

Aula N° 2

- **Divisão *Ascomycota* e Fungos Anamórficos:
Características Gerais e Classificação**

Bibliografia:

Manual de Fitopatologia vol. 1, cap 8.

Divisões (Filos) dos fungos (Dictionary, 2008)

Reino Protozoa

Myxogastrea
Phytophycea



Reino Chromista

Oomycota



Reino Fungi

Blastocladiomycota
Chytridiomycota
Zygomycota
Ascomycota
Basidiomycota



Fungos Anamórficos



DIVISÃO ASCOMYCOTA

Principal característica: ascósporos (n) formados no interior de ascos (fase teleomórfica)



1. Ocorrência e importância

- **Maior grupo de fungos – mais de 64.000 espécies (Dictionary, 2008)**
- **Habitat: terrestres e aquáticos (água doce e salgada)**
- **Saprófitas: coprófilos, restos de animais e vegetais**
- **Celulolíticos: decompositores, destruição de papéis e tecidos celulósicos. ex: *Chaetomium***
- **Simbiontes: líquens e micorrizas**
- **Parasitas do homem e outros animais: dermatites, micoses, infecção pulmonar.**

➤ Parasitas de insetos: ex: *Cordyceps*, *Beauveria*, *Metharhizium*



➤ Parasitas de plantas: fitopatógenos ou toxicogênicos



Giberella

Claviceps purpurea



Aspergillus flavus



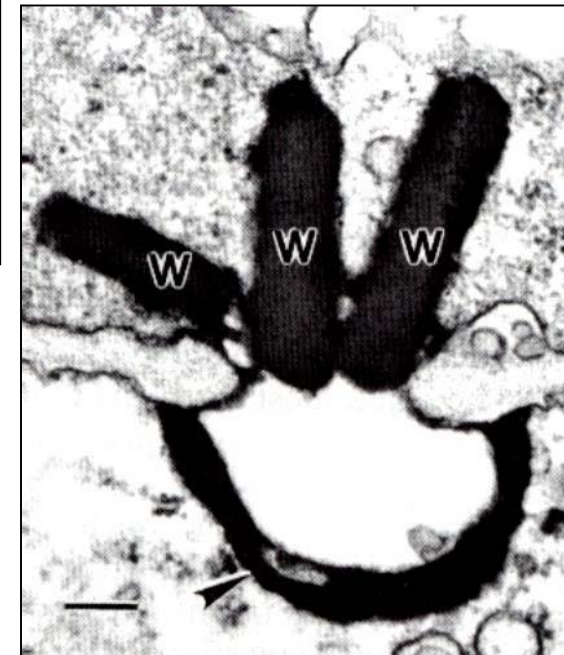
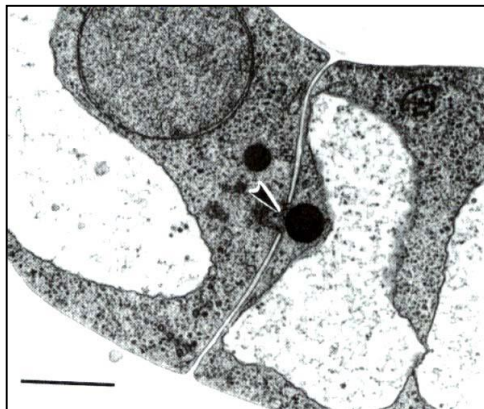
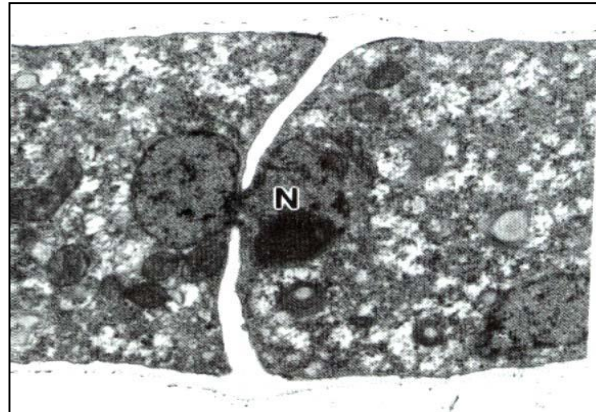
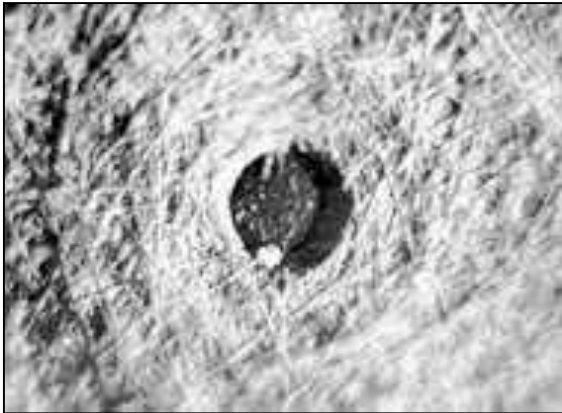
- **Fermentação alcoólica: leveduras (*Saccharomyces cerevisiae*)**
Bebidas alcoólicas, álcool combustível, panificação
- **Produção de antibióticos: *Penicillium***
- **Ascomicetos comestíveis: Morchelas e trufas**



