Basidiomycota and Deuteromycotina

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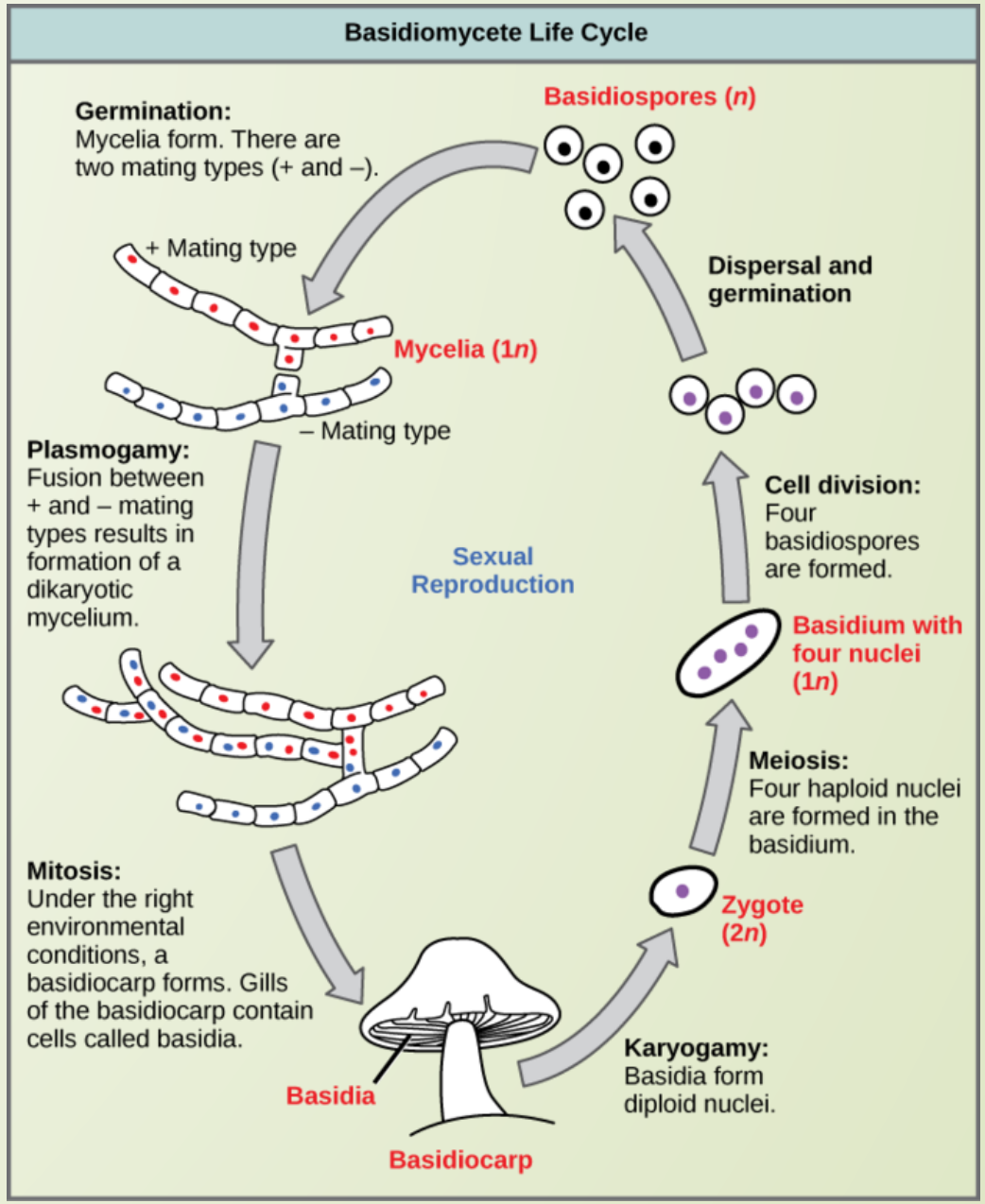
Basidiomycetes/Club fungi

- These fungi produce club shaped end cells called basidia and basidiospores on or in a basidiocarp.
- These have septate hyphae and include rust, smuts, mushrooms and puffballs
- The fruiting bodies of a basidiomycete form a ring in a meadow commonly called fairy ring.
- Basidiomycetes possess two types of extracelluar enzymatic system to degrade vegetation mass- xylanases and cellulases and ligninolytic system
- The cell wall is made up of chitin and glucans. The mycelia has septa in hyphae with dolipore septum, which flares in the middle forming a barrel shaped structure with open ends, and is covered by membranous structure called pareanthesome.
- In all basidiomycetes, expect rusts, a specialized structure called clamp-connection is formed on the secondary mycelium. Clamp connection helps in the formation of dikaryophase in the secondary mycelia
- The mycelium of basidiomycetes passes through three distinct stages called primary mycelium (monakaryotic and develops from the germination of sexual sproes called basidiospore) Secondary mycelium (dikaryotic and develops from primary mycelium after the process of plasmogamy during sexual reproduction and tertiary mycelium (matured secondary mycelium which compose the fruiting bodies)
- Asexual reproduction occurs by oidia, conidia or chlamydospres. The higher group members, lack asexual reporduction

Basidiomycete

- No specialized sex organs develop in basidiomycetes and sexual reproduction occurs by conjugation of nuclei of two different strains.
- Karyogamy does not occur just after plasmogamy, as there is a prolonged dikaryophase between plasmogamy and karyogamy. Fusion of cells occur in basidal mother cell
- Basidiospores are haploic sexual spores, which are produced exogenously on surface of basidia after karyogamy
- Apart from the rusts and smuts the basiiodiomyces produce fruiting body called basidiomata/basidiocarps

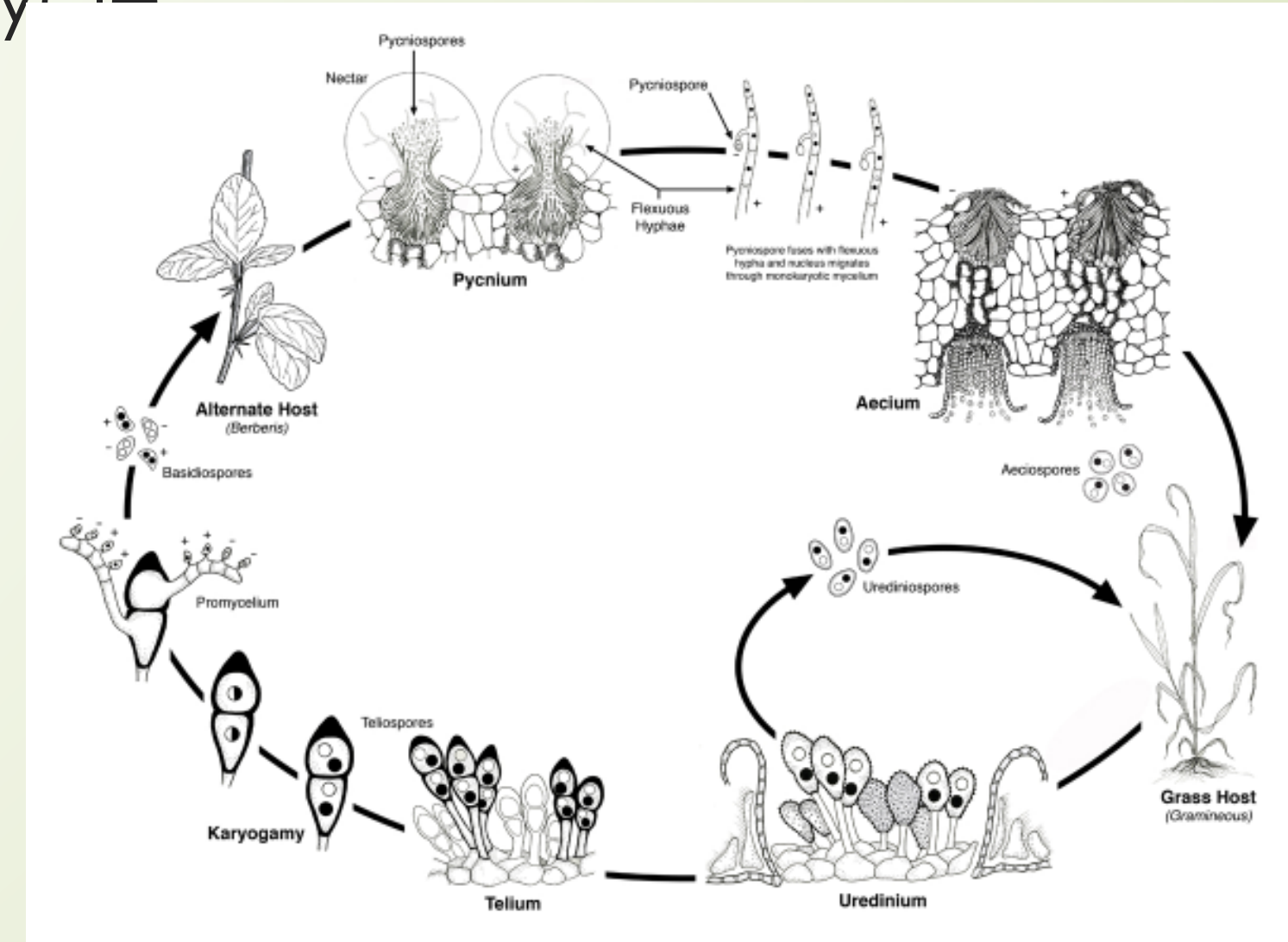


Puccinia graminis /Rusts (Stem rust of cereals; Black stem rust of wheat)

