

Title: Albugo

Class : II BSc Chemistry

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ALBUGO

Albugo is a genus of plant parasitic Oomycetes.

The taxonomy of this genus is incomplete, but several species are plant pathogens. Albugo is one of three genera currently described in the family Albuginaceae.

- This organism causes white rust or white blister diseases in above-ground plant tissues.
- While these organisms affect many types of plants, the destructive aspect of infection is limited to a few agricultural crops, including: beets (garden and sugar), Brussels sprouts, cabbages, Chinese cabbage, cauliflower, collards, gardenress, kale, lettuce, spinach, sweet potatoes, turnips, watercress, and perhaps water-spinach.

- Albuginaceae is represented by more than 25 species. It is an obligate parasite distributed all over the world.
- In India about 18 species of *Albugo* have been reported which attacks mostly crucifers like turnip, mustard, radish, cabbage.

Symptoms of Albugo:

- The disease caused by Albugo is commonly known as white rust because it appears in the form of shiny, white, smooth irregular patches (pustules) or blisters on the leaves, stems and other aerial parts of the plant. The pustules are initially formed on the lower surface of the leaf but in several cases they may be present on both the surfaces.

- With this several other effects are also produced. Increase in the size of the cells (hypertrophy) and organs takes place. It results in the formation of large galls on the various parts of the host (Fig. 1 B-D). Severe infection causes proliferation of the lateral buds, discoloration of flowers, malformation of floral parts and sterile gynoecium.

