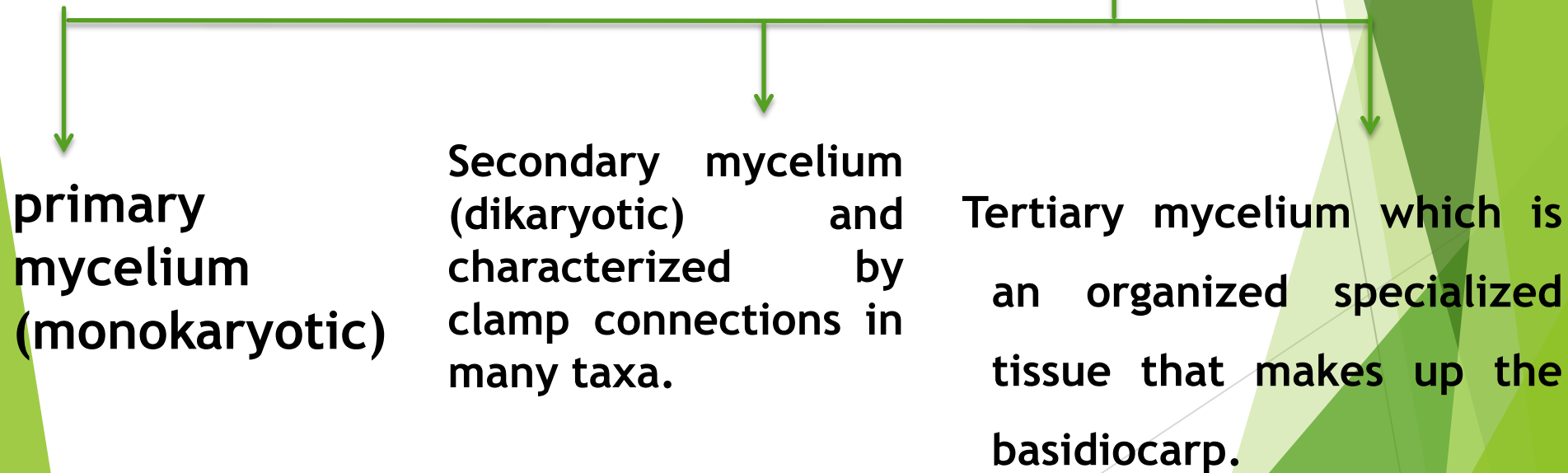


# Division: Basidiomycota

## ► General Characters:-

1- Basidiomycota is the second largest division of fungi.

2- Filamentous fungi, composed of hyphae and mycelium is septated and occurs in three types:-



3- The cell walls of most Basidiomycetes are composed of microfibrils of chitin and also  $\beta$ -glucans.