- These are obligate parasites, and is common on wheat and other grasses like oat, barley,rye
- Hetroecious host (Completes life cycle in two hosts)-primary host-wheat and secondary host-barberry plant
- Has 5 different stages- Uredia bearing uredospores, Telia bearing teleutospores, Promycelia bearing basidiospores, Spermogonia bearing spermatia and receptive hyphae, Aecia bearing aeciospores
- Puccinia cause three rust diseases on wheat: stem rust (Puccinia graminis), leaf rust (Puccinia tritici) and stripe rust (Puccinia striiformis) producing similar disease symptom s on host plants
- Symptoms : Produces postules containing dry yellow-orange to reddish-brown or black spores.
- Stem rust occurs mainly on leaves, bot leaves, sheaths, glumes, awns and even seeds can be affected
- Lesions (reddish-brown) appear which later produce black sooty spores
- Initially small circular yellow spots appear on upper leaf surface. These later develop into orange postules, surrounded by a yellow halo. These orange spores may be dislodged easily. In the later stages, black spores may be produces, resulting in a mixture of orange and black lesions on the same leaf
- In Barberry (Berberis vulgaris) circular yellow-red colored postules are visible on the underside of leaves

Disease cycle

- Although both host are reuired for completing the life cycle, disease epidemics can result due to uredospores which can cause auto-infection and this is also a repeating stage responsible for rapid development of disease
- Disease Control
- Use of a plant variety resistant to the disease, this is the most economical method
- Eradication of barberry plants to eliminate disease
- Application of fungicides

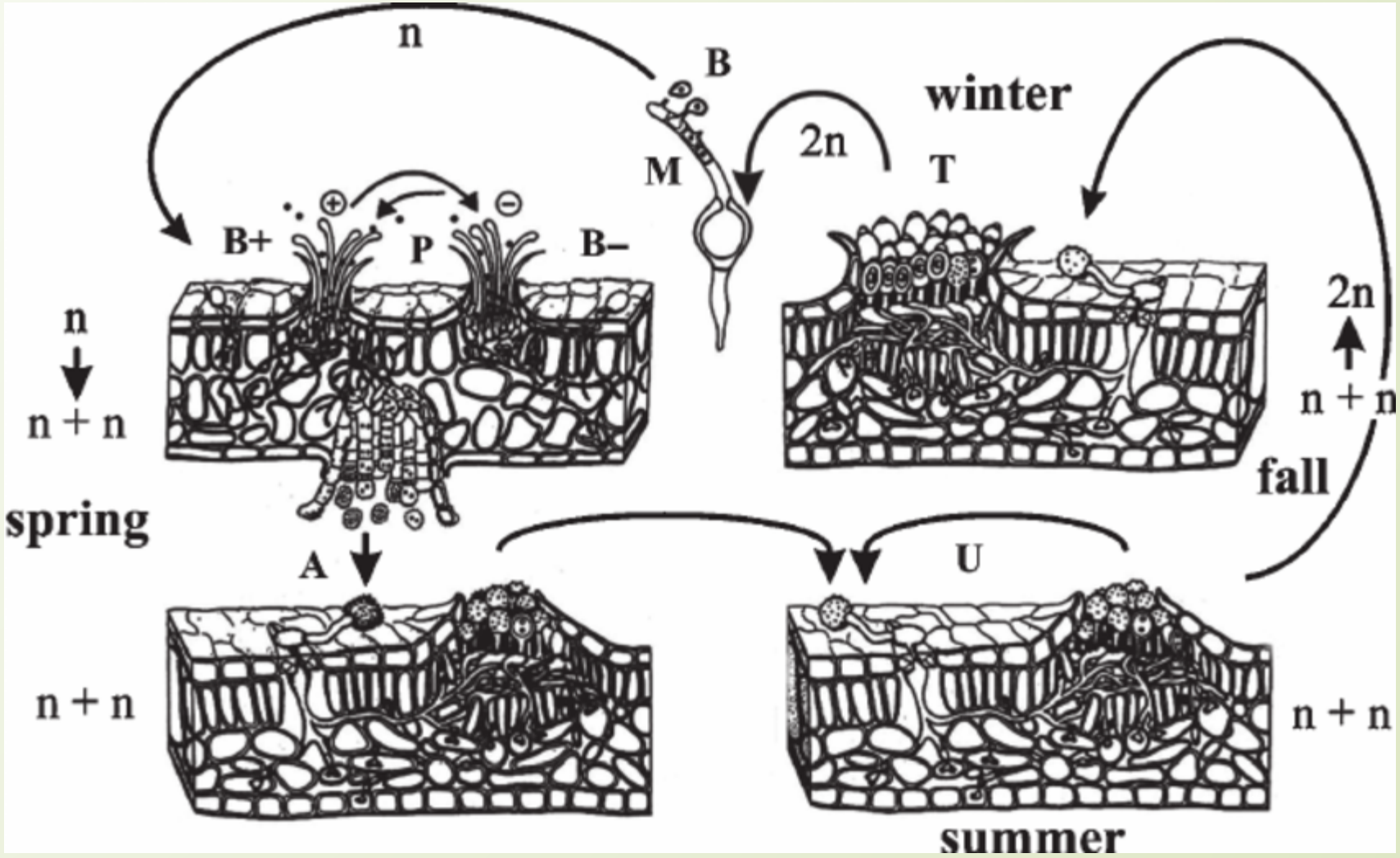


Uromyces fabae (Rust of beans)

- Member of Pucciniales (also known as Uredinales)
- Disease is fungal and is autoecious (has only one host)
- It has a complex life cycle containing five spores(teliospores (overwintering diploid teliospores) Metabasidium (germinating teliospores forming 4 haploid spores) Basidiospores (haploid four basidiospores) Pycniospores (haploid pycnidia of different mating types). Pycnia of different strains form dikaryotic aeciospores which then produce uredia, which then form the teliospores.
- Symptoms: Leaves will have numerous small, orange/brown pustules surrounded by a yellow halo. The stems of the bean plant are also affected by the rust and show pustules

Disease cycle

- Life cycle of Uromyces fabae. Overwintering diploid (2n) teliospores (T) germinate in the spring with a metabasidium (M) from which four haploid (n) basidiospores of two mating types (+, –) are formed. Haploid pycniospores (P) are exchanged between pycnia of different mating types on the upper surface of a leaf. After spermatization dikaryotic (n + n) aeciospores (A) are formed in aecia at the lower surface of the leaf. Infecting aeciospores produce uredia from which dikaryotic urediospores (U) are formed. At the end of summer uredia



Disease control

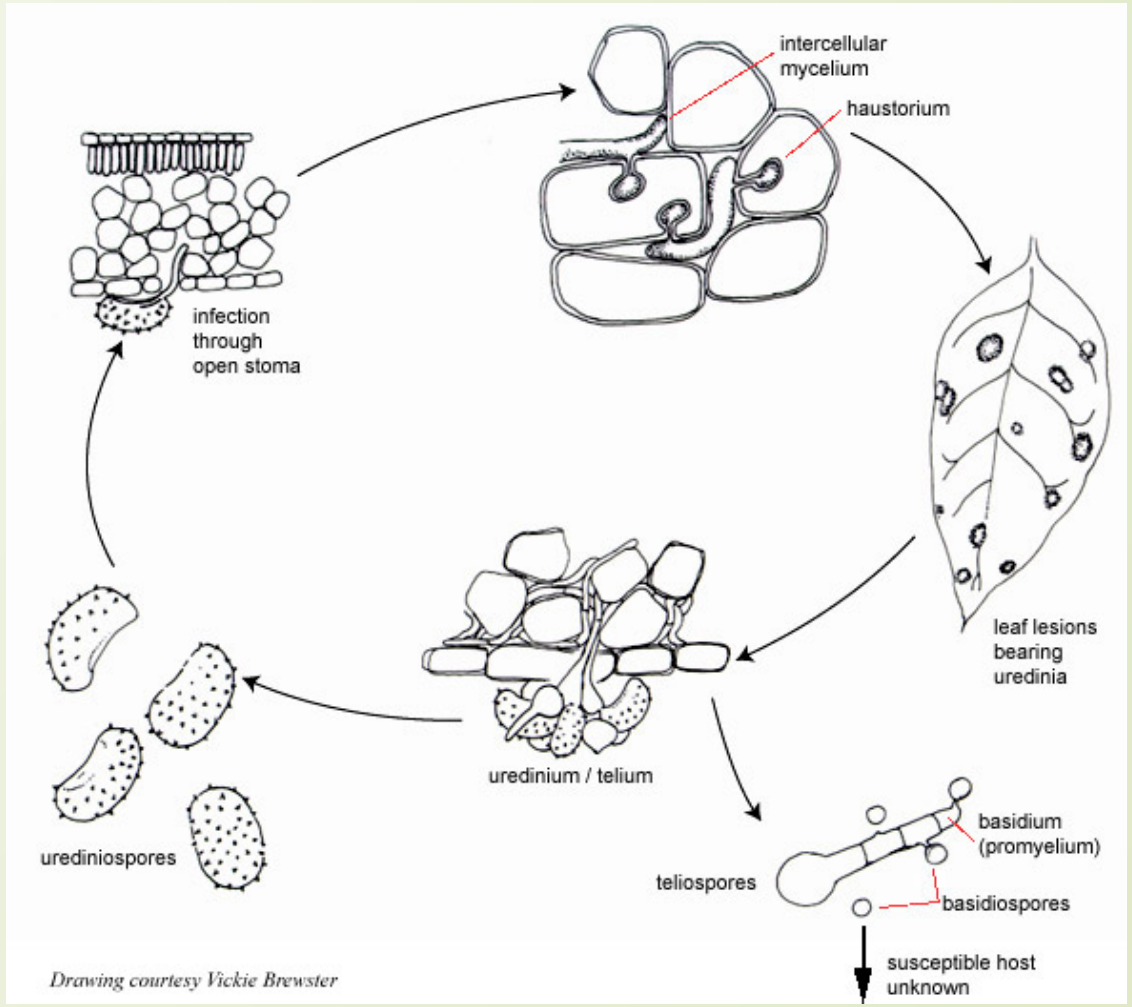
- Field sanitation- using clean seeds
- Crop rotation
- Use of resistant varities
- Weeds which serve as volunteer plants should be removed by herbicides
- Use of fungicides when