2. Morfologia

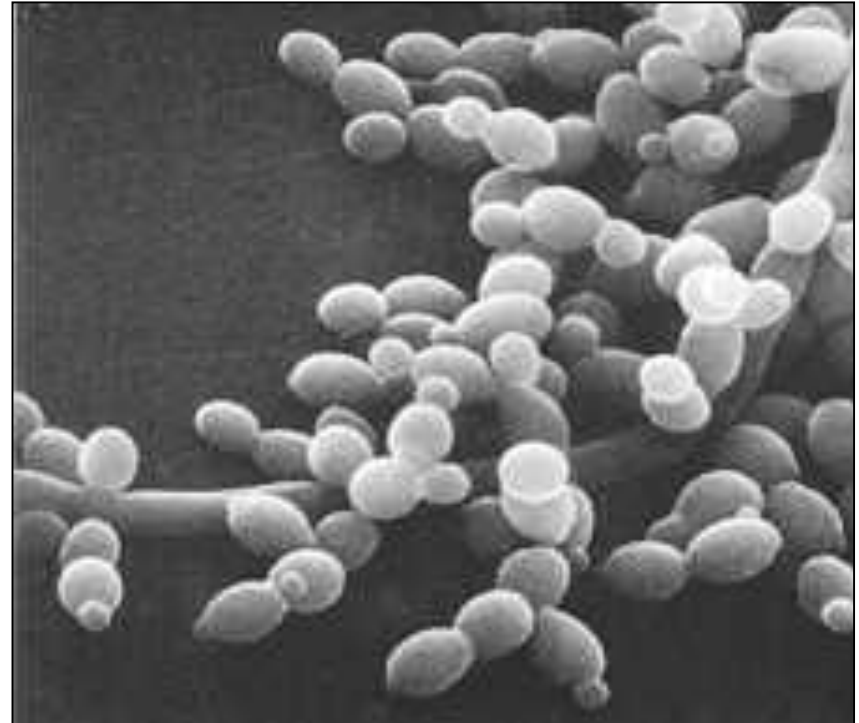
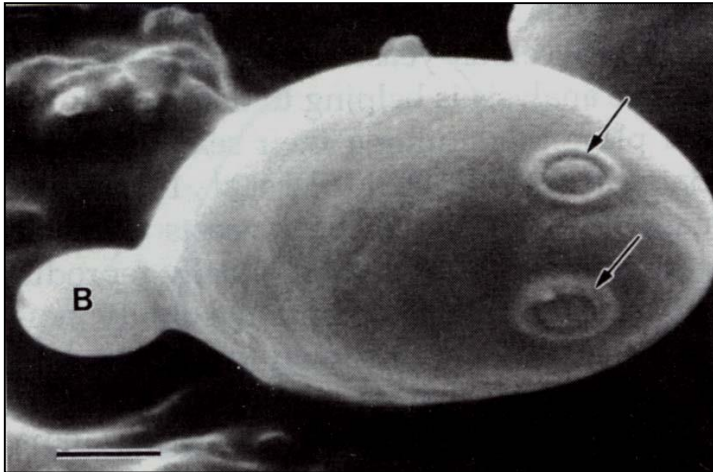
a) Talo Somático

- **Micelial:** hifas septadas
um poro simples, central
corpos de Woronin
quitina e β -glucanas na parede



B) Reprodução assexual

➤ Brotamento: leveduras



- Fase assexual (anamórfica):
- conídios
 - conidióforos, células conidiógenas
 - picnídios, acérvulos (conidiomas)