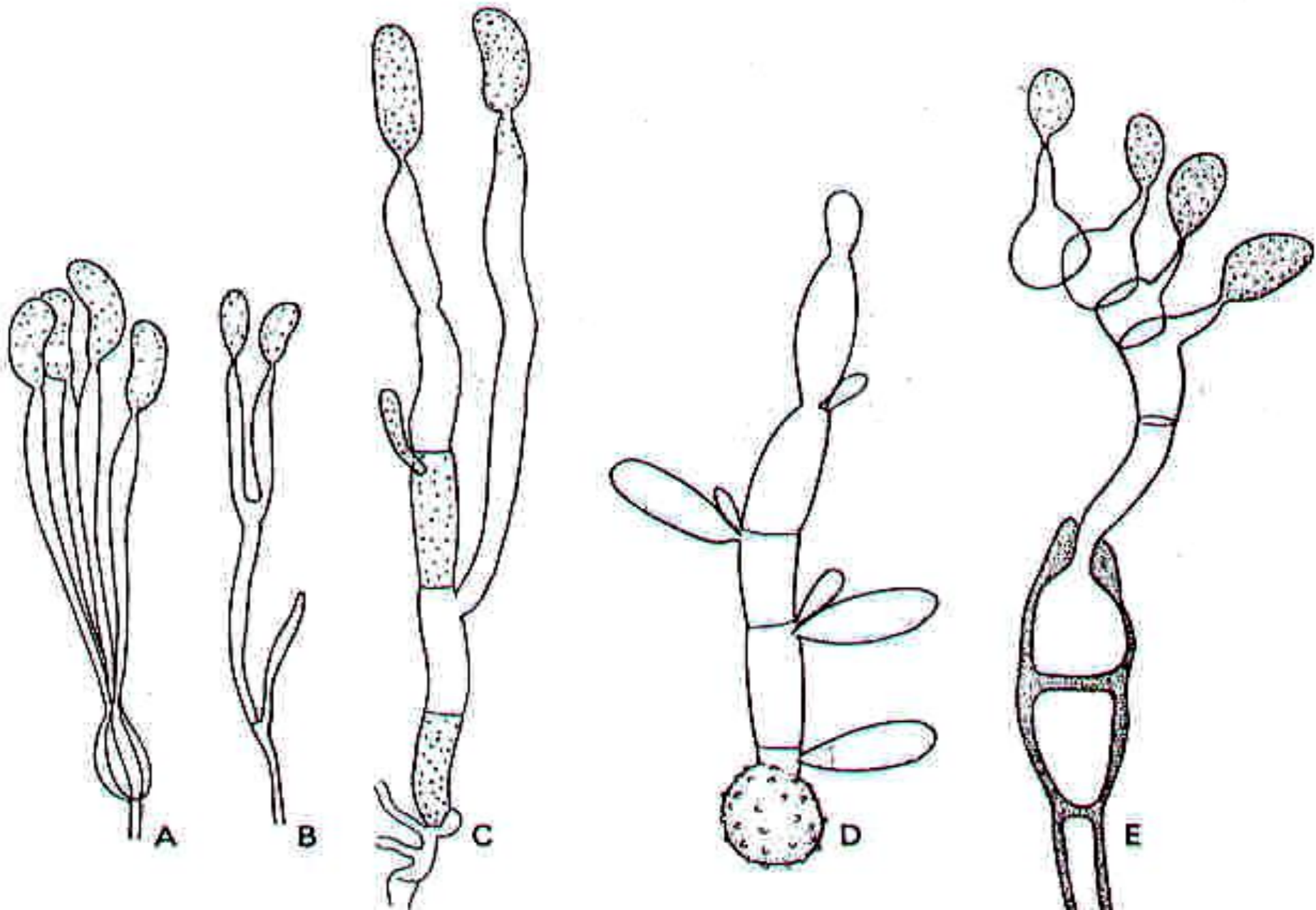
4- They reproduce sexually by the formation of basidia that normally bear four external basidiospores. Some species reproduce asexually.

5- Most of them are saprophytes, causing decay of litter, wood, or dung and some are serious agents of wood decay such as *Serpula lacrymans* (the dry-rot fungus).

6- Some of the toadstools are associated with trees and form mycorrhizae (a symbiotic association), but some are severe parasites e.g. *Armillaria mellea* (the honey agaric) which destroys a wide range of woody and herbaceous plants. They also include very important parasites such as the rust and smut fungi.

# Basidium

- ▶ It is normally a club-shaped structure bearing four basidiospores on four sterigmata.
- ▶ It is the site of meiosis.
- ▶ It is usually located in specialized regions or tissues (e.g. gills or pores).
- ▶ A typical basidium is aseptate (holobasidium) but it may be transversely or longitudinally septate (phragmobasidium) and the number of basidiospores are occasionally fewer or more than four.