Hemiliea vastatrix (Coffee rust)

- Common in coffee-growing areas of Africa, the Near East, India, Asia, (mainly Sri-Lanka, Java) and Australia
- Member of Pucciniales devastating coffee plantations
- Symptoms: It causes yellow-orange powdery lesions on the abaxial surface of leavesand causes reduced floral initiation
- Impaired photosynthesis, premature defoliation, and reduced floral initiation constitute most of the damage
- Disease Cycle: The life cycle of *H. vastatrix* resembles that of other rusts, however it has fewer stages. Pycnial and aecial stages are absent. Hemileia vastatrix exists as a dikaryotic, nutrient-absorbing mycelium ramifying intercellularly within the leaves of its coffee host.
- Clusters of short pedicels bearing dikaryotic urediniospores protrude through the stomata on the undersides of the leaves . . Urediniospores are kidney-shaped, and have fine spines over their entire surface. Occasionally, teliospores are produced among the urediniospores on older, attached leaves. Following karyogamy and meiosis, the teliospores germinate to produce basidia, each of which forms four haploid basidiospores are formed.
- Urediniospores initiate infections that develop into lesions that produce more urediniospores

Disease Cycle

- Disease Control
- Good cultural management
- Use resistant varities
- Proper pruning and training of the coffee plant
- weed control
- Copper-containing fungicides are very effective in controlling coffee rust

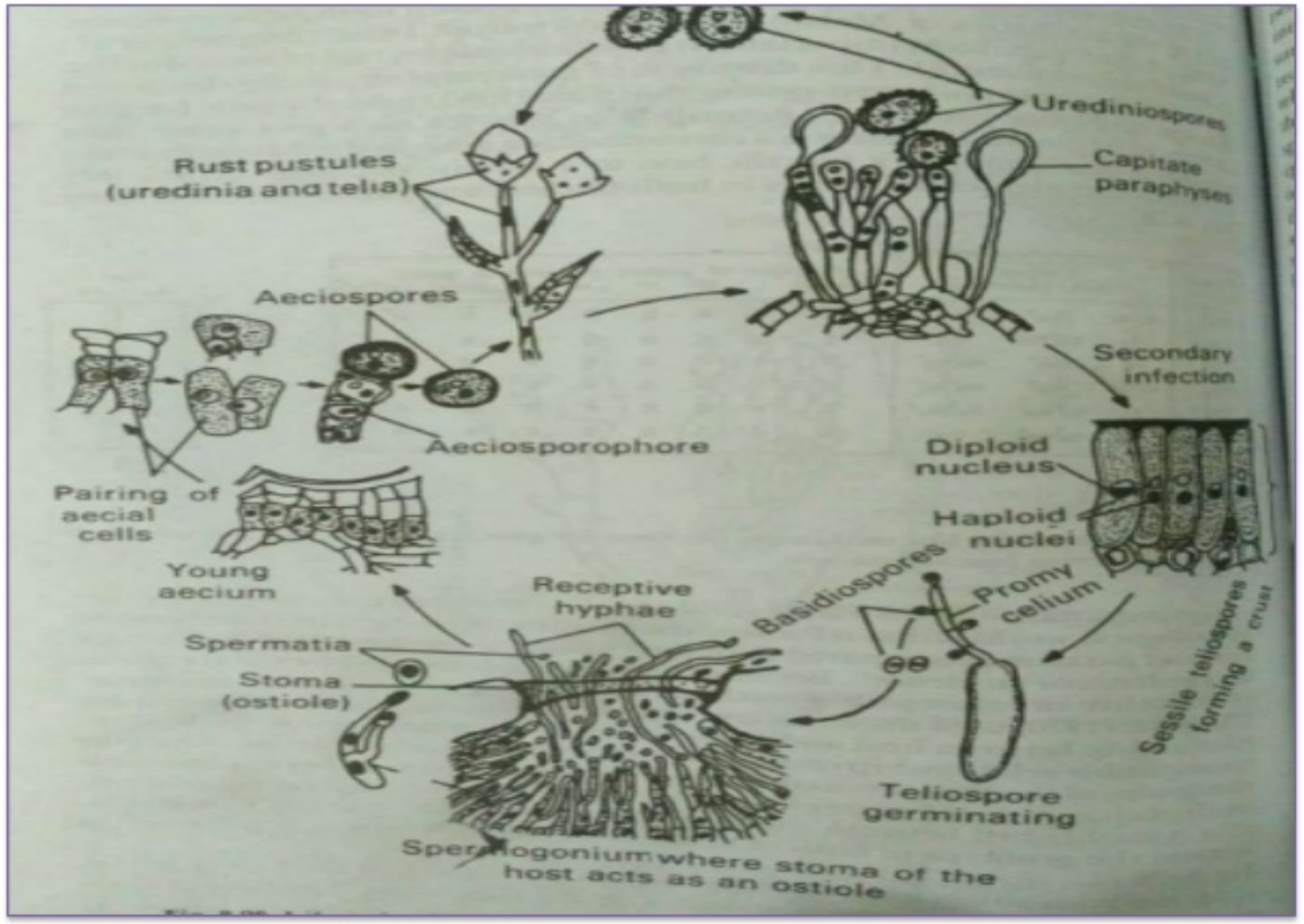


Melampsora lini (Rust of Linum)

- Melampsora is a member of Pucciniales, and is an autoecious rust Rust of linum is a common disease of flax common in all areas of world growing flax.
- Symptom of the disease are seen in the leaves and all aerial parts of the plant. Large, orange coloured pustules generally appear on the leaves and stem. Orange yellow uredopustules are often surrounded by reddish-brown teleutopustules. At the time of harvest the affected plants give a fired appearance due to the sori. Uredinial and telial stages are common, the pycnidial and aecidial stages are not very common.
- Disease Cycle: Primary infection takes place through basidiospores which are produced as a result of germination of teleutospores perennating in the soil/ due to urediniospores blown from Hills or produced locally on collateral hosts (hosts of the same family). In leaves the pustules are formed in circles, on stems the pustules are elongated
- uredospores cannot tolerate the high temperature of the plains, they die or they are blown away to hills where they survive on flax or collateral host. At the end of the season, black or reddish brown crust like telia are formed on the stem. On exposure to freezing temperature teleutospores germinate to produce 4 basidiospores on promycelium.
- In places where favourable conditions are present, basidiospores germinate to produce pycnia which contain the pycindiospores. The pycnia later develop the aecia on the lower surface of leaf. On germination, the aceciospores produce dikaryotic mycelium and uredia

Melampsc

- During the growing season, dikaryotic rust urediospores infect the plant and reproduce asexually. Under certain conditions the sexual cycle can induce the production of dipoloid teleutospores , which are resistant to environment extremes. Teleutospores undergo meiosis and form basidiospores.
- Disease Mangement
- Use of resistant varities
- Field Sanitation- Removal of weeds and proper spacing between plants
- Use of fungicides



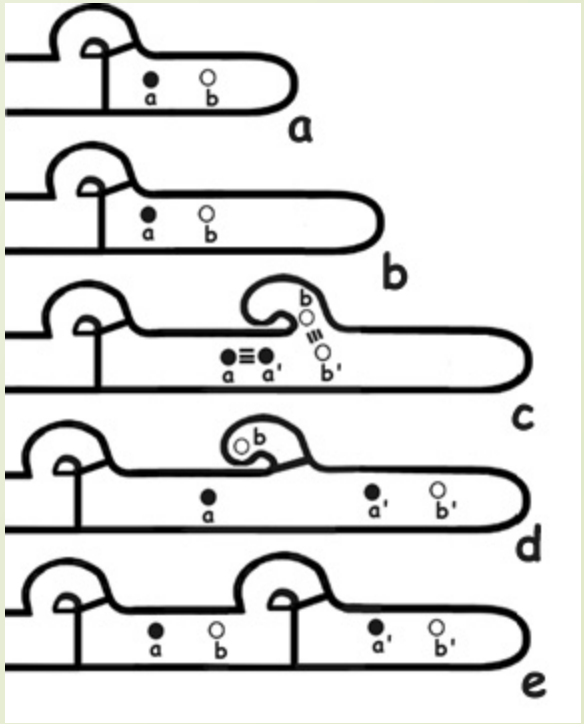
Life cycle of *Melampsora lini*

Ustilago (Smut)

- It belongs toUstilaginales, and has around 200 species parasitic on wheat, rye, oat and other grasses. The fungus is of economic importance as it affects in damage of economically important plant.
- Ustilago is derieved from ustus, meaning burnt . It produces black, sooty powdery mass of spores on the host plant parts giving them a 'burnt' appearance.
- Symptoms: Symptoms appear on the floral parts wherethe spikes turn black and remain filled with the smut spores. Ustilageo produces two main types of symptoms- a. Loose Smut: where black spores are easily blown away form wind. b. Covered Smut- where the spores are covered by the wall of the grain (peridium) and spores are released only by breaking of wall during thrashing
- Mycelium of Ustilago may be of two types: Primary mycelium: It is of a short duration and formed by the germination of basidiospores. Secondary Mycelium: is formed by dikaryotisation of primary mycelium. It is dikaryotic systemic and may be confined to a particular part of host or present throughout the host
- Reproduction may be asexual (by the budding of basidiospores and formation of conidia) or sexual. Sexual organs are absent, and two kinds of spores (teliospores/teleutospores) and basidiospores are formed. Teleutospores (sumt spores) are thick walled bi-nucleate, globose, brown with spiny or reticulate wall, and produced by dikaryotic mycelium . Prior to germination of teleutospores the two nuclei (one +; other -) fuse to form a synkaryon. The dipoloid nucleus migrates into promycelium and divides meiiotically forming 4 nucle (2+strains, and 2-strains). Septa are laid and 4 uninucleate cells are formed. Each uninucleate cell of promycelium sporuts a bud towards its upper end. These uni-nucleate buds are called basidiospores
- The basidiospores germinate to form a germtube whichis haploid or monokaryotic. When it comes in contact with an opposite strain it undergoes plasmogamy and forms a dikaryotic mycelium

