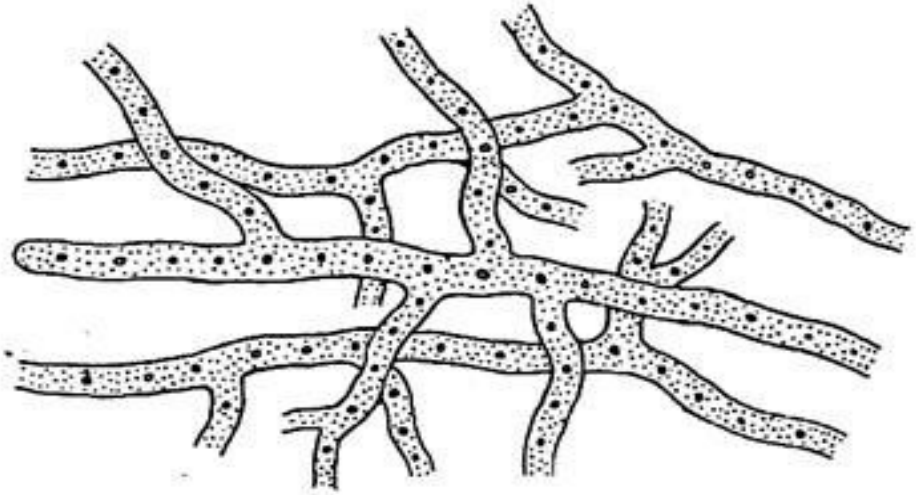


Fig. 4.19 : Vegetative mycelium of *Pythium debaryanum*

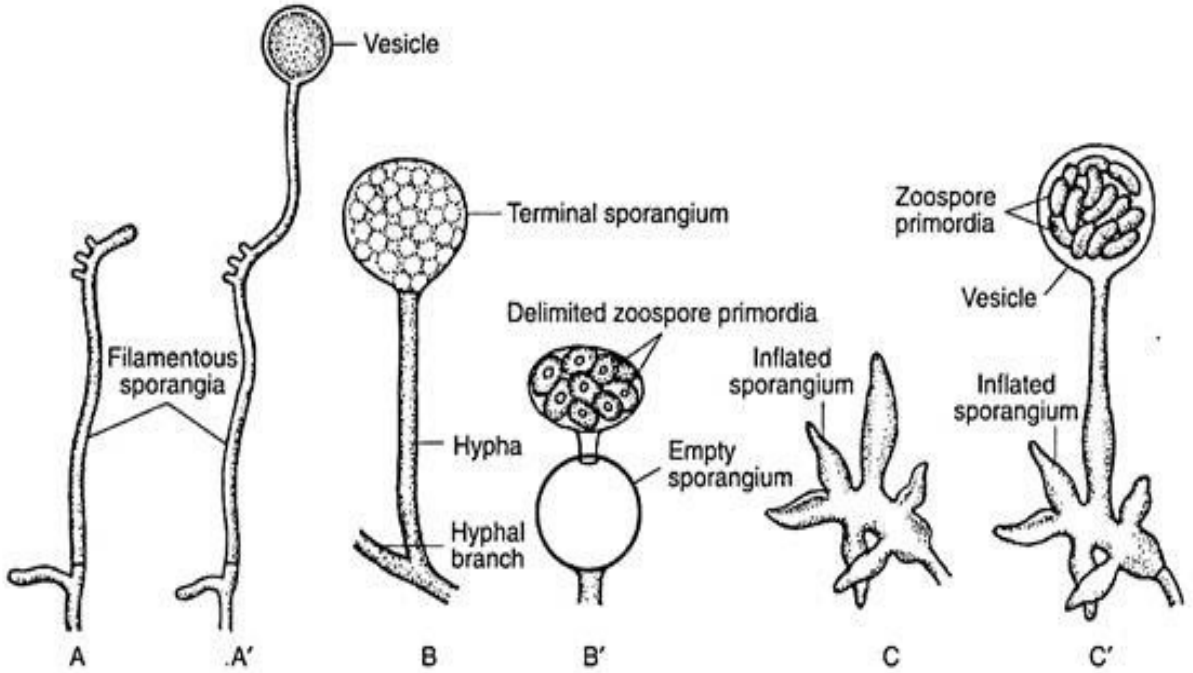


Fig. 4.20 : Different types of sporangia of *Pythium* and their germination : A-A′. Filamentous sporangia, B-B′. Globose sporangia, C-C′. Lobulated sporangia

