Lecture 3:

Classification of fungi:

Fungi are a specific and large kingdom and it is difficult to classified them. So we must collect alot of informations starting with cultural characters reaching to the size, color, shape, number of cell, type of spores.

The classification system in fungi started with **kingdom** and end with **species** as follows:

Kingdom: Mycetae -Fungi-

Division: Mycota

Subdivision: Mycotina

Class: Mycetes

Subclass: Mycetidae

Order: ales

Family: aceae

Genus and

Species: -There is no special ends-

Kingdom: Mycetae

Division 1: Myxomycota

General chracteristics:

1- No cell wall

2- Swarm cells contain two unequal anterior whiplash flagella.

This division consists of two classes:

Class 1: Myxomycetes (Free-living plasmodium).

Class 2: Plasmodiophoromycetes (Endoparasite plasmodium).

Division 2: Eumycota

This division consists of seven classes:

Class1: Chytridiomycetes: The main characteristics of this class are:

1- Swarm cells contain one posterior whiplash flagellum.

2- No mycelium (in most individuals).

Class 2: Hypochytridiomycetes:

1- Swarm cells contain one anterior whiplash flagellum.

2- No mycelium (in most individuals).

Class 3: Oomycetes:

1- Mycelium is presence but coenocytic.

2- Spore is motile with two flagella. One is whiplash and the second is tinsel.

3- Sexual reproduction is resulting in the formation of oospores.

Class4: Zygomycetes:

1- Fungi with aseptate mycelium.

2- Asexual reproduction by aplanospores.

3- Sexual reproduction – gametangial copulation - resulting in the formation of zygospores.

Class 5: Ascomycetes:

1- Fungi with septate mycelium.

2- Producing ascospores in sac-like cells –asci-, usually eight ascospores.

Class 6: Basidiomycetes:

1- Fungi with septate mycelium and forming -clamp connections-.

2- Basidium bearing usually four basidiospores.

Class 7: Deuteromycetes:

1- Fungi with septate mycelium.

2- Usually producing conidia.

3- Sexual reproduction unknown.

Division 1: Myxomycota

Class 1: Myxomycetes

One founders of mycology considered the slime molds animals and called them –**Mycotozoa**-; because the vegetative phase is like-plasmodium. They have a free- living, acellular, multinucleate somatic plasmodium. Produce flagellated swarm cells inside a fructification-sporophore- that usually develops a –peridium- enclosing the spores.

What is plasmodium?

It is a mass of protoplasm, delimited only by a thin plasma membrane and a gelatinous sheath. The plasmodium does not have a definite size or shape. The protoplast is fluid in some portions and gelatinous in others –veins-, the fluid portion of protoplast is usually in the form of an intricately branched network streaming through the gelatinous portion.

There are three types of –sporophore- reproductive organs in class Myxomycetes:

1- Sporangium: This sporangium either bearing on stalk or stalkless –sessile-, each sporangium has a peridium of its own. There may also a thin, cellophane-like base, the hypothallus, and there are spores and capillitium inside sporangium Fig: 10 Ex: *Physarum*.

2- Plasmodiocarp: Is similar to a stalkless sporangium. In the formation of plasmodiocarp, the protoplasm concentrates around some of the main veins of the plasmodium and secreting a membrane around itself Ex: *Trichia*.

3- Aethalia: a group of sporangia that have not separated into individual units. In some aethalia the wall of the individual sporangia is quite evident, in other they are difficult to see Ex: *Lycogala*.