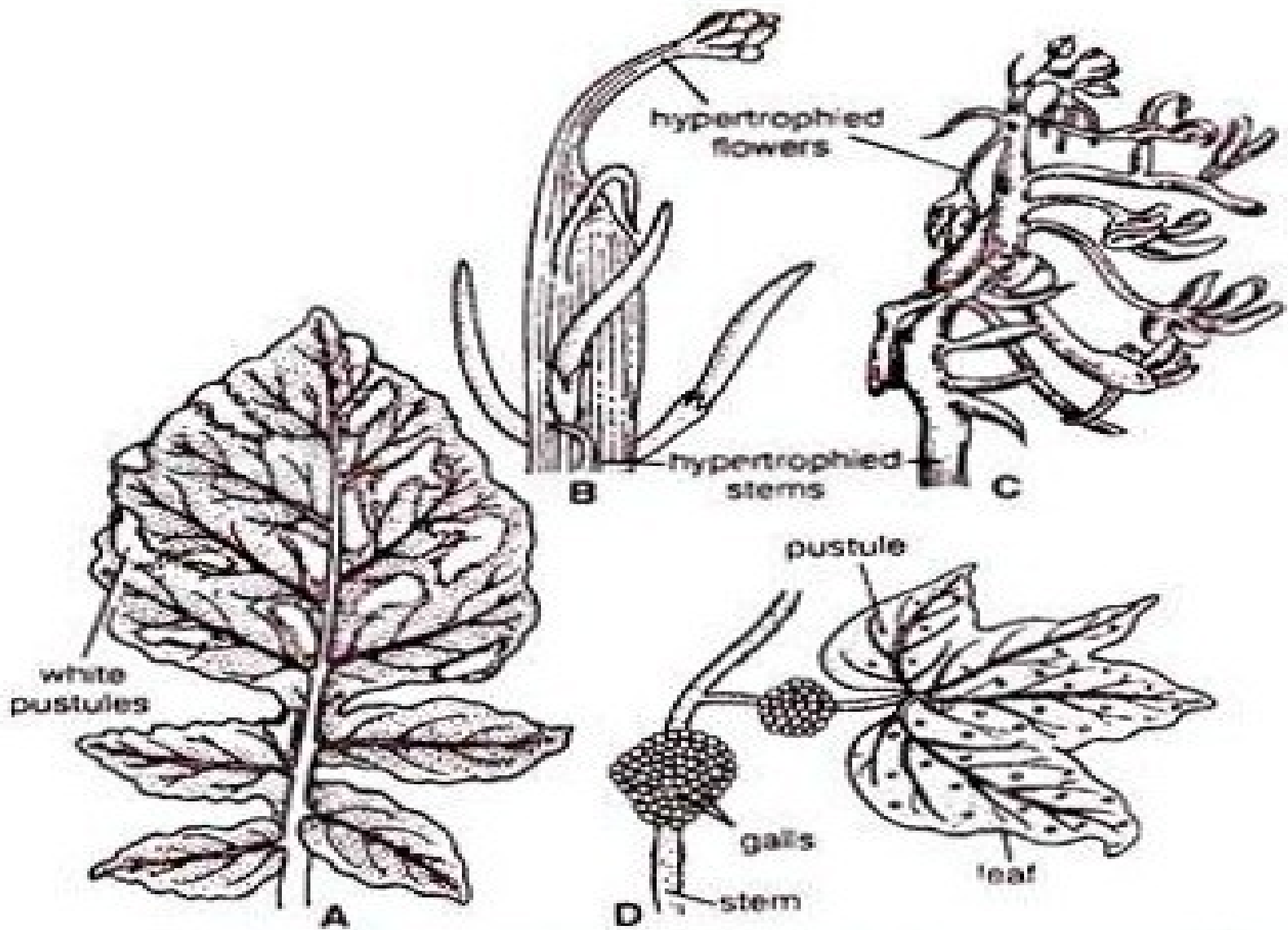


Fig. 1. (A–D). Albugo : Symptoms. (A) Infected radish leaf showing pustules; (B–C) Hypertrophied flowers and stem; (D) Galls on stem

Vegetative Structure of Albugo:

- Thallus is eucarpic and mycelial. Hyphae are intercellular, coenocytic, aseptate and profusely branched. Cell wall is composed of fungal cellulose. The protoplasm contains a large number of nuclei distributed in the cytoplasm.
- Reserve food material is in the form of oil drops and glycogen bodies. Some mycelium is intracellular in the form of knob-like haustoria for the absorption of food material from the host cells.

It can be differentiated into two parts:

- (a) Haustorial head, and
- (b) Narrow stalk.
- The cytoplasm of the head of haustorium is densely packed with mitochondria, ribosomes, endoplasmic reticulum and lipid inclusions but nuclei are absent.
- The base of the haustorium is surrounded by a collar like sheath which is an extension of the host cell wall. Between the haustorium and the host plasma membrane is an encapsulation. Within the plasma membrane of the haustorium lamellae are more numerous than in the intercellular hyphae

Reproduction in Albugo

The fungus reproduces both by asexual and sexual methods .

- ***Asexual Reproduction of Albugo:***

It takes place by conidia or conidiosporangia. They develop on conidiophore or conidiosporan- giophore

Mycelium below the epidermis gives off many erect, short, unbranched, club-shaped hyphae called conidiophores.

Conidiophores lie parallel to one another and perpendicular to the surface of the host, and form a palisade-like layer.