Clamp connection

- The dikaryotic mycelium forms the teliotospores.
- The secondary mycelium forms the characteristic clamp connection, which functions to ensures that each cell is dikaryotic and allows the migration of a nucleus from one cell to the other
- Formation of Clamp Connections: a. Terminal cell of hypha. Growth only takes place at hyphal tips; b. Hyphal tip elongating. c. Synchronous division of nuclei and the beginning of hyphal branch that will become the clamp connection. One nucleus (b) migrates into the new clamp. d. Septum forms at base of the clamp trapping nucleus b. Nuclei a' and b' migrate to the hyphal tip, while nucleus a migrates *away* from the tip. e. Septum forms below clamp forming new cell at hyphal tip. Fusion of the clamp to the adjacent cell releases nucleus b to the adjacent cell. Now both the terminal and subterminal are binucleate, each with a compatible pair of nuclei



Control of smut

- Physical treatment
- Solar heat treatment of the seeds ie, soaking seeds in water and drying them in hot sun
- Hot water treatment
- Anaerobic treatment of seeds- soaking the seeds and then enclosing them in air tight jars
- Using resistant varities
- Use of fungiscides-systemic
- Rogueing- Plants with infected ear, which emerge earlier are uprooted and burnt
- Rotation of crops

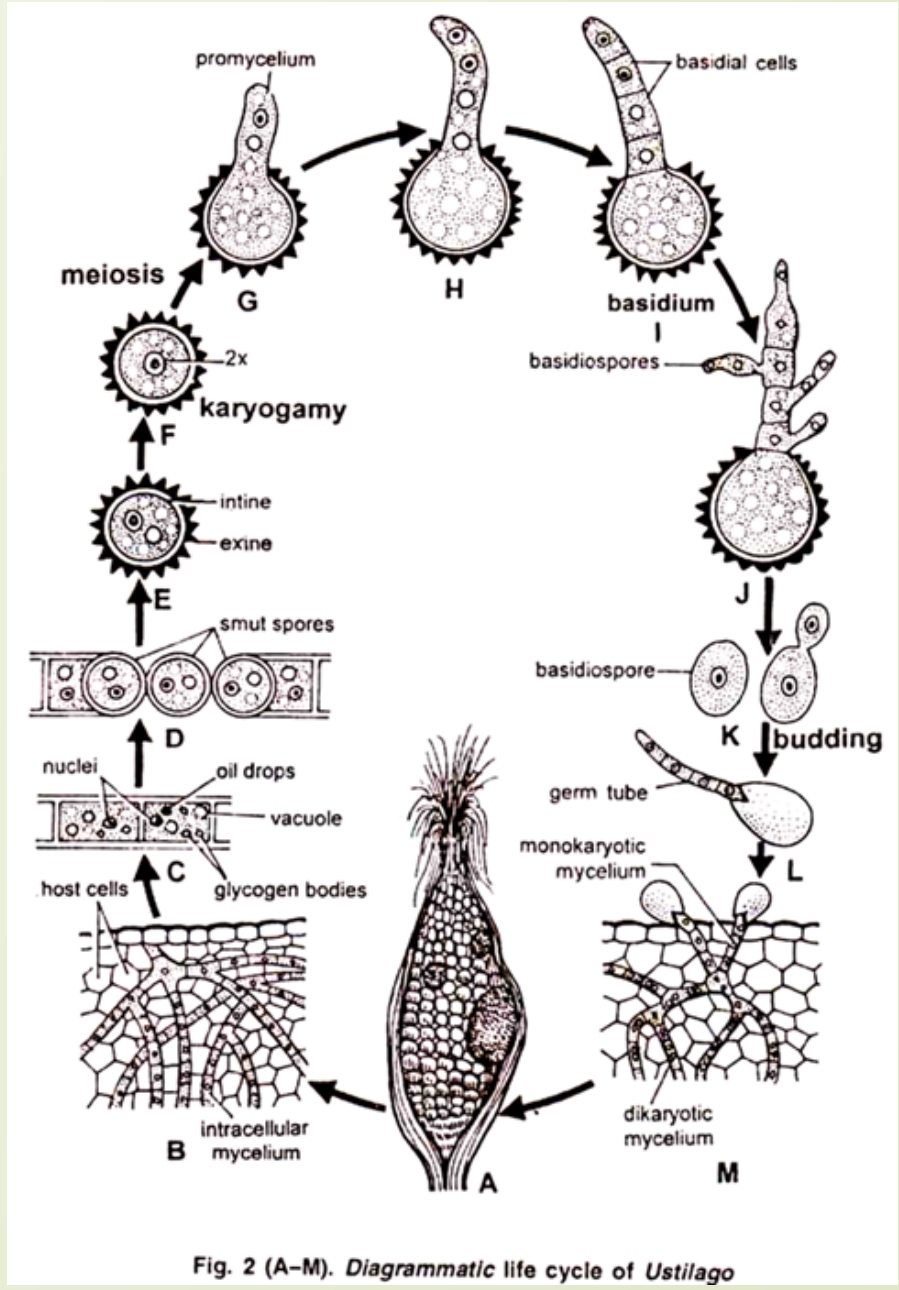


Fig. 2 (A–M). *Diagrammatic* life cycle of *Ustilago*

Tilletia tritici (Bunt of Wheat/stinking/kernel/ hill bunt of wheat)

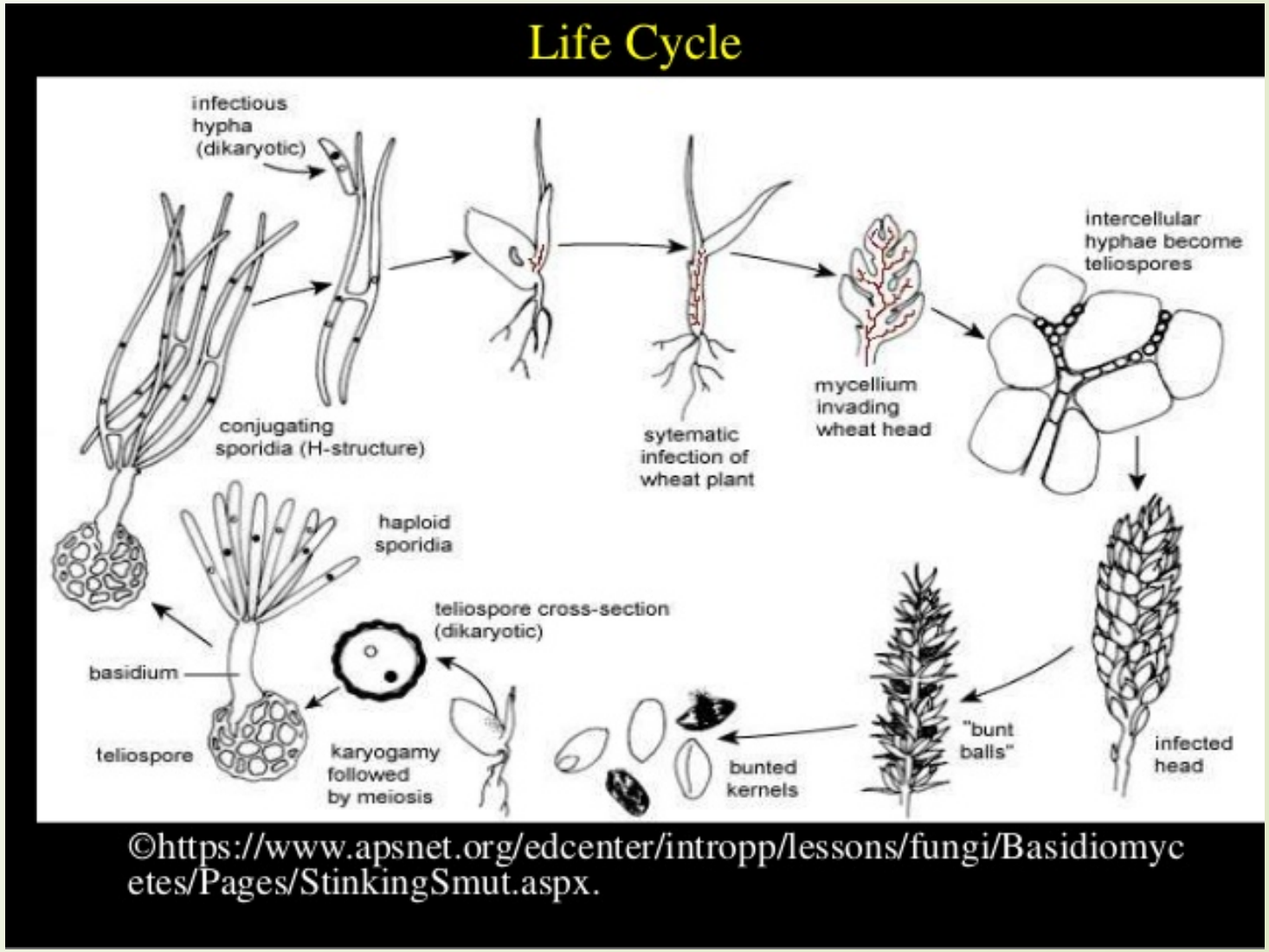
- This disease is present in Asia, Austrailia,Europe, North America and South America. The disease affect wheat, rye and various other grasses. Spores are seed and soilborne as well as windborne
- Symptoms: The fungus causes reduction of ears and number of spikelet of bunted ear
- Kernels in heads of affected wheat plants are replaced with grayish-brown sori that produce a fishy odor, the outer hull of infected wheat kernels may remain intact also called bunt balls. The teliospores contain trimethylamine which gives the fishy odor. The pericarp of infected wheat kernels remains intact, till the field is harvested. At this time the pericarp ruptures, and powdery spores are released. Spores contaminate healthy seed
- The infected plants, remain to appear heathy till the grains emerge.

