

IMPORTANT CHARACTERISTICS OF DIVISIONS AND SUB-DIVISIONS

DIVISIONS :

1. **MYXOMYCOTA:** Plasmodial forms with out cell wall. Plasmodium is a naked multinucleate mass of protoplasm which moves and feeds in an amoeboid direction. Also called as slime molds.
2. **EUMYCOTA:** True fungi. Thallus is typically filamentous with cell wall. Plasmodium absent

SUB DIVISIONS OF EUMYCOTA:

1. MASTIGOMYCOTINA :

Thallus is unicellular or aseptate mycelium. Asexual spores are zoospores (motile spores). Sexual spores are oospores. Sexual reproduction by gametangial contact.

2. ZYGOMYCOTINA :

Thallus is aseptate mycelium. Motile spores are absent. Asexual spores are sporangiospores (aplanospores). Sexual spores are zygospores. Sexual reproduction through gametangial copulation.

3. ASCOMYCOTINA :

Thallus is septate mycelium. Rarely unicellular. Motile spores are absent. Asexual spores are conidia. Sexual spores are ascospores produced endogenously in an ascus. Sexual reproduction mainly by gametangial contact .

4. BASIDIOMYCOTINA:

Thallus is septate mycelium. Motile spores are absent. Clamp connections and dolipore septum are present. Sexual spores are basidiospores produced exogenously on basidium. Sexual reproduction is by spermatization and somatogamy.

5. DEUTEROMYCOTINA:

Thallus: septate mycelium . Motile spores are absent. Sexual spores are absent. Asexual spores called conidia are present.

DIVISION – MYXOMYCOTA

IMPORTANT CHARACTERISTICS OF

CLASS: PLASMIDIOPHOROMYCETES, ORDER: PLASMIDIOPHORALES

FAMILY: PLASMIDIOPHORACEAE

1. These are obligate endoparasites. Commonly called as endoparasitic slime molds. Thallus is a plasmodium
2. Zoospores are anteriorly biflagellate, whiplash type, unequal in size which are called as Heterokont zoospores.
3. After swimming for some time, the zoospore encysts on the root hair of the host. A cylindrical sharp pointed body, called **satchel**, is formed in a specialized pouch or sheath called **Rohr**.
4. Nuclear division is by cruciform division.
5. Sexual reproduction is by isogamous planogametic copulation.
6. Members cause abnormal enlargement and multiplication of host cells i.e., hypertrophy and hyperplasia.

Eg: *Plasmodiophora*, *Spongospora*

Diseases : *Plasmodiophora brassicae* : club root / finger & toe disease of cabbage / crucifers.

Spongospora subterranea : powdery scab of potato

DIVISION : EUMYCOTA

... **SUB - DIVISION: MASTIGOMYCOTINA**

IMPORTANT CHARACTERISTICS OF CLASS CHYTRIDIOMYCETES:

1. Thallus (a) primitive members - unicellular, advanced members with coenocytic mycelium.
2. Asexual reproduction is by zoospores produced in zoosporangia.
3. Sexual reproduction is by (a) planogametic copulation (isogamy, anisogamy, heterogamy) . (b) gametangial copulation.
4. Zygote is converted into resting sporangium / resting spore.
5. Zoospores produced from this resting spore infect host cell and produces pro sorous.

Eg. *Synchytrium*

Disease: Causes black wart of potato. It is prominent in hilly regions like Darjeeling.

Epidermal cells of tubers are infected by the fungus. Hypertrophy and hyperplasia takes place, as a result, out growths appear on tubers.

Diseases transmitted : *Synchytrium endobioticum* transmits potato virus - x .