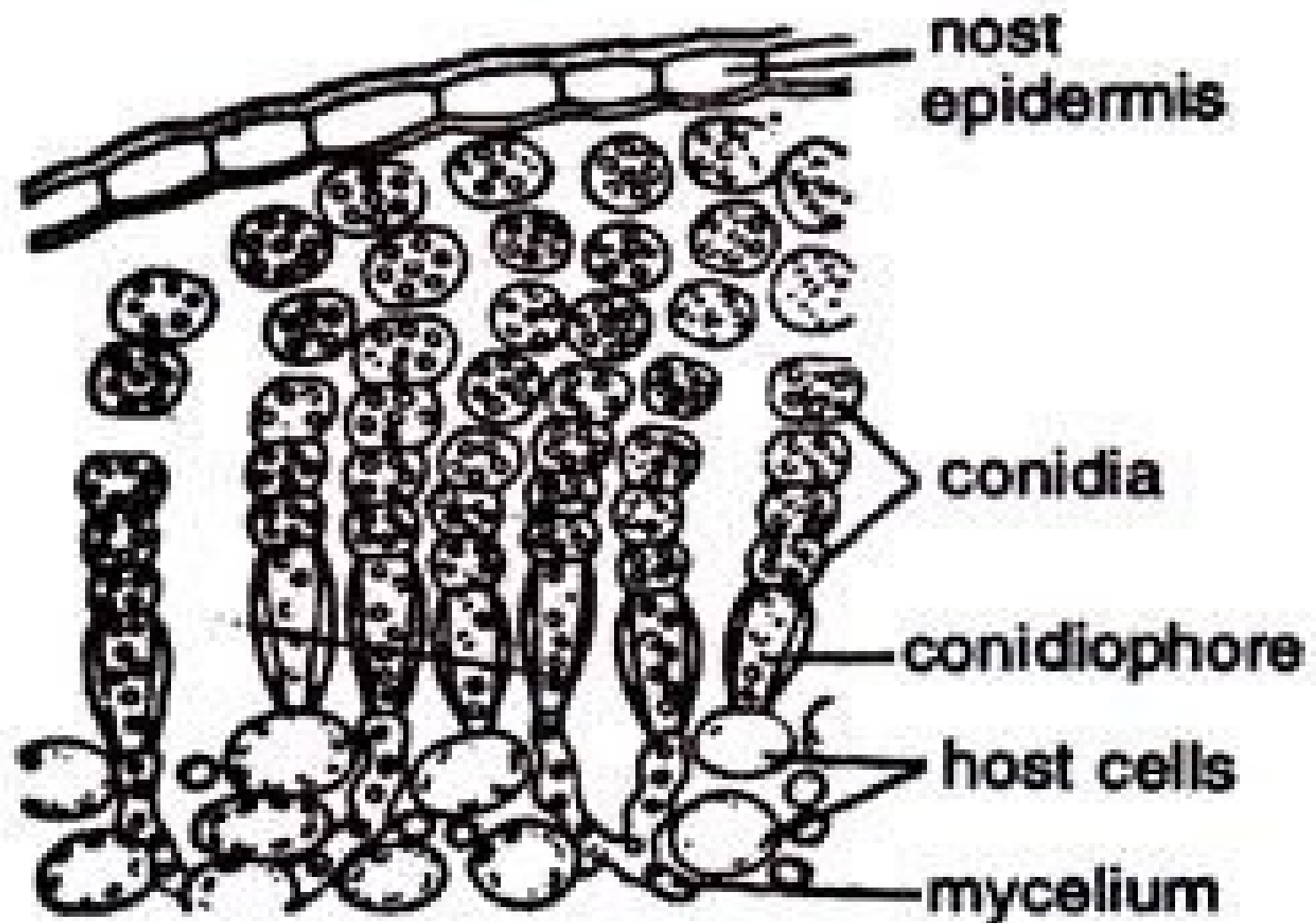


Fig. 71. *Cystopus*. T.S. of infected leaf showing asexual stages.

On the thin-walled apical end of the thick-walled conidiophore are present four to six or more spherical, smooth and hyaline bodies called conidia.

Conidia are arranged in basipetal succession on the conidiophore, i.e., youngest at the base and oldest at the top.