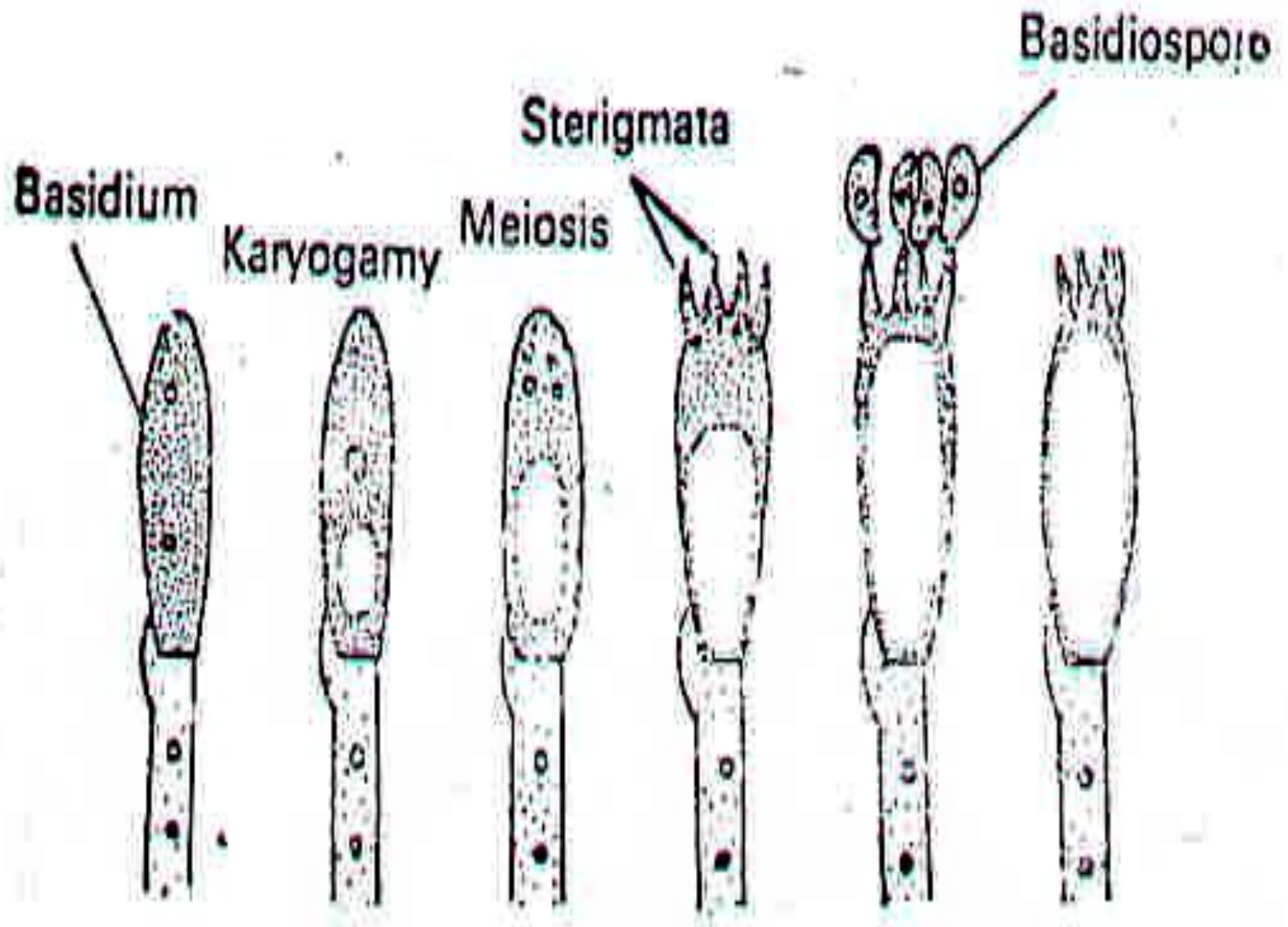


Septated basidia. A-Longitudinally septated, B- Tuning Fork type, C-D-Transversely septated type, E- Germinating Teliospore.

# Stages of basidium development:

**1- Basidium arises as a terminal cell of a hypha making up the gill tissue.**

**2- Nuclear fusion occurs in bi-nucleated young basidia (probasidium) and is immediately followed by meiosis; thus four haploid daughter nuclei result, one is assigned to each basidiospore. In some basidia a mitotic division follows meiosis, so that some basidiospores are binucleate.**



**Stages of Basidium development.**

# Basidioma

- ▶ Basidioma(ta) is the basidiocarp or the sporocarp (fruiting body) of basidiomycetes.
- ▶ Basidiomata are quite variable in the different groups of Basidiomycetes. Basidioma consists of:
  1. Pileus (cap or upper surface of basidiocarp)
  2. Hymenophore (spore producing region); may be lamellate, pored or toothed
  3. Stipe (stalk); may be central, eccentric or lateral in position, may be solid or hollow and may be absent.

**A**



**B**



**Basidioma: A- lamellate, B- pored.**



# Life Cycle of Basidiomycota

- ▶ Basidiospores germinate to produce a primary mycelium which is multinucleate at first.
- ▶ Then septa are laid down, cutting the mycelium into uninucleate segments.
- ▶ Two compatible homokaryotic mycelia are fused together.
- ▶ Nuclear migration occurs but karyogamy is delayed. This results in the formation of secondary mycelium.

- ▶ The two nuclei in each segment of a dikaryon usually divide simultaneously.
- ▶ Generally all dikaryotic mycelia bear at each septum a characteristic lateral pulge termed the clamp connection.
- ▶ Clamp connection is a device that ensures that when a dikaryotic mycelium segments, each segment contains two genetically distinct nuclei.

# Class : Agaricomycetes

## ► General Characters:-

1. They are always filamentous, the hyphae are septated.
2. The dominant stage in the life cycle is typically the secondary dikaryotic mycelium.
3. Dikaryotic and monokaryotic mycelia have been shown to produce asexual spores in some species, but asexual forms are not widespread as in the Ascomycota.