Reproduction in Pythium

Asexual Reproduction

- It takes place by means of **zoospores** which are produced in small, globular or oval, sac-like sporangia.
- The sporangia are formed singly and terminally at the ends of somatic hyphae which project into the damp atmosphere from the mycelium within the host tissue.
- The sporangium is **multinucleate**.
- During zoospore formation, the clevage of cytoplasm starts in the thin-walled **bubble like vesicle** at the tip of long tube that produced from the sporangium.
- After maturation, wall of the vesicle bursts and the zoospores are liberated.
- The zoospores are of secondary type (i.e., **kidney-shaped**) having two **lateral flagella** attached at the concave region.
- After swimming for sometimes, the zoospores come to rest, encyst and then germi-nate by germ tube to form new mycelium.

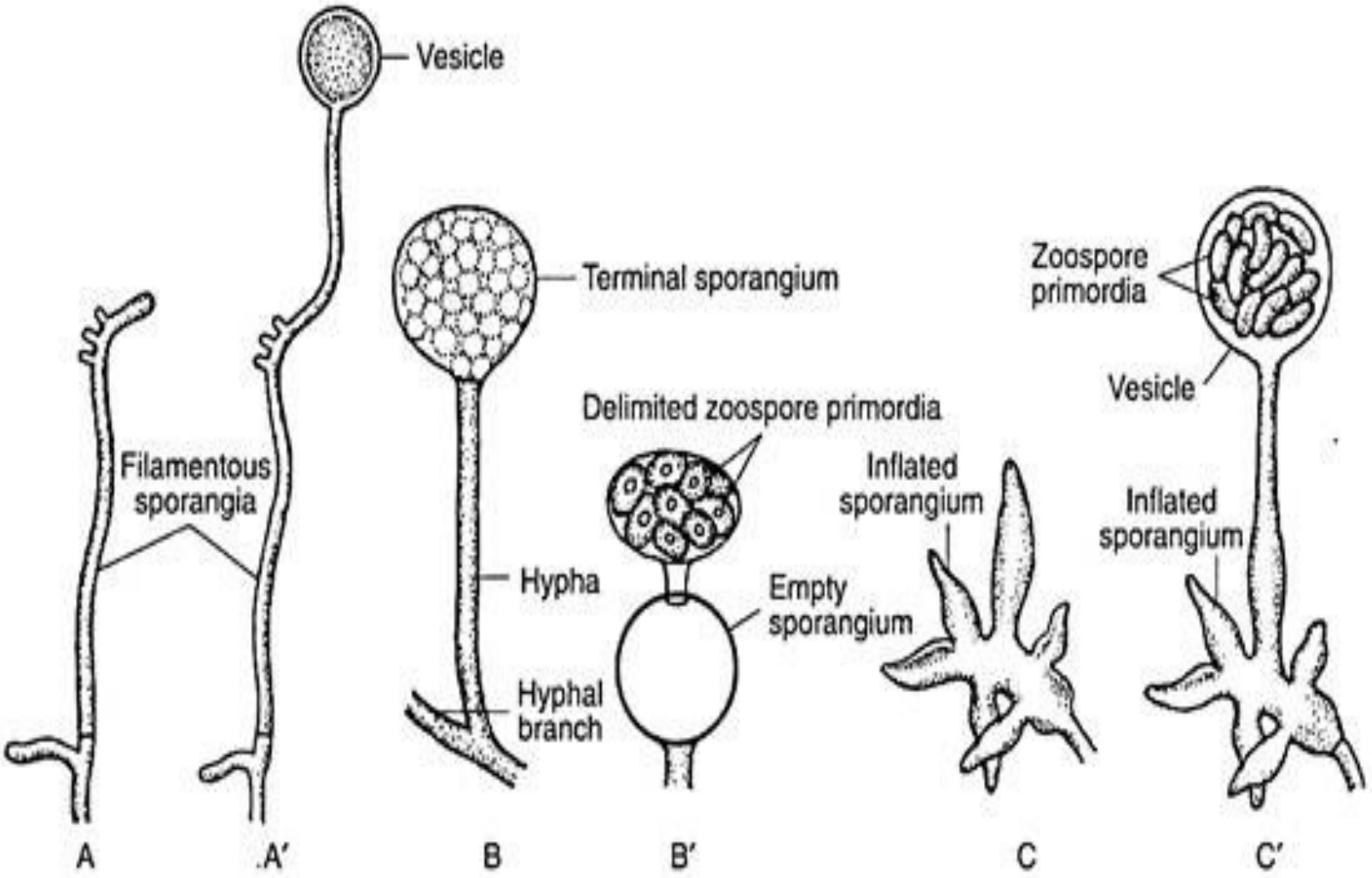


Fig. 4.20 : Different types of sporangia of *Pythium* and their germination : A-A′. Filamentous sporangia, B-B′. Globose sporangia, C-C′. Lobulated sporangia

Sexual Reproduction

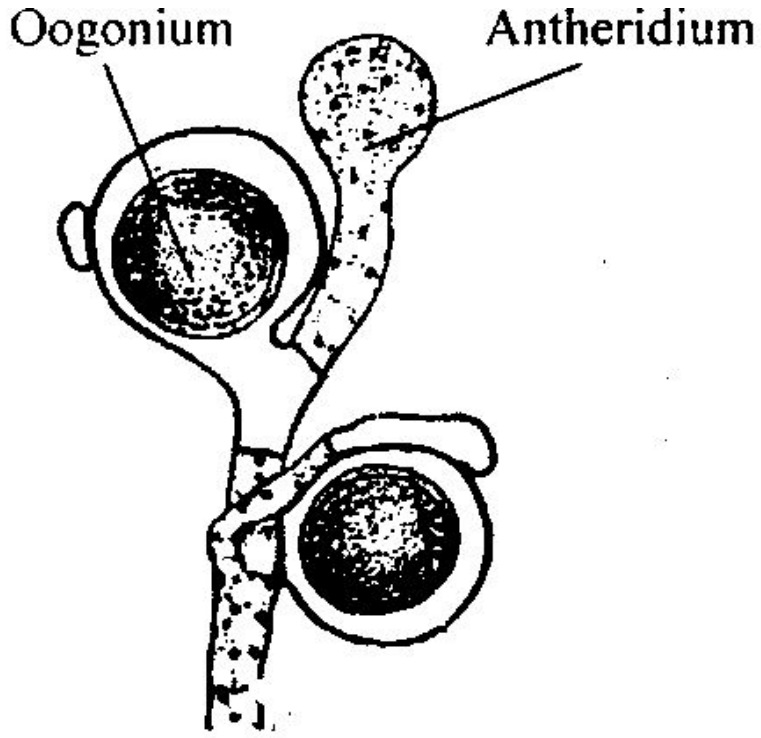
- It is of **Oogamous** type and takes place by gametangial contact at the end of the growing season.
- The sex organs are formed within the dead tissues of the host.
- The male sex organ is antheridium and female sex organ is oogonium.
- Antherium and oogonium are developed in close proximity on separate short, lateral hyphae arising from the same mycelium.

Antheridium structure

- Antheridium is an elongated, club-shaped structure much smaller in size than the oogonium.
- The cell organelles (ribosomes, endoplasmic reticulum, nuclei, mitochondria and dictyosomes) are randomly packed in the cytoplasm of antheridium.
- At maturity the antheridial protoplast becomes differentiated into a central uninucleate portion which functions as the male gamete and the outer periplasm.

Oogonium

- The tip of the female hypha inflates to form a globular swelling.
- Finally the terminal swelling is cut off from the parent hypha by a basal hyphal plug or septa usually after, but sometimes before antheridial contact.
- The separated terminal swelling functions as the young oogonium.
- During fertilization, the mature oogonium its protoplast is differentiated into two zones, outer periplasm and inner ooplasm.



Fertilization

- By **gametangial contact** tip of the antheridium applies itself closely to the oogonial wall and becomes flattended at the point of contact.

- Before fertilisation, a fertilisation tube deve-lops by the antheridium at the contact wall of oogonium through which one of the male nuclei passes and fertilises the egg.

- The fertilised oosphere develops into a thick walled, smooth oospore or zygote.