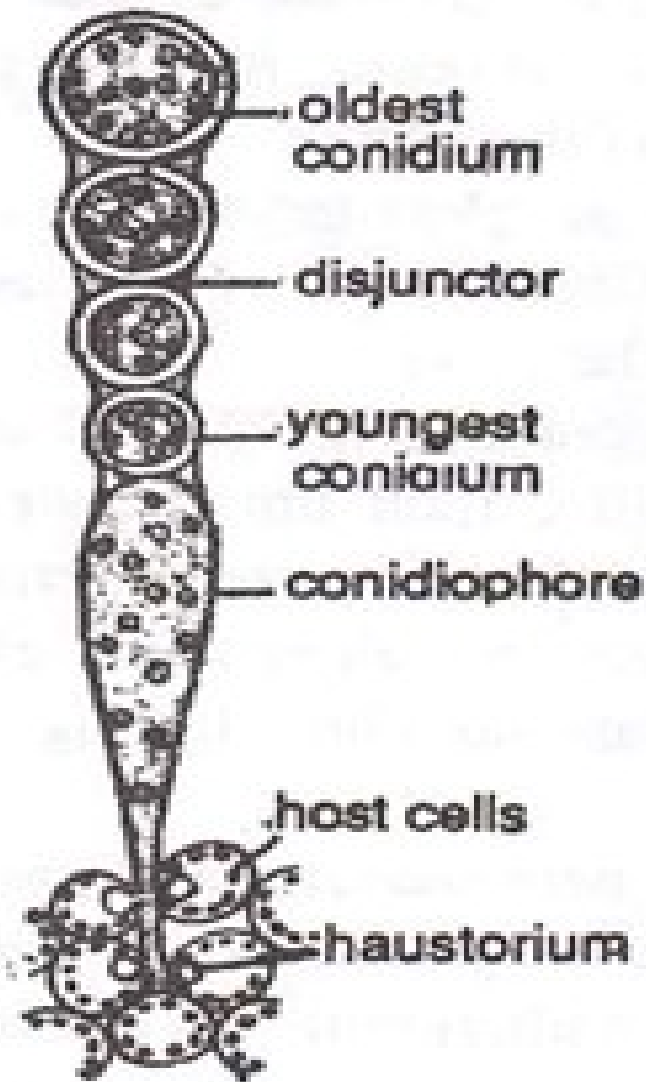


Fig. 72. Cystopus. A single conidiophore with conidia.

In between two conidia is present a pad or disc of gelatinous material called mucilaginous disc or disjunctor.

Each conidium and conidiophore is a multinucleate structure.

In the later stages, the epidermis of the host gets ruptured and conidia disseminate. They germinate either directly by forming a germ tube or form biflagellate zoospores.

Sexual Reproduction of Albugo:

1. Sexual reproduction is oogamous and the two sex organs are antheridium and oogonium.
2. Sex organs generally develop in stem.
3. Two sex organs develop near each other but on different male and female hyphae.
4. Antheridium develops in close contact with the oogonium at the side.
5. Oogonium is globular and multinucleate, and contains a large amount of food material. It bears a septum at the base.
6. Mature oogonium in *C. candidus* remains divided into central uninucleate dense ooplasm and peripheral, multinucleate periplasm.