Disease Cycle: The fungi survives as teliospores in soil or seed. Teliospores germinate and form basidiospores also known as primary sporidium. The basidiospores are of two different strains.

The filiform basidiospores of two different strains form “H” shaped structure, where basidiospores fuse. A dikaryotic mycelium is formed also known as secondary spridium. These infect the seedling and the mycelium grows inside the plant to the growing tip. Once the kernel is formed the mycelium form teliospores in the kernel, and forms a bunt ball full of teliospores. These balls break during harvesting allowing teliospores to fall on ground or on other kernels.

Disease Control

- Use of resistant varities
- Use of disinfected seeds
- Use of soil fungiscides
- Since the fungi requires a low temperature to germinate, cultivation can be carried out when temperature are higher than 15®C



Sphacelotheca sorghi- grain smut or covered smut of Jowar

- Grain smut of Jowar is a serious disease causing serious losses and common in states of Andhra Pradesh, Madhya Pradesh, Karnataka, Tamilnadu and Uttar Pradesh
- Symptoms-The fungus attack ovaries and all the ovaries in the head turn into sori of sumt ie, ovary replaced by oval or cylindrical black sac
- Other floral parts are not affected. Mycelium is intercellular, sparsely branched, septate and without mycelium
- Disease Cycle-During threshing teleutospores are released from infected ovaries and get lodged on surface of seeds. They may remain viable for 5 years. These are thick walled, unicucleate diploid cells. Teleutospores germinate to produce three celled promycelium which produce lateral spordia
- Sporidia fuse in pairs forming dikaryotic mycelium, which enters the seeling
- Dikaryotic mycelium grows with seedling and produces sori in ovaries

Urocystis agropyri (Flag smut of wheat)

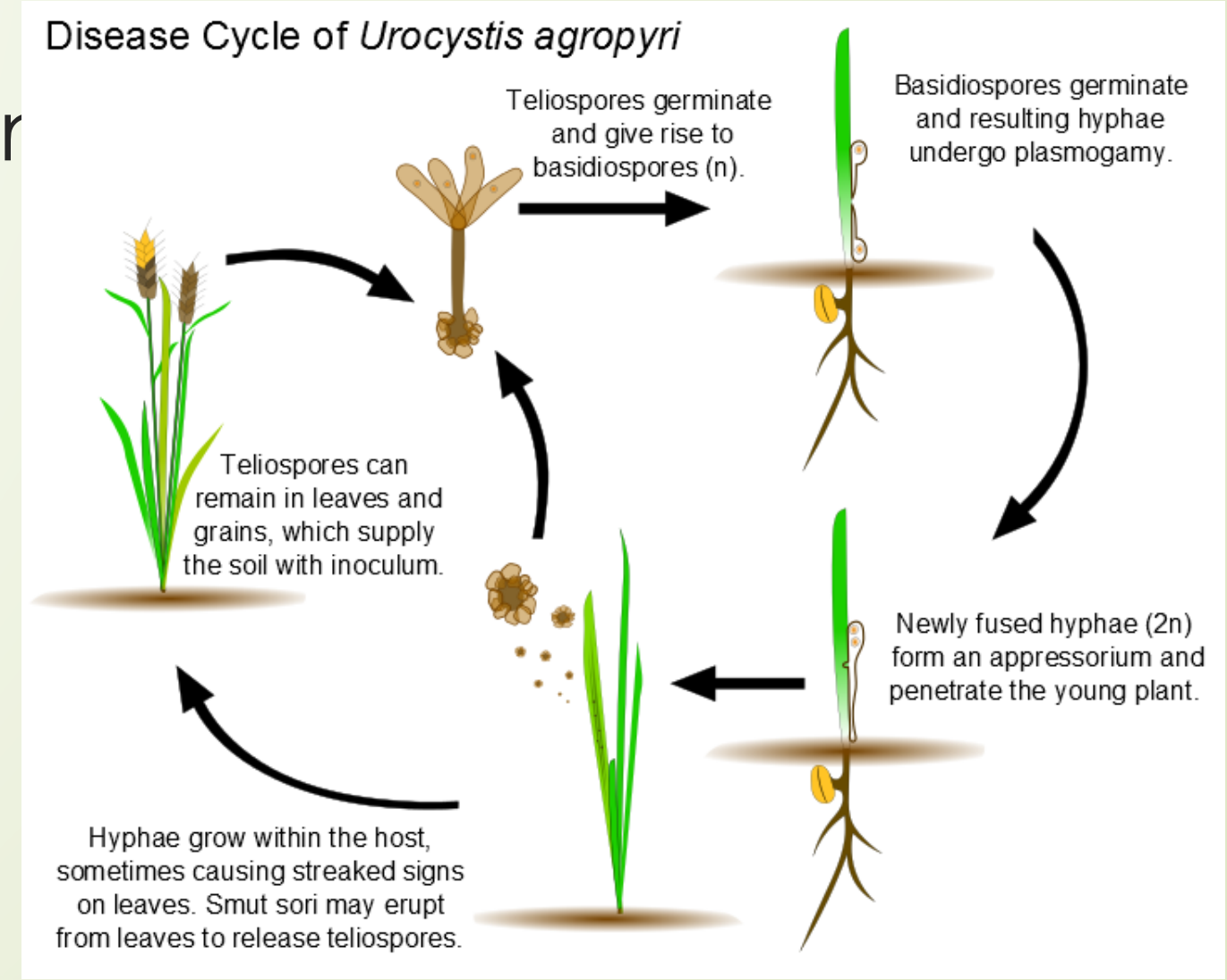
- This pathogen is found globally, but is most problematic in Australia and India. It produces basidiospores and teliospores
- Symptoms: Attacks leaf and stem of leaf. The fungi produces grey black lines of spore parallel to the veins. Infected plants are stunted and flag leaf twisted. Infected leaves not able to show full growth and remain rolled and twisted. Spores from infected leaf and straw spread on other grains and soil.
- Disease cycle Teliospores from the infected leaves or from the soil cause infection. The dikaryotic teliospores germinate , undergo meiosis and form basidiospores. Basidiospores germinate on seedlings and undergo plamogamy with compatible strains, and establishes dikaryotic stage.
- Some hyphal cells give rise to smut sori, bearing teliospores, which emerge through the leaf tissue for wind dispersal, or remain in the soil or rest on the seedlings. Teliospores can remain viable from 3-7 years.

Disease Mangaemer

- Avoid seeds from infected area
- Follow 3 yrs crop rotation in disease sick plots.

Treat the seed with Vitavax or Bavistin

- Rouging and burning of infected plants.



Smut of sugarcane(Sporisorium scitamineum/ *Ustilago scitaminea*)

- Sporisoium scitamineum attack s sugarcane species and has been reported to occur on a few other grass specie. The most recognizable characteristic of this disease is a black or gray growth that is referred to as a "smut whip".
- It is known to occur in India , Java,Taiwan, Philippines, Australia, South Africa, Italy
- Symptoms: A black whip like structure from the central core of the meristematic tissue. Initially, a thin, white and papery membrane covers the whip later, millions of black spores liberated after rupture of epidermis.
- Infected canes are short with more tillers, on emergence of whip the cane dies and withers.
- Disease cycle: The mycelium is intercellular and aggregates in dense masses towards the surface of the spore-bearing shoot where the spores are formed. The smut spores (teliospores) are spherical, smooth, light brown
- The spores from the whip like structure on affected canes are blown away by wind. Some of spores fall on the nearby canes and get deposited at the junction of the leaf and the leaf sheath from where they travel down the sheath to reach the nodal region.

- Disease Control

- Removal of smutted whips from the field.
- Discourage the practice of ratooning.

Avoidance of planting of setts from smutted canes.

- Disinfection of setts by 0.1 precent mercuric chloride, agallol, aretan, etc. before planting.
- Systemic fungicides-like vitavax, benlate, etc. can be used from setttreatment to eradicate the internally present dormant mycelium.
- Use of resistant varieties- like Co 449, 527, 658, 974, 1148, 6806, 7108, 7319, 62101, BO 22, 24, etc.