4. Mushrooms are fruiting bodies produced under favorable conditions by dikaryotic mycelia.

5. Karyogamy and meiosis occur in basidia in the hymenium layer.

6. The hymenium often includes specialized non-reproductive cells called cystidia.

7. Basidia are mostly unseptated (homobasidia), carrying two to eight basidiospores (meiospores); the most common number of spores is four.

# Class: Pucciniomycetes

## Order: Uredinales

### ► General Characters:-

1. Pucciniomycetes are the rust fungi. They are obligate parasites on ferns and seed plants, e.g. *Puccinia graminis*.
2. Mycelium - lacking clamp connections - is generally intercellular (frequently with haustoria).
3. They have up to five spore stages, frequently numbered 0 - IV. These spore stages are:

- ▶ Stage 0 is spermatogonium bearing spermatia (n) and receptive hyphae (n)
- ▶ Stage I is aecium bearing aeciospores (n + n)
- ▶ Stage II is uredinium bearing urediniospores (n + n)
- ▶ Stage III is telium bearing teliospores (n + n → 2n)
- ▶ Stage IV is basidium bearing basidiospores (n)

4. The life cycle is complex and may be one of the following:

(a) Heteroecious: requiring two taxonomically different host plants in order to complete life cycle: an alternate host for stages 0, I and a primary host for stages II, III.

(b) Autoecious in which the entire life cycle is completed on a single host species