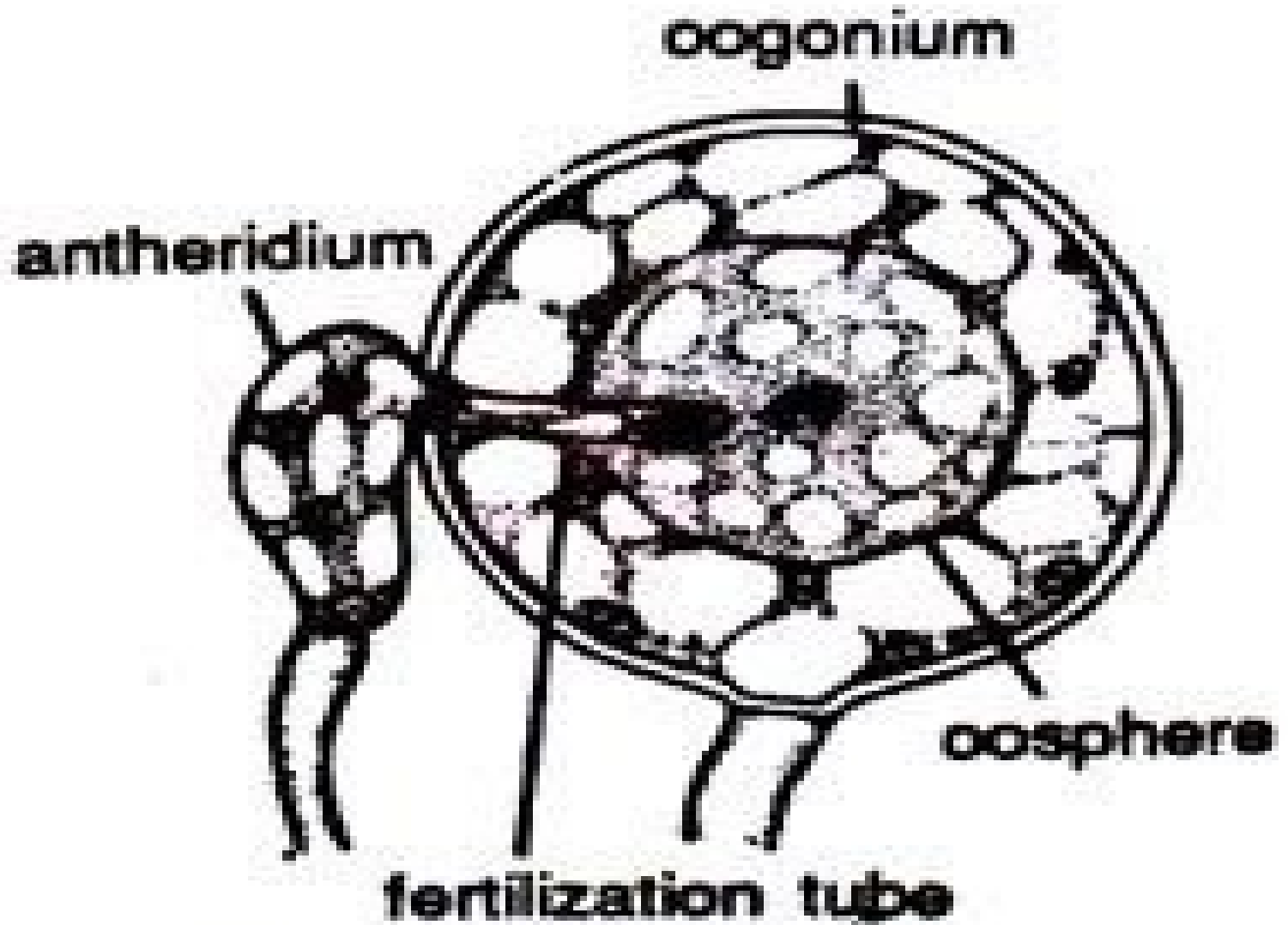


Fig. 73. *Cystopus*. Sex organs.

7. Antheridium is elongated, club-shaped and multinucleate structure having a septum at its base.
8. The wall between antheridium and oogonium dissolves at the place of their contact, and a tube is formed by antheridium. This is called fertilization tube.
9. Fertilization tube penetrates into periplasm and ooplasm, and through this tube the male nucleus comes in contact with the female nucleus to form the diploid oospore.
10. Oospore is a globular body and remains surrounded by outer thick and sometimes spiny exosporium, and inner thin and smooth endosporium. Sometimes, a third middle layer is also present.