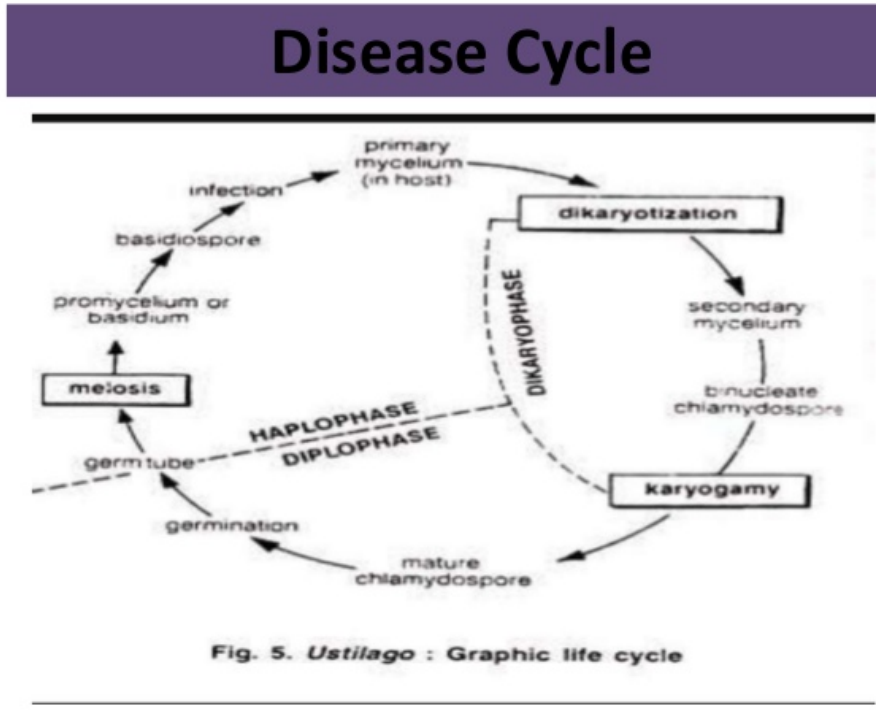


Fig. 5. *Ustilago* : Graphic life cycle

Deuteromycotina/Anamorphic fungi/ dustbin fungi/Imperfect fungi

- These are the artificially grouped fungi which do not have sexual reproduction
- Some members are saprophytes or parasites while a large number are decomposers of litter and help in mineral recycling
- They have a septate and branched mycelia
- Sexual reproduction is absent
- Reproduction is only by asexual spores, for eg. Conidia formation
- A. Conidiophores Producing Forms-conidia are produced in the centre of the conidiophore and pushed out successively
- B. Acervulus and Sporodochium Producing Forms: small or large cushion-like masses of hyphae with forms a bed of short conidiophores from which acervuli are produced. Acervuli may or maynot have a hair like setae
- C. Pycnidia Producing Forms: The pycnidia are more or less-globose or flask-shaped, hollow sporocarps in which conidia are borne at the tips of the conidiophores. Conidia may be coloured, commonly black, The pycnidium is usually provided with an opening (ostiole) through which conidia escape. The conidiophores borne in the pycnidia are generally very short, in some cases almost absent

Conidiation

- Conidiospores or conidia (sing. Conidium) are asexual reproductive structures borne on special spore bearing hyphae conidiophores. They are found in many different groups of fungi, but especially in ascomycotina, Basidiomycotina and Deuteromycotina.
- Conidia may be borne singly or in chains or in cluster. They vary from unicellular (e.g. Colletotrichum), bicellular, microconidia of Fusarium spp. and multicellular. The shape of the conidium may vary. They may be globose, elliptical, ovoid, cylindrical, branched or spirally coiled or star-shaped (staurospores). The colour of the conidia may be hyaline (hyalospore) or coloured (phaeospore) pink, green, or dark.
- On germination primary conidia develops uninucleate or binucleate secondary conidia. In species of Fusarium one or two-celled microconidia and many-celled macroconidia are common.
- Conidiophores are also known as sporophores. They are special hyphae bearing conidia
- They may be free, simple or branched. They may be distinct from each other or may be aggregated to form compound sporophores or fruiting bodies such as synnemata, sporodochia, acervuli and pycnidia.

Cercospora (Tikka disease of groundnut)

- Cercospora has been shifted to ascomycete, on the discovery of sexual stage, Mycosphaerella. Majority of the species are parasitic and cause leaf spot or tikka disease of economically important plant.
- Symptoms: Infection begins as pale green spots on the upper surface of the leaf, which slowly enlarge, turn brown and drying the entire leaf
- The mycelium is well developed, branched, intercellular, septate with a lobed haustoria. At maturity some of the hyphae aggregate to form brown to black color globular mass, called stroma in the sub-stomatal cavity or beneath the epidermis of the host.
- Asexual reproduction occurs by means of conidia. A tuft of conidiophores emerge either through stomata or ruptured epidermis. Conidia are long cylindrical, obclavate, multi-septate. Conidia germinate by giving rise to one or more germ tubes

Disease Cycle:

- Pathogen penetrates through conidia lying in soil or plant debris. It penetrates the leaf and forms the stroma. Conidiophores emerge from the stroma and conidia are formed. Conidia cause secondary infection, by disseminating through wind and insects.

Disease Control

- Field sanitation: Removal of debris to reduce primary infection
- Crop rotation
- Disinfection of the seeds
- Spraying of fungicides like Bordeux mixture

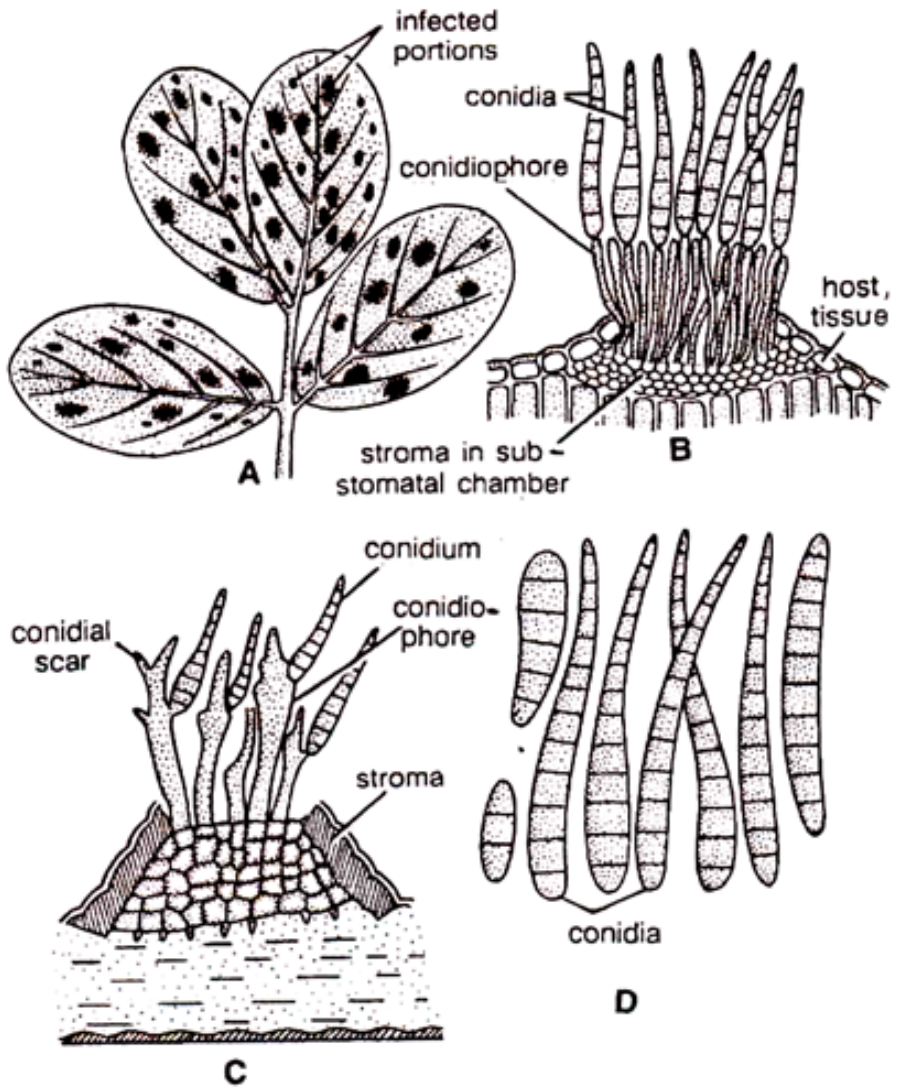


Fig. 1. (A–D). *Cercospora*. (A) Leaf spot disease of ground nut, (B) Conidiophore bearing conidia, (C) Logitudinal section of acervulus with geniculate conidiophores, (D) Conidia

Helminthosporium

- These are dematiaceous fungi or pigmented fungi. The hyphae are dark yellow or brown when unstained. Colonies are darkly pigmented at some stage of growth. They have pigmented hyphae or spores or both,
- Dematiaceous fungi have
- A.fungi with muriform (conidia club shaped withtransverse or longitutinal septa) macroconidia septation Eg. Alternaria
- B. Fungi with transversely septate macroconidia Eg. Curvularia, Drecshlera
- C.Fungi with microconidia
- D. Fungi with unique forms
- Helminthosporium causes leaf spot, crown rot, root rot, leaf blight, especially of grasses (e.g., bluegrass, corn, oats), in humid areas.
- These have now been transferred to Bipolaris and Exserohilum
- It causes grayish green, tan, or brown elliptical spots that appear on lower leaves and spread later to upper leaves

- The mycelia extend and expand their branches through the stomata or broken cells from lower surface of leaf
- Branches are called condiophores and contain conidia at the apical parts.
- The conidia spread to other plants in favourable conditions