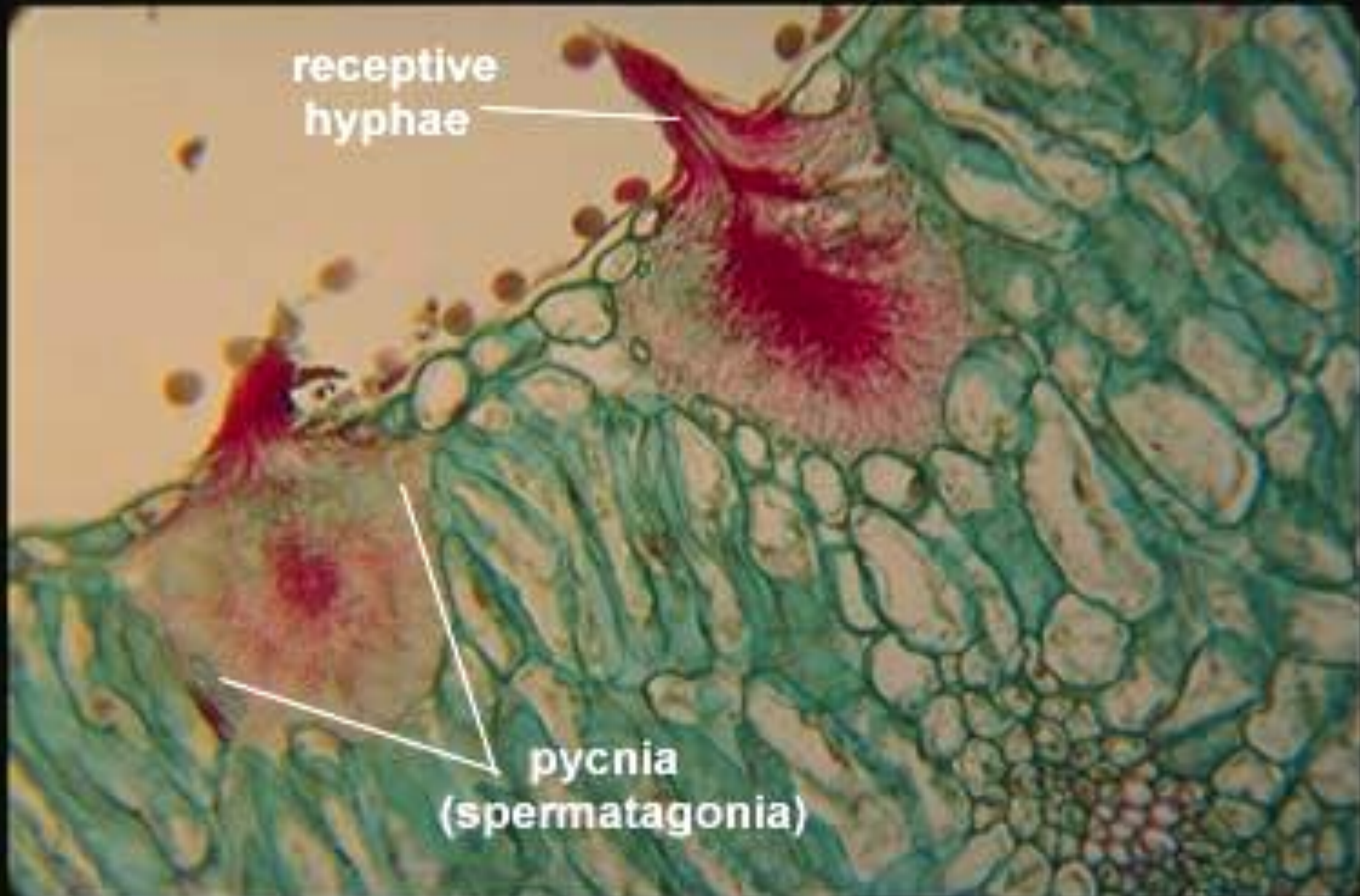
# Life Cycle

## Stage 0: Pycniospore

- ▶ Pycniospores develop inside distinct structures called pycnia, which represent the spermagonia.
- ▶ Pycnia result from infection by the haploid basidiospores.
- ▶ The upper wall of the pycnium produces receptive hyphae which protrude through the ostiole.
- ▶ The pycnium also produces fertile hyphae (pycniophores) carrying unicellular hyaline spermatia.
- ▶ Spermatia are transmitted in a sweet sticky exudate which attracts insects.
- ▶ Plasmogamy (dikaryotization) occurs when spermatium fuses with a receptive hypha. The two nuclei move down the intercellular hyphae in the host to the aecial initials



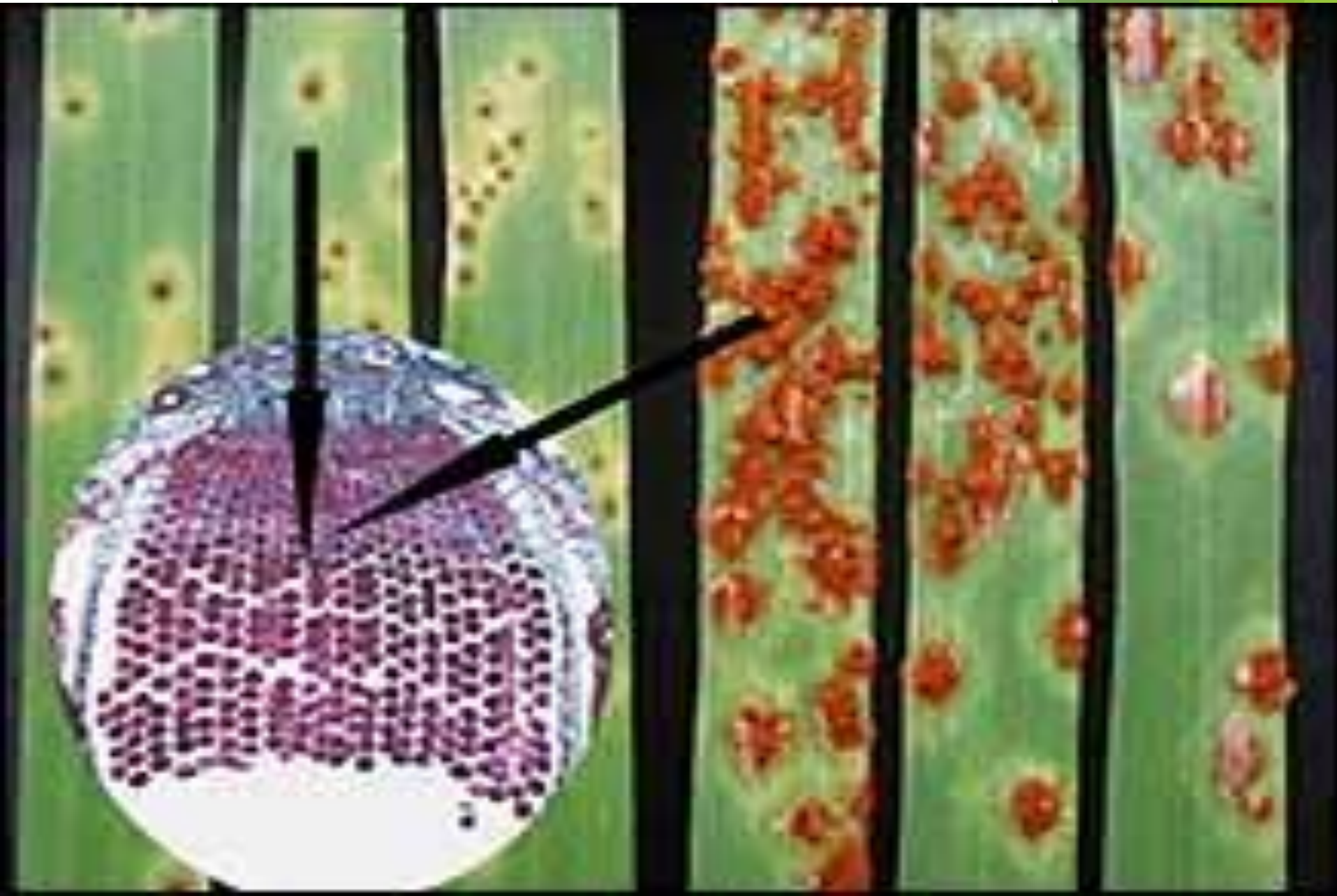
## Stage 0: Spermagonium and spermatia.