- The oospore germinates after a period of rest.

- The pattern of oospore germination depends on the variation of environmental temperature. At high temperature **(28°C),** the oospore germinates by **germ tube**, while at low temperature between **10-1 7°C**, the germ tube elongates at a length of 5-20 µm, then swells up at the tip and forms a vesicle in which **zoospores develop.**

- The zoospores come out of the vesicle after bursting the vesicle wall. After swimming for some time, the zoospores become encysted and take rest. After rest, it germi-nates by germ tube, which develops like the mother mycelium.

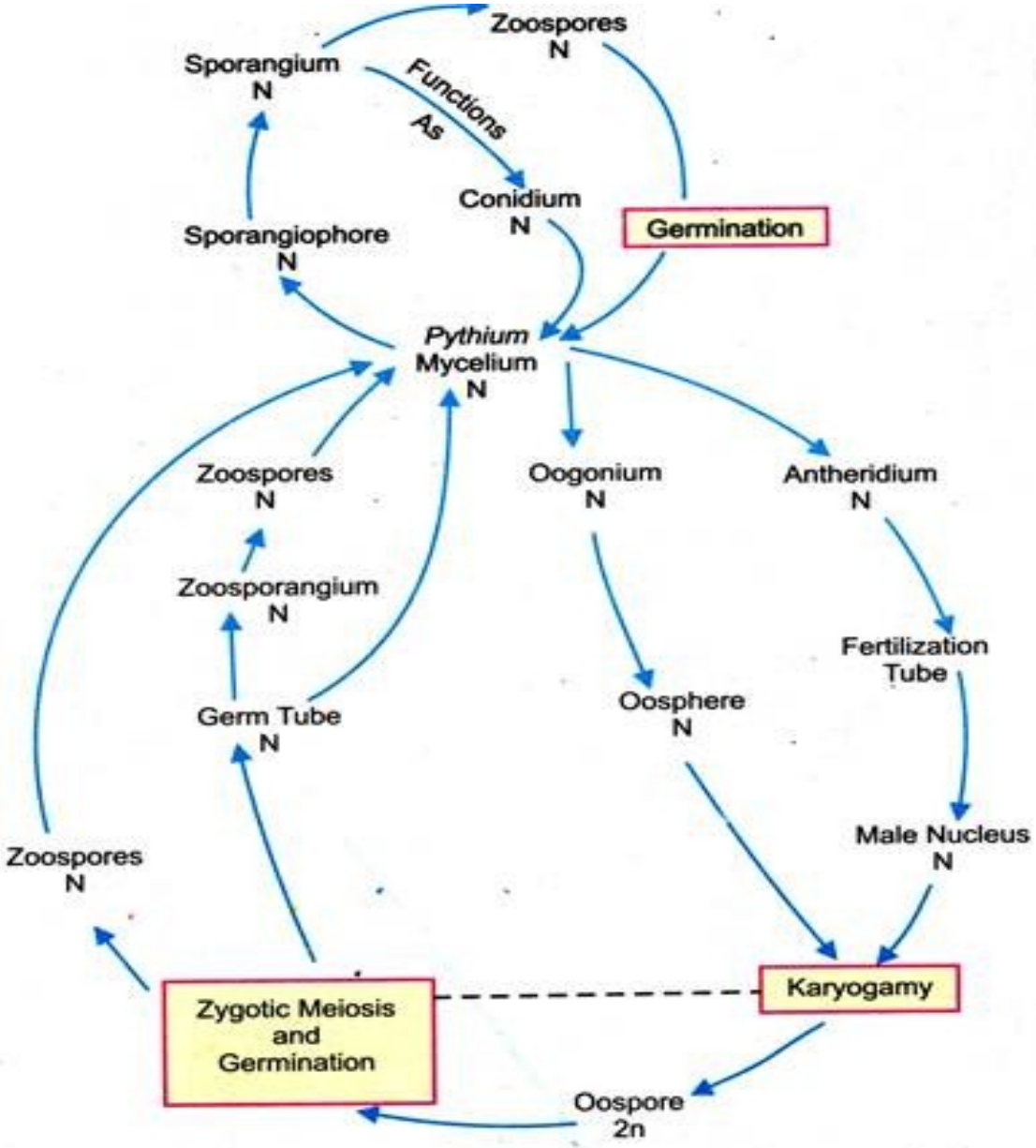


Fig. 6.24. *Pythium.* Word diagram of life cycle with zygotic meiosis.