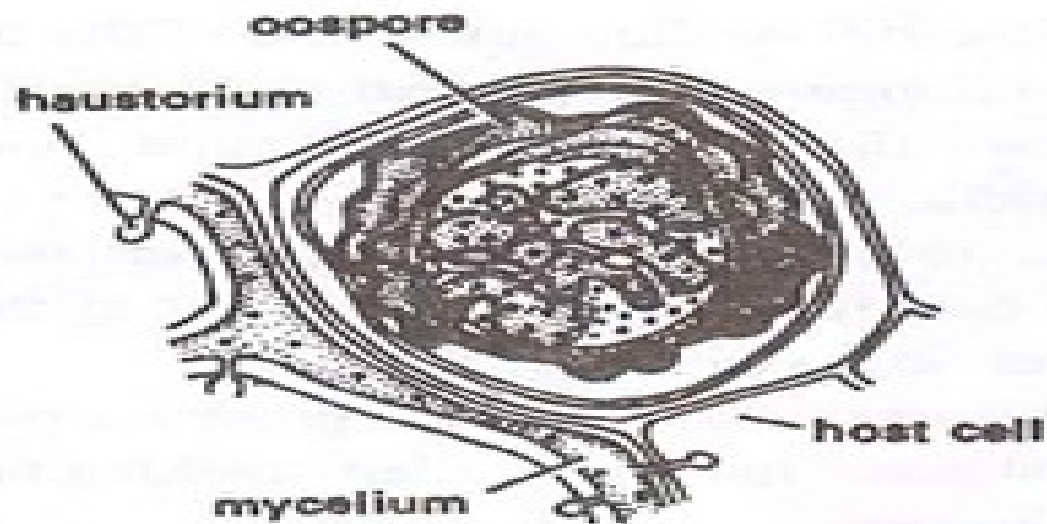
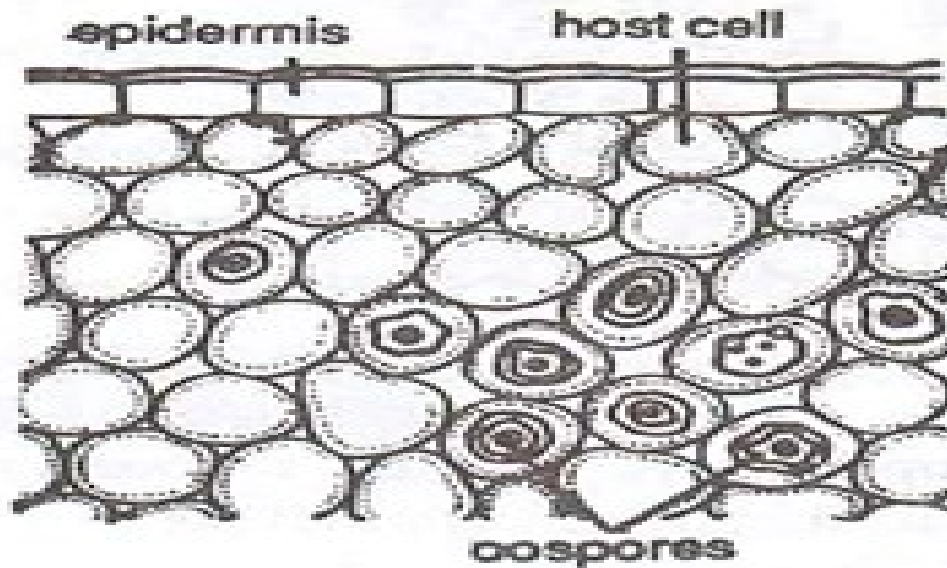


Fig. 74. *Cystopus*. T.S. through an infected stem showing oospores and a single oospore.

11. Diploid oospore divides first meiotically and then ordinarily into many biflagellate, reniform and haploid zoospores or zoomeiospores.
12. Zoospores, on withdrawing their flagella, germinate and form new mycelial hyphae on the host.

LIFE CYCLE

When liberated, the sporangia inside the pustules are spread by wind, rain, and insects. After landing on a susceptible plant, each sporangium gives rise to about six zoospores which, under suitable conditions of moisture and light, form germ tubes which invade the plant's tissues.

Zoospores are naked (wall-less), kidney-shaped and bi-flagellate. Both flagella are inserted laterally. Thick-walled sexual spores, called oospores are produced which germinate, producing either vesicles inside the plant tissue, exit tubes with vesicles at the tip, or germ tubes. Further zoospores develop inside the vesicles. The infection is spread by either oospore-infected seed or by mechanical movement of sporangia.