IMPORTANT CHARACTERISTICS OF CLASS OOMYCETES

1. Members may be aquatic or terrestrial ,saprophytes or obligate parasites.
2. Thallus - mostly eucarpic ,coenocytic
3. Cell wall consists of cellulose. Chitin is absent.
4. Asexual reproduction is by zoospores produced in zoosporangia. Zoospores are biflagellate (whiplash and tinsel), anteriorly or laterally positioned, equal in size.
5. Sexual reproduction is oogamous type ie.,gametangial contact/ gametangy.. Heterogametangia come in contact, contents of antheridium (male gametangium) passes into oogonium(female gametangium) containing oosphere (egg) through fertilization tube.
6. Zygote resulting from sexual reproduction is called oospore.
7. Oospore is the sexual resting spore which is the characteristic of oomycetes.
8. This zygote/ oospore is diploid.Oospore which gives rise to mycelium/ gametangia is also diploid.
9. Meiosis occurs in gametangia instead of zygote.
- 10.

ORDER PERONOSPORALES :

Families: 1.Pythiaceae 2.Albuginaceae 3.Peronosporaceae

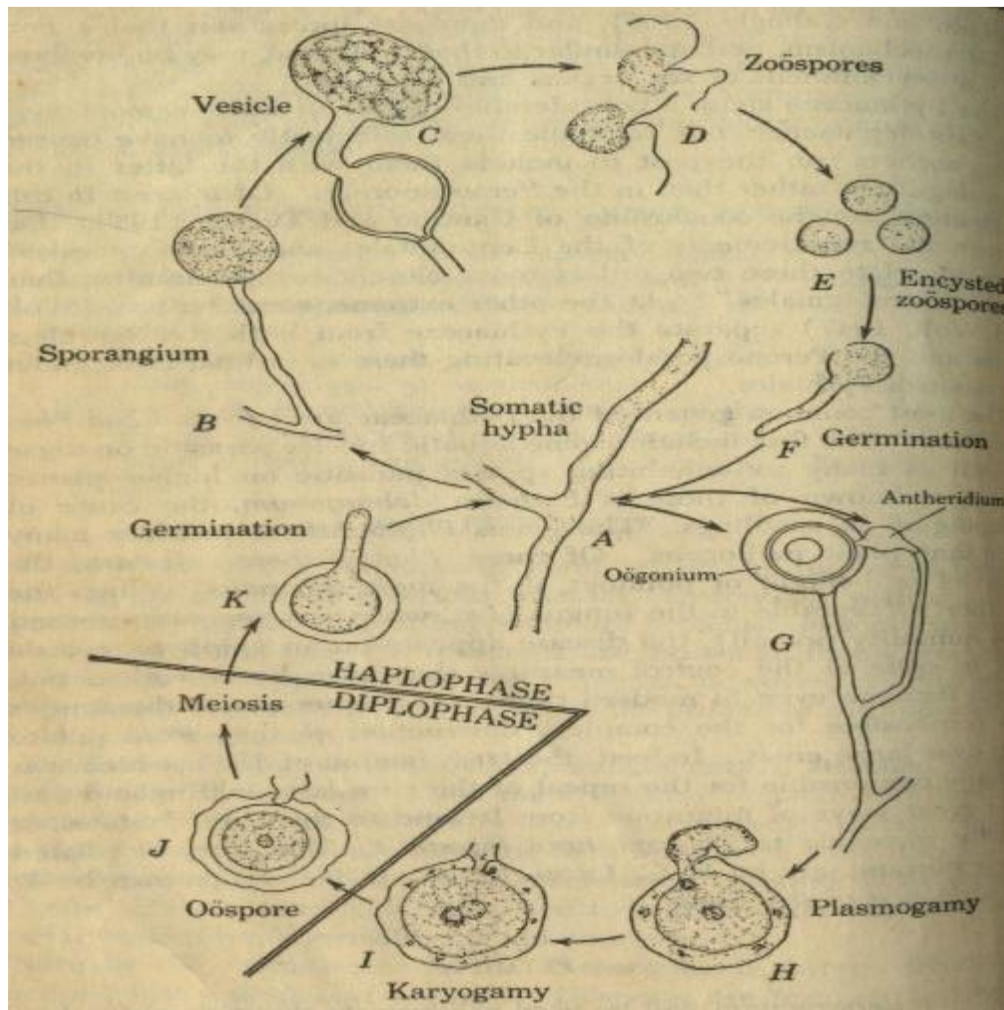
These three families are distinguished based on characteristics of sporangiophores and sporangia.