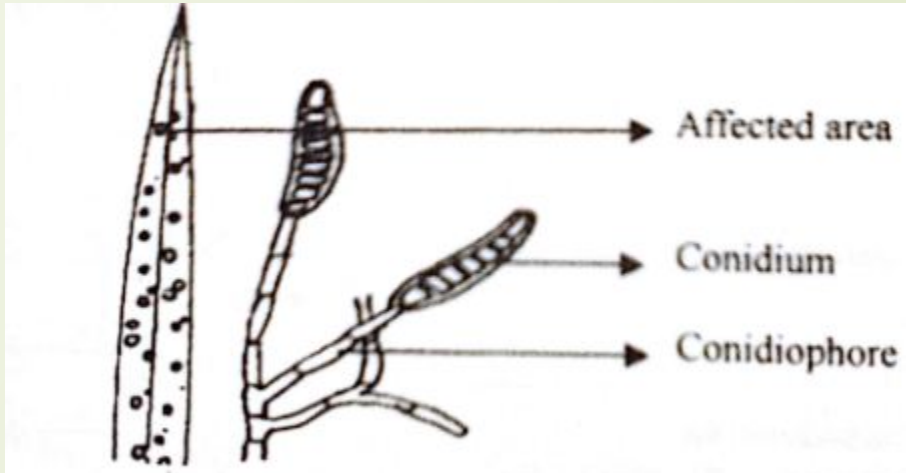
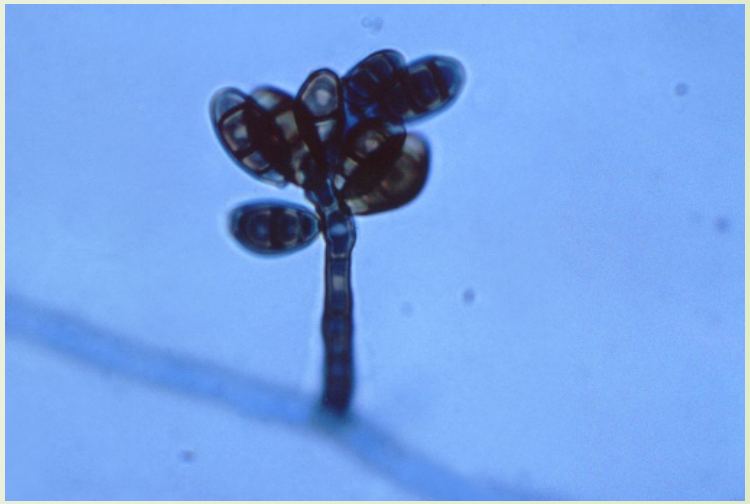


Fig: *Helminthosporium oryzae*

Curvularia,



- It is a dematiaceous filamentous fungi which are facultative pathogens of soil, plants and cereals
- Conidiophores erect, straight to flexuous, septate and give rise to geniculate (producing conidia in sympodial succession). Conidia are boat shaped, rounded at the ends or sometimes tapering slightly towards the base, pale brown, medium reddish brown to dark brown with 3–5) septa.
- The teleomorphic state of *Curvularia lunata* is *Cochliobolus lunatus* member of ascomycete

Alternaria

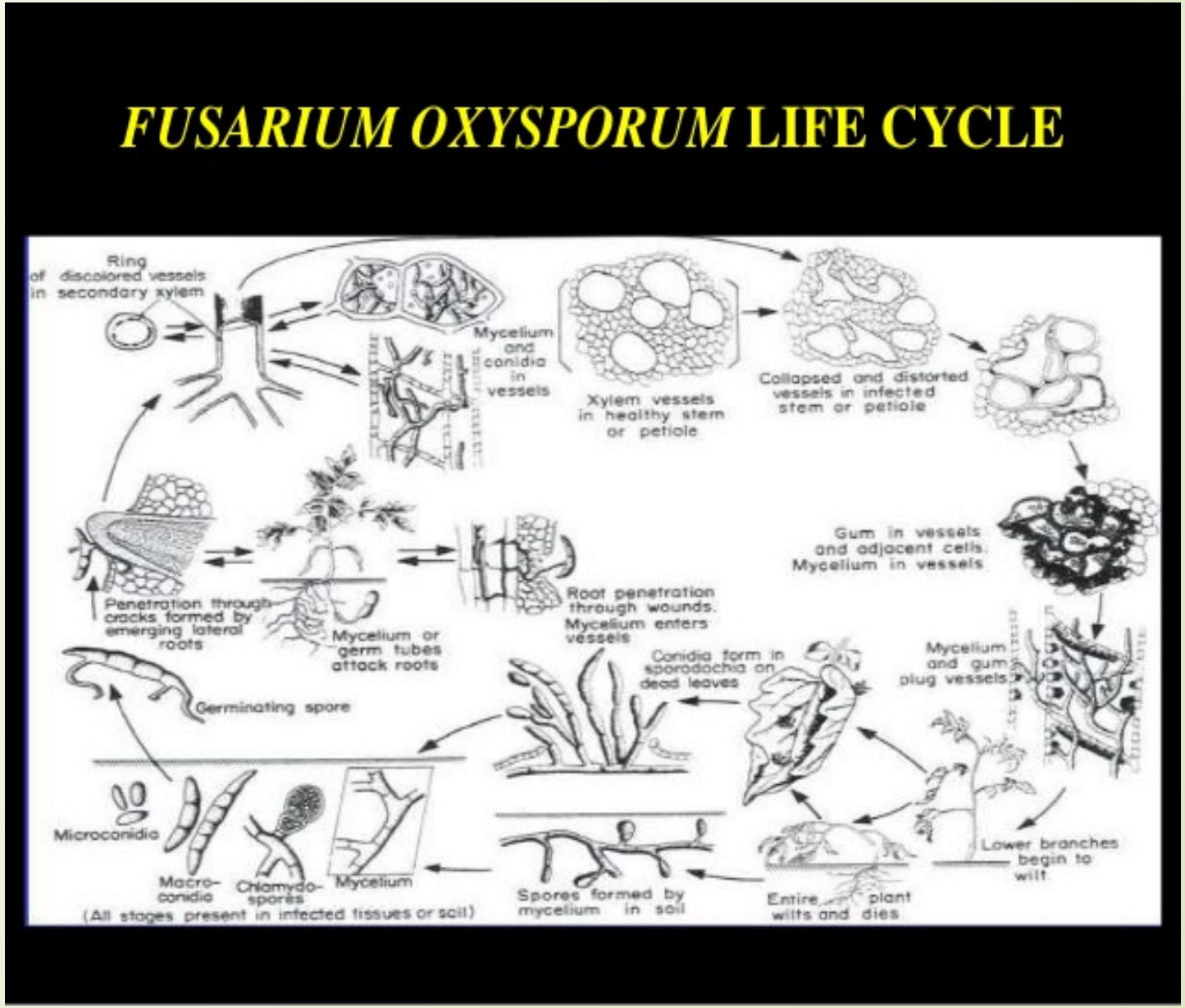
- Alternaria is a dematiaceous fungi, as melanin-like pigment production is one of its major characteristics. Alternaria species are saprophytes, involved in the decomposition of various organic matter, however some species of Alternaria can be parasitic. *Alternaria* spp. have emerged as opportunistic pathogens
- Alternaria produce,mycotoxins, toxic compounds, alternariols, altenuene, tentoxin and tenuazonic acid, which are found in food stored with moisture content.
- Conidiophores are erect, septate, and geniculate. Large brown, muriform (regular arrangement as in bricks of wall) conidia with beaks are borne singly or in chains
- Its teleomorphic genera are called *Clathrospora* and *Leptosphaeria*.

Fusarium oxysporum (Wilt of cotton)

- Fusarium is a member of ascomycete with anamorph of Gibbrrella
- Fusarium are filamentous, referred to as hypohomycetes (lack closed fruit bodies, and are often referred to as moulds)
- Fusarium produces mycotoxins grouped into four groups Trichothecenes, zearalenone, fumonisins, and enniatins (including, vivotoxin and fusaric acid)
- Fungi causes wilt of cotton which is one of disease, found wherever the crop is grown. Fungus is present both inter and intracellular in host tissue
- The mycelium plugs the xylem completely. It undergoes asexual reproduction to form macrocondia, microconidia and chlamydospores. Macroconidia are 1-5 septate, hyaline thin walled falcate in appearance. Microcondia are hyaline thin elliptical to spherical, single or two celled. Chlamydosproes are spherical and thick walled and formed during unfavorable conditions
- Symptoms: They causes the loss of turgidity of leaves Discoloration of leaves occurs from margins towards midrib. The yellowing of leaves occurs which then causes the leaves to turn brown and finally fall off
- It causes yellowing and browning of cotyledons
- The vascular tissue becomes brown and then black

Disease cycle

- Disease is common in heavy black soils with alkaline reactions.
- The soil temperature of 20-30 with increased doses of nitrogen and phosphatic fertilizers. Common in areas with hot and dry periods followed by rains.
- Soil humidity of 40-70% with pH 5.3
- Disease Control
- Treatment of seeds with carboxin or carbendazim
- Field sanitation- removal and burning infected plant debris
- Growing resistant varieties



Colletotrichum fulcatum (Red rot of sugarcane)

- Colletotrichum, sexual stage Glomerella, is an important species which form parasitic and mutualistic relationship with host
- The hyphae is colorless internal (intercellular or intracellular), septate and branched.
- Red rot of sugarcane is one of the severe diseases affecting sugarcane growing areas of the world
- Symptoms: First external evidences of disease are the drooping, withering, and finally yellowing of the upper leaves.
- Infection in the stem is internal, and the presence of the disease is not visible externally. Upon splitting a diseased cane during the early stages of the disease, it will be found that the fibro-vascular bundles near the base are reddish in color. This is due to some reaction caused between the fungal hyphae and the host. The protoplasm changes color and a gummy dark-red material oozes out of the cells filling the intercellular spaces. The soluble pigment in the material is absorbed by the cell-walls which give a red rot appearance.
- As the infection spreads red color spreads to other areas through internodes forming irregular discolored blotches which may be red/yellow/white with red margins. When the stem is completely rotted inside, black specks appear at the rind the stem shrinks at the node. On splitting the cane gives a sour odor

Disease cycle

- The hyphae after ramifying in the infected host tissue collect beneath the epidermis and form a stroma of densely packed cells develop an acervulus is developed which causes rupture of host epidermis. The acervulus bears long septate setae along with short conidiophores on which falcate (sickle-shaped) conidia are borne
- In unfavorable conditions, the hyphae produce chlamydospores which persist in soil for a long time
- Disease Control
- Field Sanitation
- Ratoon crops also serve as a source of primary inoculum-Use of resistant ratoon varieties
- Physical methods-hot water treatment of seeds, which can be utilized for controlling red rot of seed
- Treating seed with fungicides like Arasan