C) Reprodução sexual

➤ **Asco:** cilíndrico, clavado ou globoso



➤ **Túnicas do asco:**

Asco prototunicado: 1 túnica, evanescente

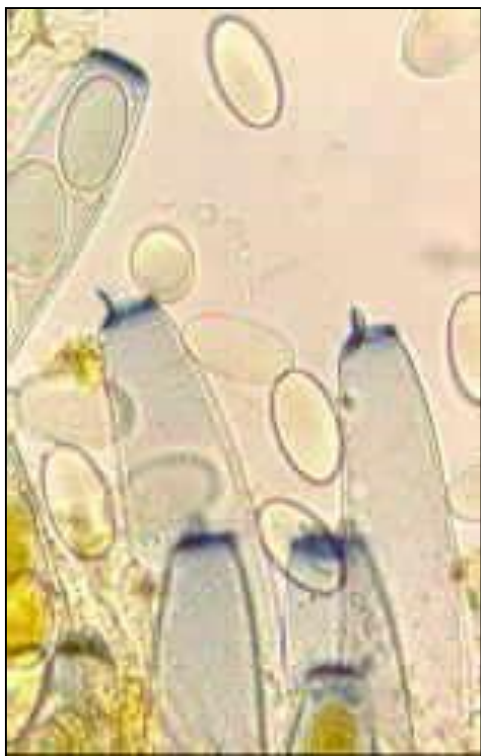
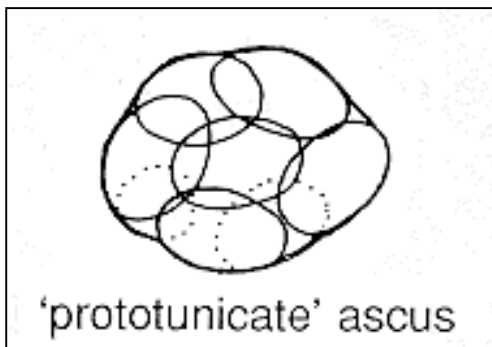
Asco unitunicado: 1 túnica (2 firmemente aderidas)

Asco bitunicado: 2 túnicas

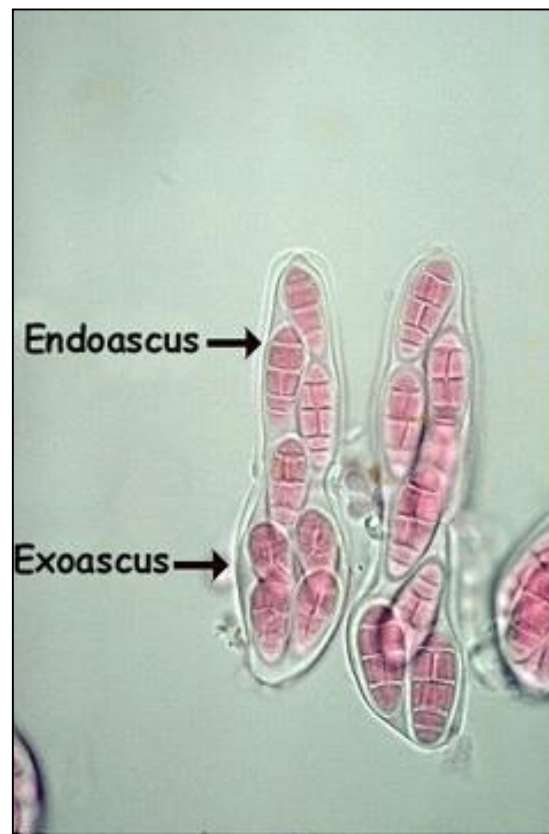
Exoasco ou exotúnica: fina e rígida

Endoasco ou endotúnica: elástica

Prototunicado



Unitunicado



Bitunicado

➤ **Ascocarpos (ascomas):**

Sem ascocarpos: ascos nus (ex: *Saccharomycetales*, *Taphrinales*)

“Hemiascomicetos”

Cleistotécio: globoso, fechado

“Plectomicetos”

Peritécio: forma de pera, com rostro (pescoço) e ostíolo (abertura)

“Pirenomicetos”

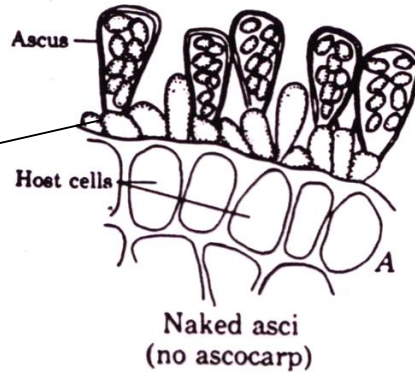
Apotécio: aberto, forma de taça, disco ou prato