# Stage I. Aeciospores (aecidiospores)

- ▶ **Aeciospores are produced in aecia which are cup-like structures arising on the lower leaf surface of the alternate host (*Barberis vulgaris*).**
- ▶ **They are unicellular thin-walled vegetative spores, usually resulting from dikaryotization and germinate to give dikaryotic mycelium.**

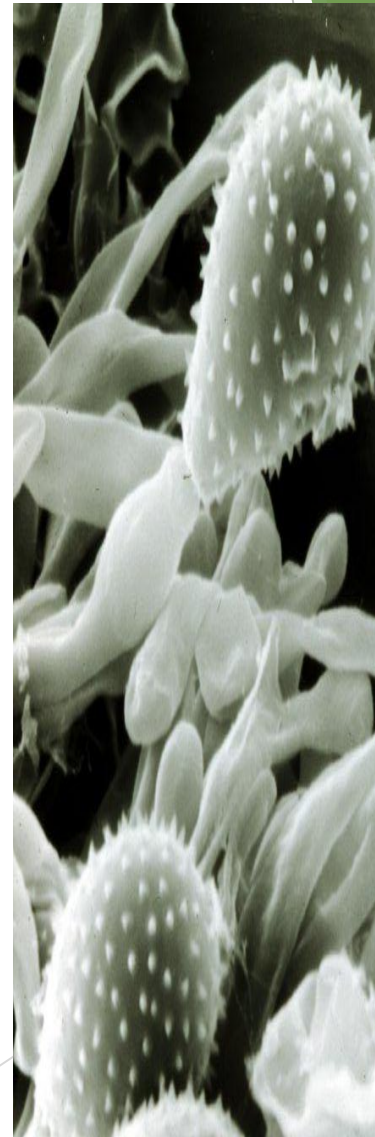
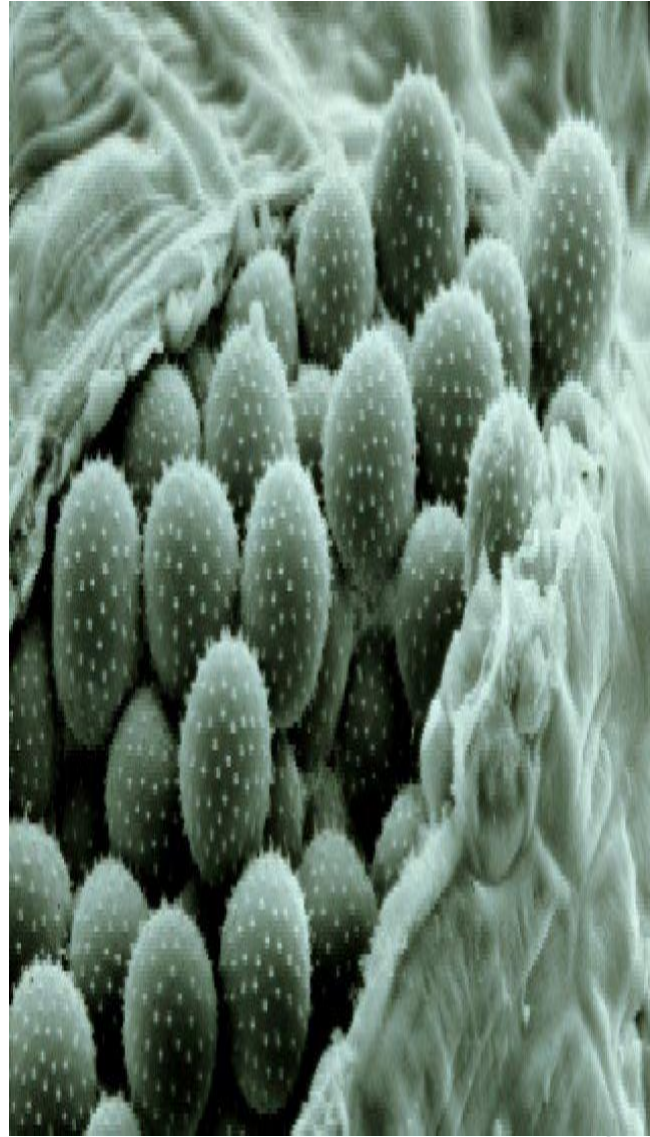
# Stage I: Aecia bearing aeciospores.