FAMILY 1. PYTHIACEAE :

Genus **PYTHIUM** :Fungus is facultative parasite and lives in soil on dead organic matter or parasitically on young seedlings of crop plants .Mycelium well developed,branched,coenocytic,hyaline,intracellular mycelium without haustoria. Thallus is homothallic.Asexual reproduction is through zoospores produced in zoosporangia. . Sporangia are large globose(*P. debaryanum*) or irregularly lobed (*P. aphanidermatum*) produced terminally or intercalary on somatic hyphae. Zoospores are produced in a vesicle which emerge out of sporangium.ie.,zoospore differentiation takes place in vesicle.Sexual reproduction is by gametangial contact.

Paragynous antheridium(Antheridium is by the side of oogonium).Oospores are smooth,thick walled,round,light brown.

Diseases: Damping off of vegetable seedlings of solanaceous crops caused by *Pythium debaryanum* or *P. aphanidermatum*



FAMILY : ALBUGINACEAE

GENUS: Albugo

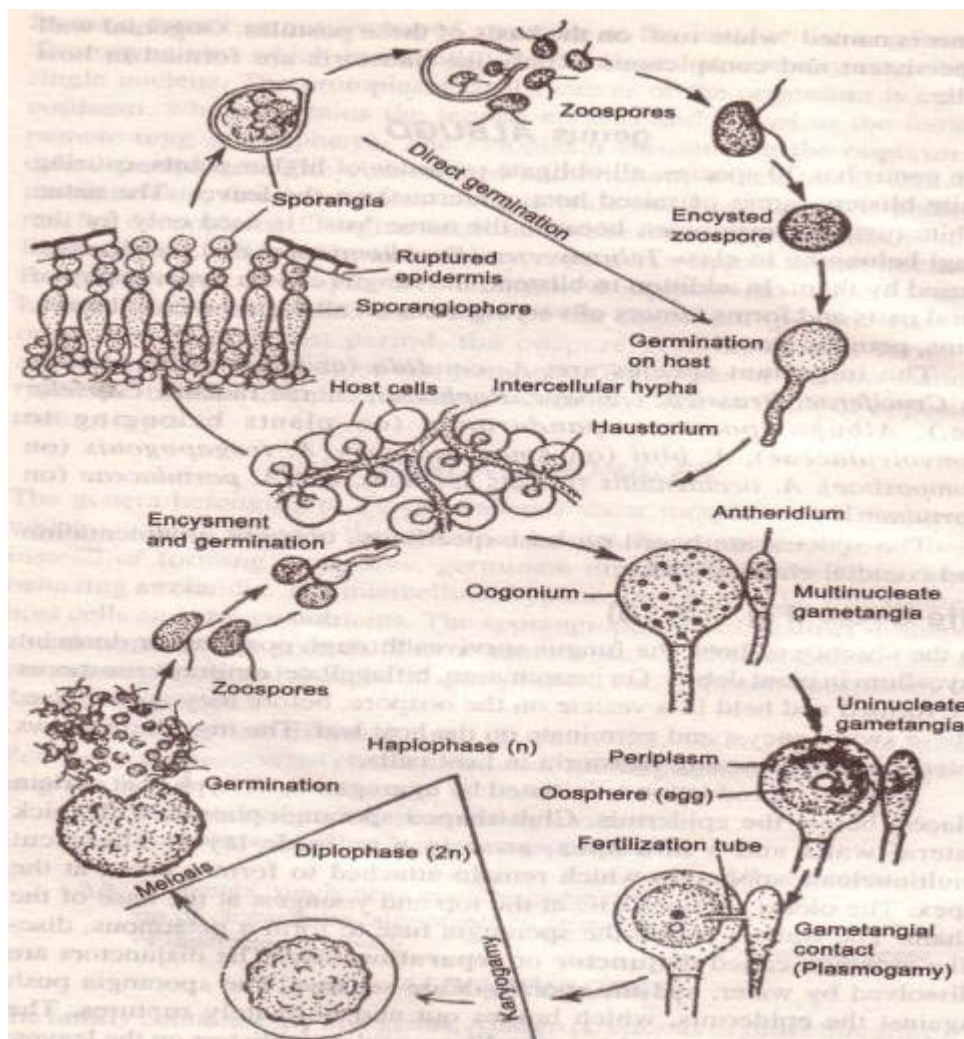
Fungus is an obligate parasite on crucifers and lives in soil in the form of oospores or parasitically on plants.