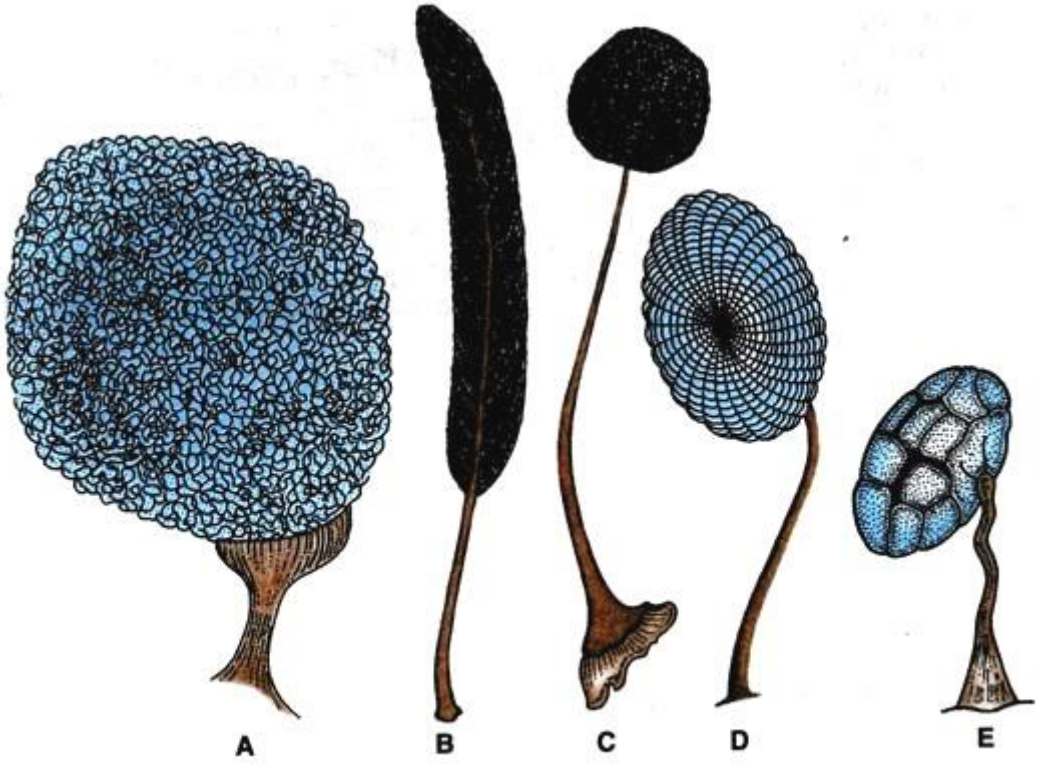

Fig.2.2. Different types of sporangia in slime molds : A, *Arcyria*; B, *Stemonitis*; C, *Comatricha;* D, *Didymium;* E, *Physarum*

Fig. 2.3. Aethalia (A) and plasmodiocarp (B) in slime molds.

Figure 10: Types of sporophore in Myxomycetes

Life cycle of a typical Myxomycetes:

The sequence of events in the life history of the endosporous species is usually as follows:

The spores germinate under favorable conditions and release one to four rarely more myxamoebae or flagellate cells- swarm cells- that feed on bacteria.* Myxamoebae divide repeatedly until a considerable population has been formed, and then copulate in pairs.* In the presence of free water, myxamoebae may develop flagella and converted into swarm cells.*If so, they eventually lose their flagella forming myxamoebae.* The two forms- myxamoebae and swarm cells are thus interconvertible, with the presence of water favoring the flagellate form and drier conditions inducing the amoeboid form.* Swarm cells as such do not divide, whereas myxamoebae do so regularly.-Both stages are typically uninucleate and haploid-.*

After copulation, karyogamy occurs with formation of zygote. * The resulting zygotes are either flagellate at first, later becoming amoeboid, or amoeboid from the start depending on the nature of the gametes.*Growth of the zygote is accompanied by a series of mitotic nuclear divisions resulting in a multinucleate plasmodium with diploid nuclei.* The plasmodium grows by nuclear division and enlarge.* At maturity , the plasmodium thickens and converts itself into one or more sporophore.* Its protoplasm then cleaves into numerous spores.* Meiosis now take place in young spores Fig 11.