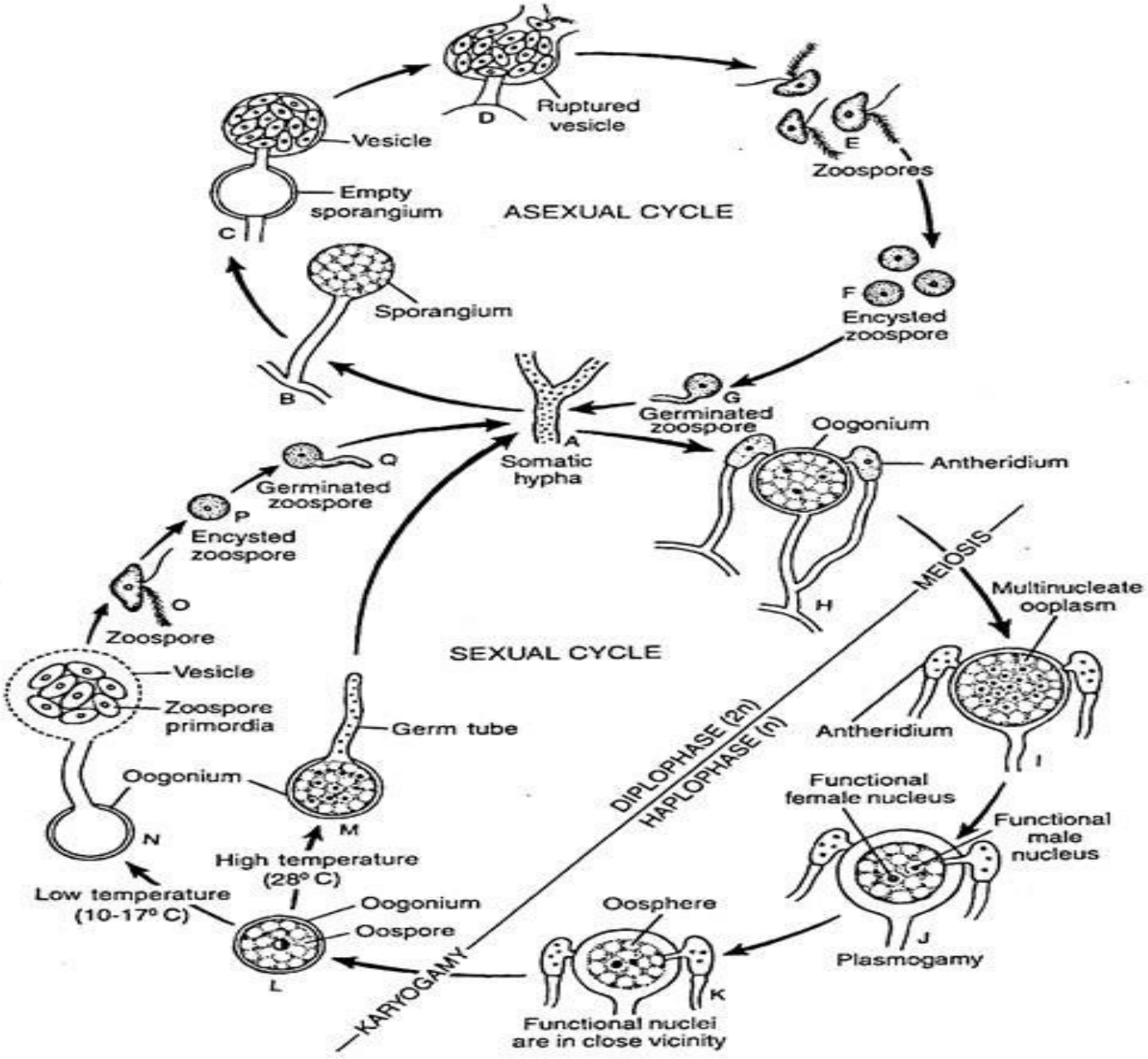


Fig. 4.21 : Life cycle of *Pythium debaryanum*


THANK
YOU!