Mycelium is coenocytic, hyaline, endophytic, intercellular with knob shaped haustoria.

Asexual reproduction is by zoospores produced in sporangia. Sporangioophores are unbranched, hyaline clavate, bears sporangia in chains in basipetal succession. Sporangia are spherical, thin walled, sessile, hyaline and germinate by zoospores.

Sexual reproduction is by gametangial contact. Oospores are round, thick walled, dark brown and outer wall warty.

Diseases: White rust on mustard caused by *Albugo candida*



FAMILY:3.PERONOSPORACEAE

foliage consisting of sporangiophores of these fungi.

The members are further divided into different genera and distinguished based on two characteristics viz., 1. morphology of sporangiophore (branching pattern) 2. method of germination of sporangia.

Eg. *Peronospora*, *Pseudoperonospora*, *Peronosclerospora*, *Sclerospora*, *Plasmopara*, *Bremia*, *Sclerophthora*.

DISTINGUISHING CHARACTERISTICS OF DOWNY MILDEW GENERA:

1. **SCLESPORA**: Sporangiophores are stout, having upright branches, bearing sporangia on sterigmata. Sporangia are hyaline, ovoid, smooth walled, papillate and germinate by zoospores. Oospore is plerotic.

Eg. *Sclerospora graminicola* – downy mildew of bajra.

2. **PERONOSPORA**:Sporangiophores are dichotomously branched 2-7 times at acute angles and tips of branches are curved and pointed bearing sporangia on sterigmata.Sporangia are hyaline ,ovoid ,non-papillate and always germinate by germ tube. i.e.,sporangia behave like conidia.

Eg;*Peronospora destructor*-downy mildew of onion.

3. **PERONOSCLEROSPORA** :Fungus possess characteristics of both *Peronospora* and *Sclerospora*.Sporangiophores are erect,short,stout,widening towards upper portion,dichotomously branched 2 -5 times at apex bearing sporangia on sterigmata.Sporangia are hyaline,elliptical or ovoid,thin walled, non-papillate and germinate by germ tube like *Peronospora*. Oospore is plerotic type like *Sclerospora*.

Eg.*Peronosclerospora sorghi*-downy mildew of jowar

P.philippinensis-downy mildew of maize

4. **PSEUDOPERONOSPORA**:Sporangiophores are branched at acute angles with curved,blunt tips,bearing sporangia on sterigmata.Sterigmata are unequal (1 big and 1 small).Sporangia are greyish,ovoid,papillate and germinate by zoospores.

Eg.*Pseudoperonospora cubensis* -downy mildew of cucurbits

5. **PLASMOPARA**;Sporangiophores are branched at right angles to the main axis at regular intervals.Monopodial branching is observed.Subsequent branches are 3-6 which end in blunt sterigmata of 3 in number.Sporangia are ovoid and germinate by zoospores.

Eg.*Plasmopara viticola*-downy mildew of grapes.