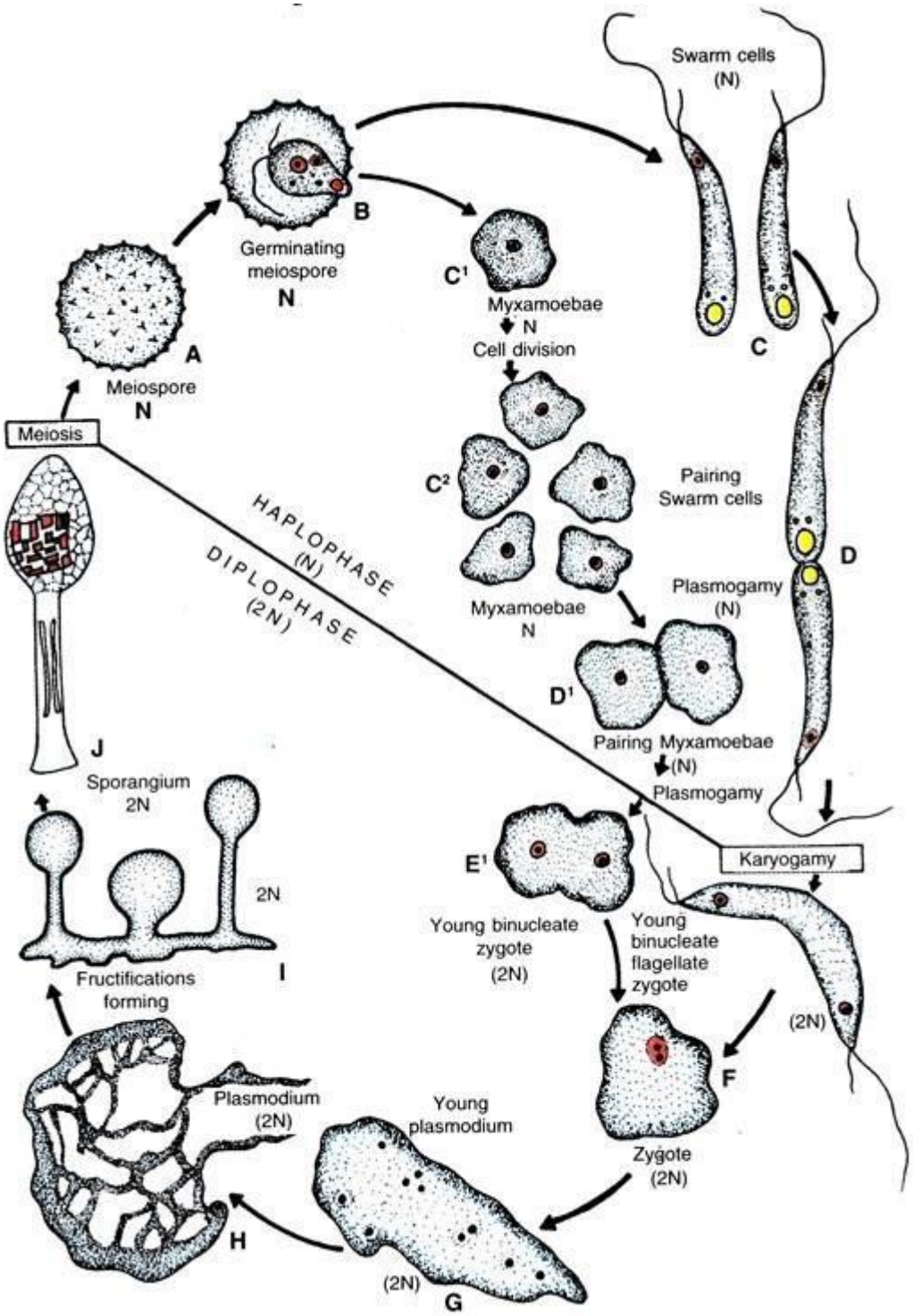

Fig. 2.13 (A-J). *Slime molds.* Pictorial life cycle of *Physarum polycephalum.*

Figure 11: Life cycle of a typical myxomycetes

Classification of Class 1: Myxomycetes:

The class myxomycetes classified into two subclasses **according to the type of spore:**

Subclass 1: Ceratiomyxomycetidae

Order: Ceratiomyxales

Genus: *Ceratiomyxa*

This genus called exospores, there is no sporangium, we can find them in root, leave, as white columns, under microscope we can see the spine bearing the spores.

Subclass 2: Myxogastromycetidae

Spore borne internally in various sporophores –Endospores-. This subclass involves four orders according to:

1- The color of spores.

2- Presences or absence of capillitium.

3- Presence or absences of lime.

4- Presence or absences of columella

Order1: Liceales:

- Spores in mass are pallid or brightly colored.
- The capillitium and columella are lacking.
- Pseudocapillitium is often present.
- Ex:- *Lycogala*

Order 2: Trichiales

- Sporangium is large, stalked or sessile.
- Columella is lacking.
- Sporangium contains spores and capillitium.
- Ex: *Arcyria.*

Order 3: Stemonitales:

- Spores are dark or black in color.
- Columella is presence.

- Lime is absences.

- Ex: *Stemonitis.*

Order 4: Physarales

- The same characteristics of order Stemonitales except **lime is presence.** Ex: *Physarum.*

Class 2: Plasmodiophoromycetes:

General characteristics:

- The somatic phase is a plasmodium that develops within the host cells- **Endoparasite**-

- Produce two types of spores –**zoospores** and **resting spores**-.

-When the resting spores are germinated give zoospores.

Family: Plasmodiophoraceae

Ex:- *Plasmodiophora brassicae*

Causes: Club-root disease in Cruciferae Figure 12.

Figure 12: - Club-root disease in *Cruciferae*

Life cycle of *Plasmodiophora brassicae*:-

The life cycle is initiated when RESTING SPORES-cysts- germinate. * Each giving rise to a zoospore capable of infecting the host plant.* Zoospore attaches to the wall of a root hair and then penetration occur and converted to the myxoamoeba.* Following penetration of a host small sporangiogenous plasmodia appear within the host cells.* It is possible that, these plasmodia develop directly from individual amoebae .* Plasmodia increase in size with some fusion with one anthers, nuclear division during this phase is happened, and after the plasmodium reaches a certain size, it cleaves into segments that develop into zoosporangia.* Zoospores are then formed and released from the zoosporangium either directly into host tissue or to the outside of the host. – **Asexual cycle**-.