## **Stage II. Urediniospores (uredospores)**

- ▶ **Also called summer spores or red rust spores.**
- ▶ **They are repeating vegetative spores which give urediniospores again or teliospores.**
- ▶ **They arise in uredinia (uredosori, uredia).**
- ▶ **Urediniospores are unicellular, binucleate and pedicellate, with a pigmented spiny wall showing two or more germ pores.**

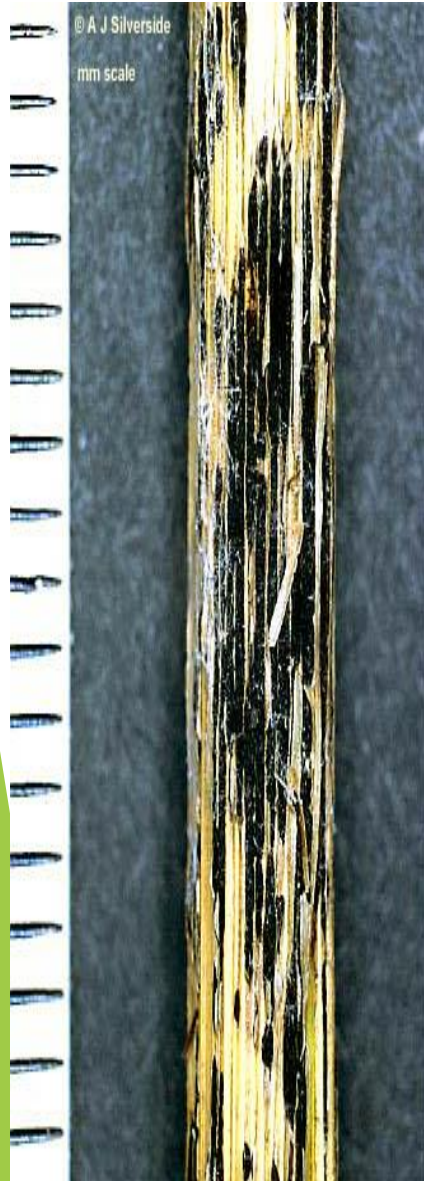
## Stage II: Uredinia bearing urediniospores (n+n).



## **Stage III- Teliospores (teleutospores)**

- ▶ **Also called winter spores or black rust spores.**
- ▶ **They are produced in telia (teleutosori). They are basidia-producing spores.**
- ▶ **Teliospores are resting spores, bicellular, sessile or pedicellate and the thick wall is variously ornamented.**