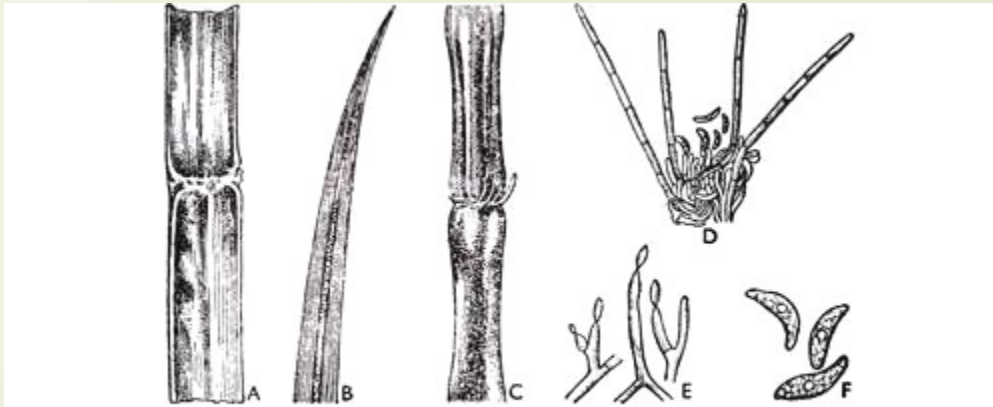


Fig. 374. Red Rot of sugarcane. A—C. Disease symptoms. A and C. On stem. B. On leaf. D. An acervulus. E. Conidiophores producing conidia. F. Conidia.

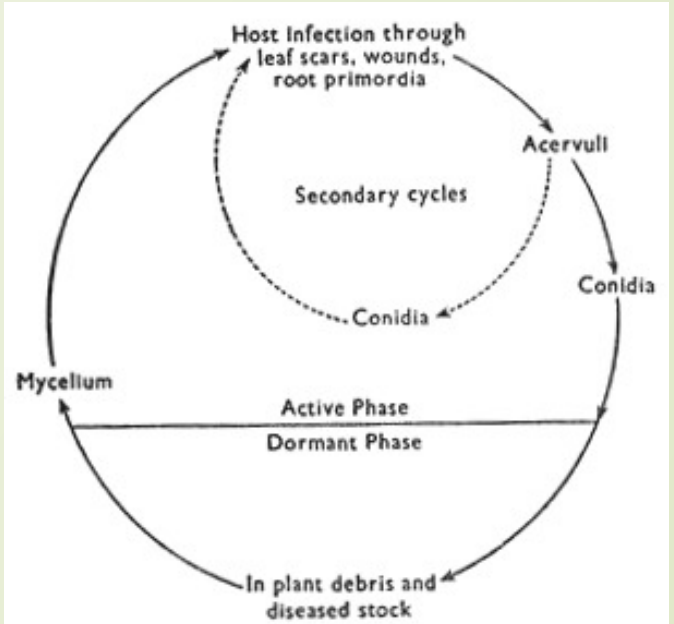


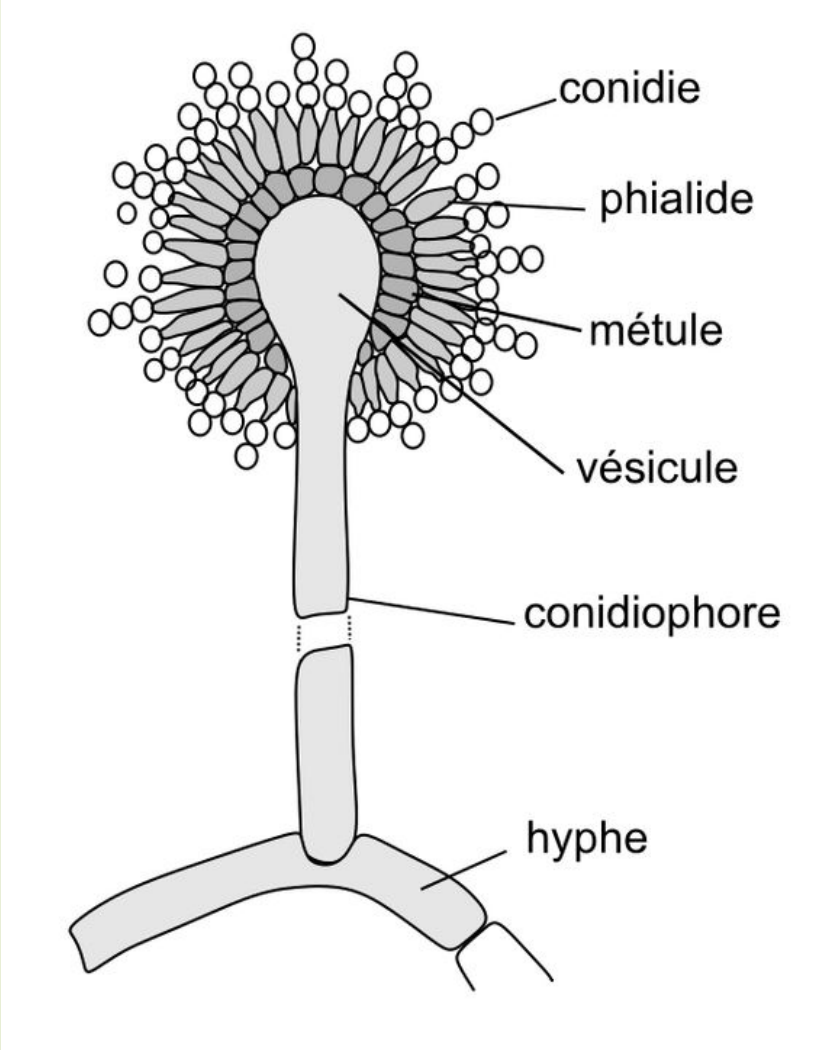
Fig. 375. Disease cycle of Red Rot of sugarcane.

Aspergillus,

- **Aspergillus** is a ubiquitous mould fungi having around 100 species whose spores are present in the air, soil, compost, dung etc. In air the spores normally do not cause illness. It is known to cause opportunistic infections in man; allergies; toxicoses
- Genera Fennellia, Petromyces, Neocarpenteles and Neopetromyces are synonmised as telomorph of Aspergillus (Members of Ascomycetes)
- They are known to cause Aspergillosis, and can also colonize lung cavity arisen due to previous tuberculosis. Some *Aspergillus* antigens are fungal allergens and may initiate allergic bronchopulmonary aspergillosis. Some *Aspergillus* spp. produce various mycotoxins, for example, aflatoxin which may contaminate food and also may be potential carcinogenic.
- Aspergillus is thermos tolerant and can grow at temperatures above 40®C. The color of various Asperigillus species colony differ ranging from blue green to black to yellow and pink
- Mycelium is thus colored, septate and hyaline. The conidiophores originate from the basal foot cell located on the supporting hyphae and terminate in a vesicle at the apex. The morphology and color of the conidiophore vary from one species to another. Covering the surface of the vesicle entirely ("radiate" head) or partially only at the upper surface ("columnar" head) are the flask-shaped phialides which are either uniseriate and attached to the vesicle directly or are biseriate and attached to the vesicle via a supporting cell, metula.

Economic use of Aspergillus

- *Aspergillus flavus*, which produces **aflatoxin**. Aflatoxin is a contaminant of nuts and grain. It is both a toxin and a carcinogen
- Aspergillus causes opportunistic diseases
- *A. niger* produces most of the world's citric acid, which acts as preservative for foods, used in detergents and other industrial products
- Aspergillus is also used in process of fermentation process for the formation of food beverages, such as soy souse, chocolate, soft drinks, vitamins, black tea and fruit juice
- A non-carcinogenic, aflatoxin-free strain of *Aspergillus flavus*, *A. flavus* AF36, is used as a component of pesticides



Penicillium

- Penicillium species are ubiquitous fungi also known as blue or green moulds. These are saprophytes which may function as opportunistic parasites in immune deficient organisms
- The teleomorph of Penicillium is Eupenicillium and Talaromyces
- Penicillium is composed of colorless slender, tubular, branched and septate hyphae. The net like mycelium is found on the surface which eater enters the substratum and absorbs food and nutrients.
- Reproduction can be by asexual or sexual means. Asexual reproduction is common and occurs by means of uninucleate conidia. The conidiophores are formed on the hyphae the terminal ends of the conidiophore bear the bottle like philalids on which about 100s of conidia are born.
- The conidia is green, therefore the fungus also called as green mould.
- The conidiophore along with the conidia give a broom like appearance .
- Sexual reproduction occurs by formation of ascogonium, and an antheridial branch which coils around the ascogonium. On plasmogamy clestothecium is formed, which undergoes karyogamy forming ascospores.
- Pencillium is of importance for maintaining the natural environment, in food industry and drug industry. Penicillium grown on rotten vegetable, fruits and dead organic matter, thus having ecological role

Economic Importance of Penicillium

- Penicillin discovered in 1928, Alexander Fleming, from Penicillium notatum which can be used as antibiotic. Later P. chrysogenum is used as mass production of antibiotic. Grieseofulvin is another antibiotic produced by P. griseofulvum (which inhibits the growth of some other fungi, e.g.. Control of ringworm disease)
- Penicilium roqfertii and P. camembertii are used to make cheese
- During damp and warm weather it appear on wood, fabrics, cheese, butter, jam and jelly causing their decay
- They also cause rot and decay of lemon, orange and other fruits and vegetable during their storage

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- Thank You