In the **sexual cycle**, the zoospores behave as gametes and couple in pairs forming – binucleate amoeboid cells-. * Then karyogamy occur to give zygote-2n-, also the cells of host increase in size – Hypertrophy-. * The young plasmodium then converted to old one and Meiosis take place and each nucleus converted to resting spore. Figure 13.

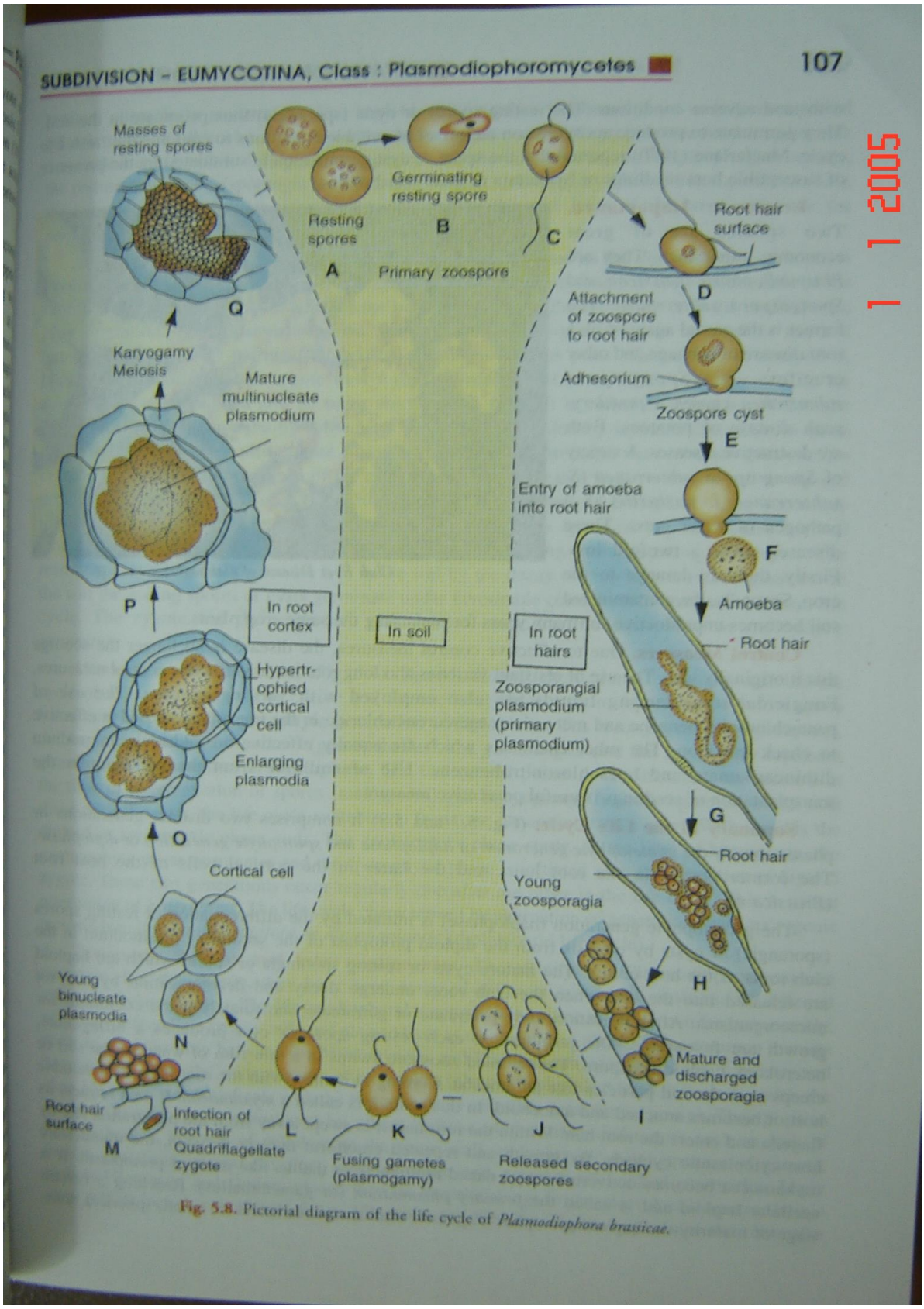

Fig. 5.8. Pictorial diagram of the life cycle of *Plasmodiophora brassicae*.

Figure 13: Life cycle of *Plasmodiophora brassicae*