# Stage III: Telia bearing teliospores ( $n+n$ ----- -> $2n$ ).

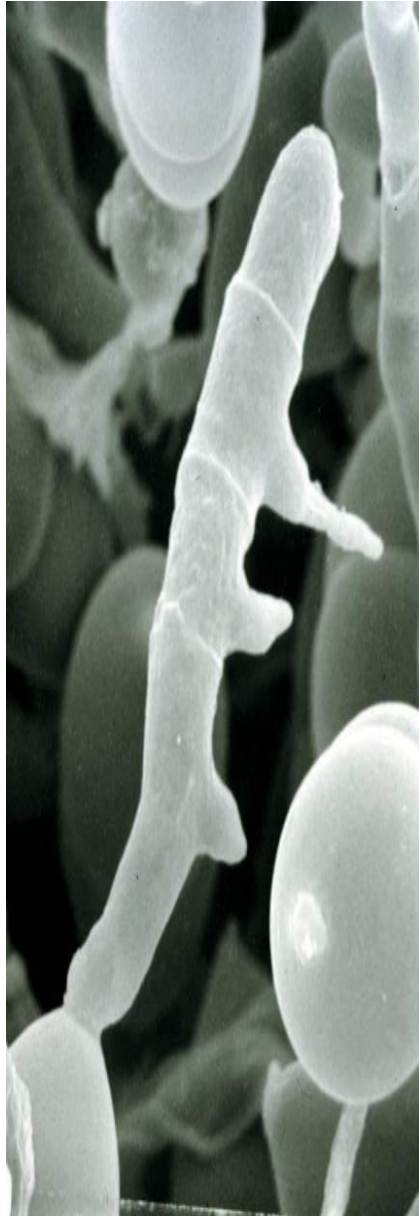


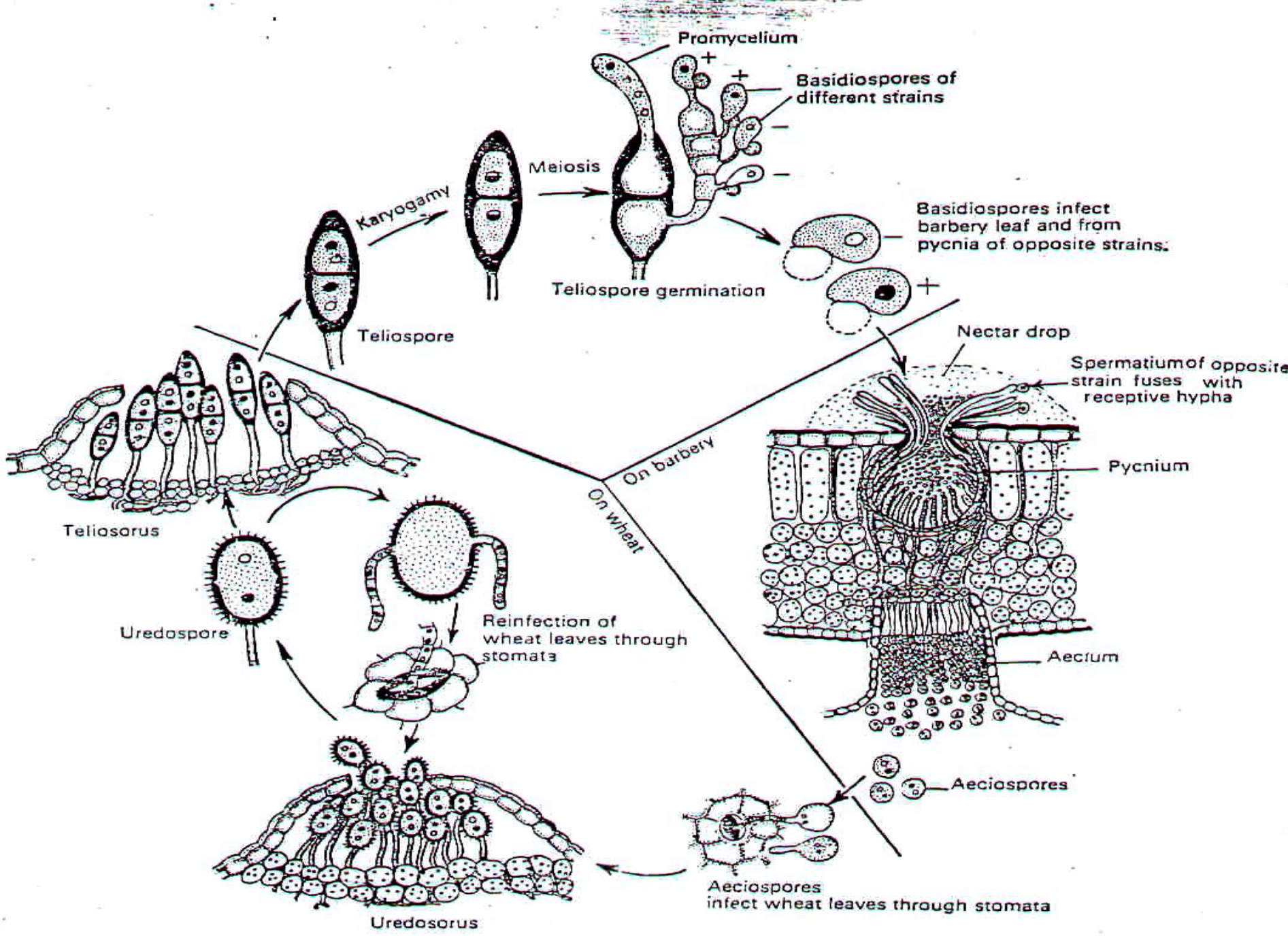
## Stage IV. Basidiospores (sporidia)

- ▶ **They are haploid, unicellular, thin-walled, short-lived spores produced on two- to four-celled basidia after meiosis and liberate from sterigmata by objection.**



# Stage IV Basidia bearing basidiospores (n).





Life cycle of *Puccinia graminis tritici*.

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