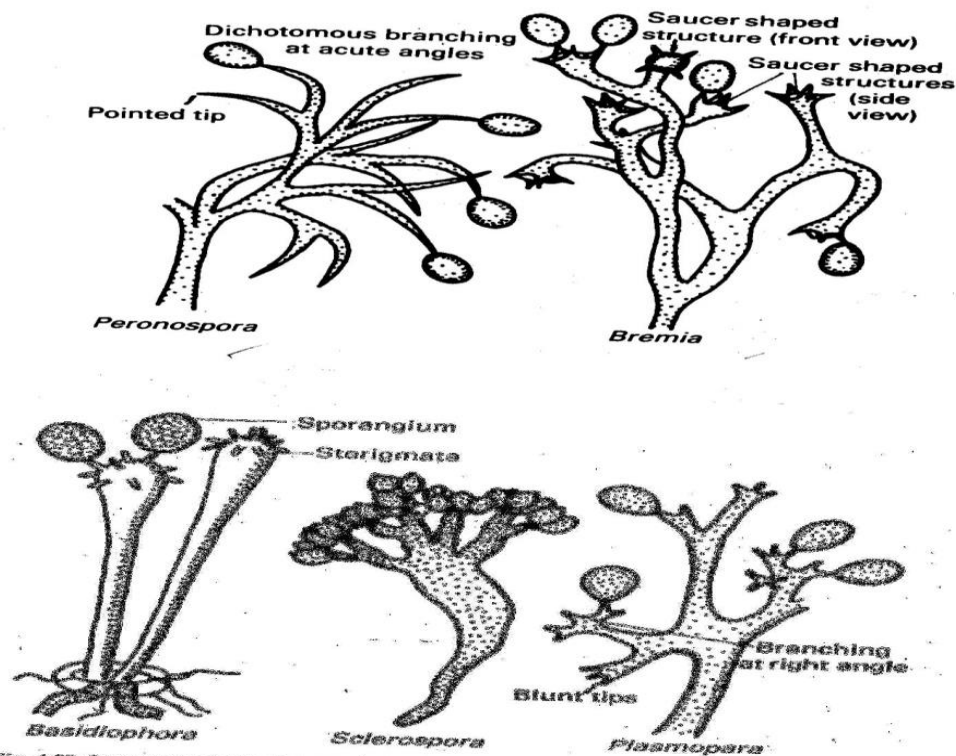


Fig. 4.59: Sporangiohores characteristic of five genera of the Peronosporaceae (Redrawn from Alexopoulos and Mims, 1978).

1. **BREMIA** :Sporangiophores are dichotomously branched ,tips of branches are expanded to cup shaped apophysis with four sterigmata bearing sporangia.Sporangia are ovoid,papillate and germinate by zoospores.

Eg:*Bremia lactucae*-downy mildew of lettuce.

SUB-DIVISION: ZYGOMYCOTINA
CLASS: ZYGOMYCETES
ORDER: MUCORALES:

FAMILY: MUCORACEAE:

Eg. Rhizopus stolonifer

Genus: Rhizopus:

Rhizopus stolonifer, commonly called as bread mold is a general contaminant of several food materials. The fungus is mostly saprophytic but is a weak parasite.

1. Well developed coenocytic mycelium. Mycelium is differentiated into rhizoids, stolons and sporangiophores
2. Rhizoids / holdfast are a cluster of brown, slender, branched root like structures which arise from the lower side of stolons and penetrate into the substratum. These are useful for anchoring the thallus into the substratum and for absorption of nutrients.
3. Stolons or runners are aerial hyphae which grow on the surface of substratum horizontally and connect the two nodal points (the junction of stolon and rhizoid or the point from which rhizoids are produced is called node).
4. Sporangiophores are erect, unbranched hyphae usually produced in fascicles (groups) only from the nodes during asexual reproduction. Each sporangiophore bears a single sporangium at its tip. Sporangia are large, globose, many spored with a sterile structure called columella.
5. Asexual reproduction is by non-motile sporangiospores.
6. Fungus is heterothallic. Phenomenon of Heterothallism was discovered by in 1904 by A.F. Blakeslee.
7. Sexual reproduction is by isogametangial copulation. Zygosporangia are thick walled, dark, warty sexual resting spores which develop in a zygosporangium.
8. Diseases: Soft rot of sweet potato, fruits and vegetables.