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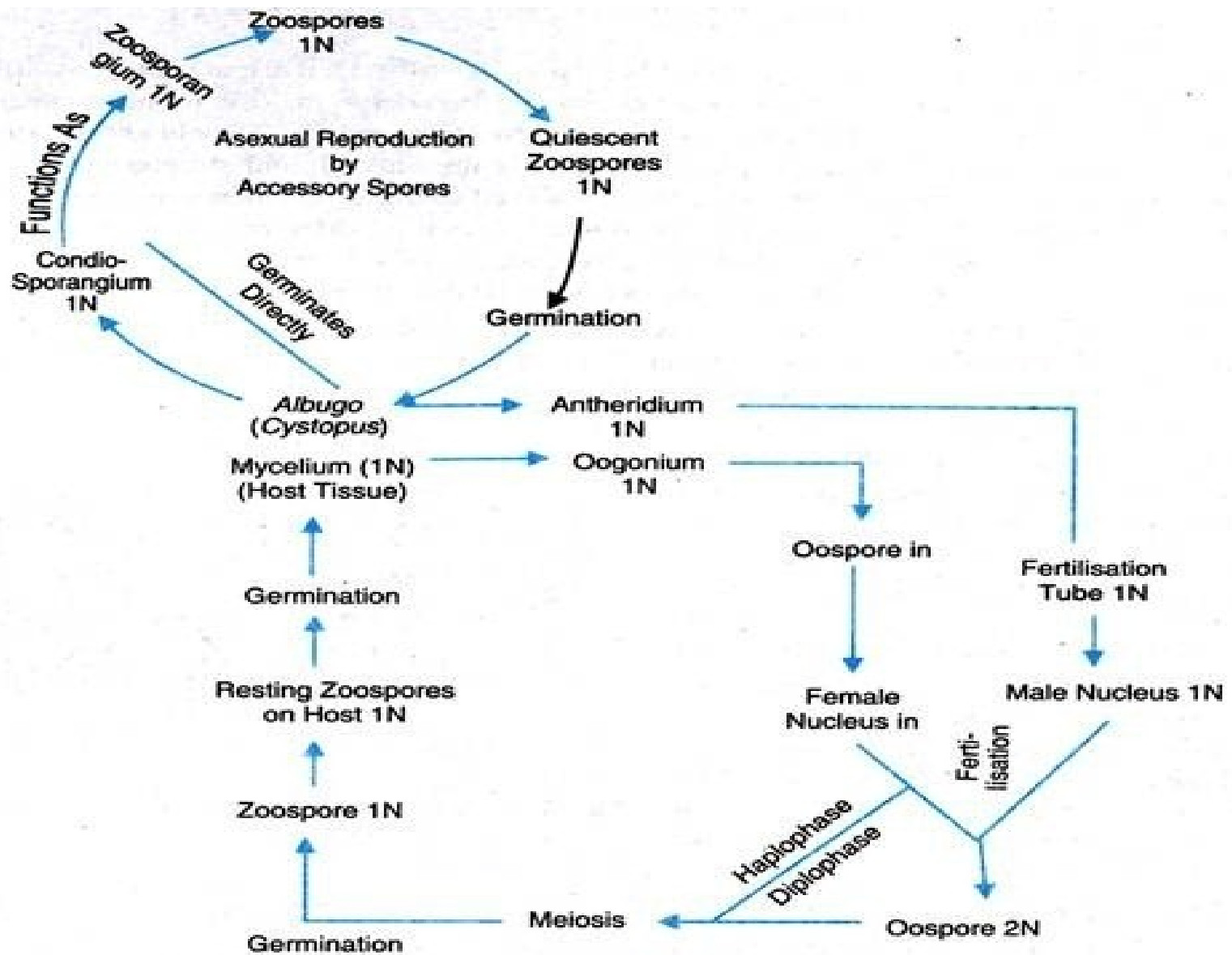


Fig. 6.60A. Graphic representation of life cycle of *Albugo (Cystopus)* with zygotic meiosis.

- Life Cycle of Albugo
- Albugo is a biotrophic or obligate parasite fungus.
- Mycelium is branched, non-septate and intracellular.
- Button shaped haustoria are present. Sporangiophores are form on lower side of epidermis.
- Sporangiophores bear the sporangia which are in basipetal chain. •
- Upper

THANK YOU