“Discomicetos”

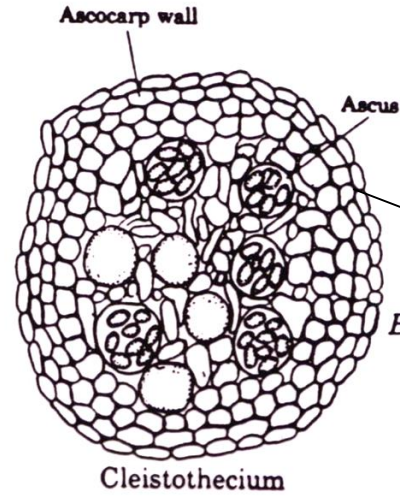
Ascostroma: estroma com cavidades (lóculos) em seu interior

“Loculoascomicetos”

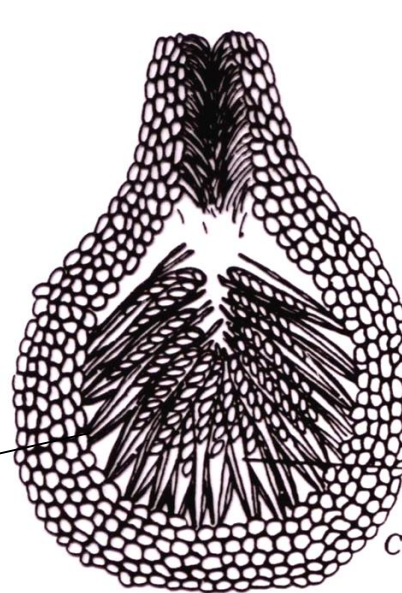
Ascus nus



Cleistotécio



Peritécio



Apotécio

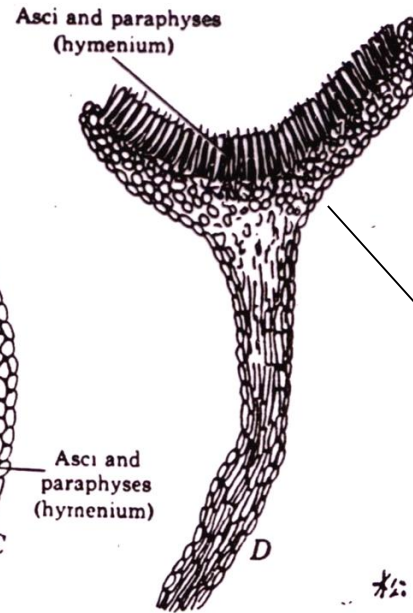
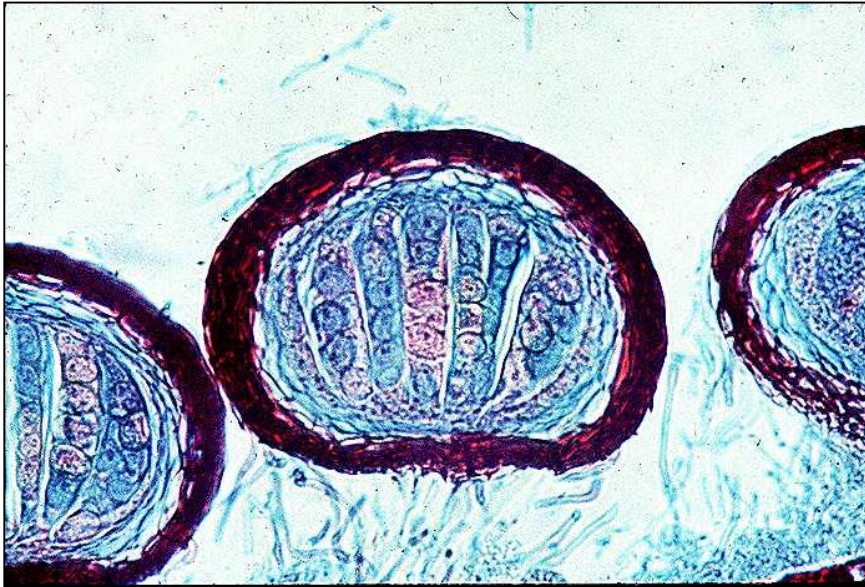


Figure 11-11. Four ways in which Ascomycetes bear their asci.

Cleistotécio



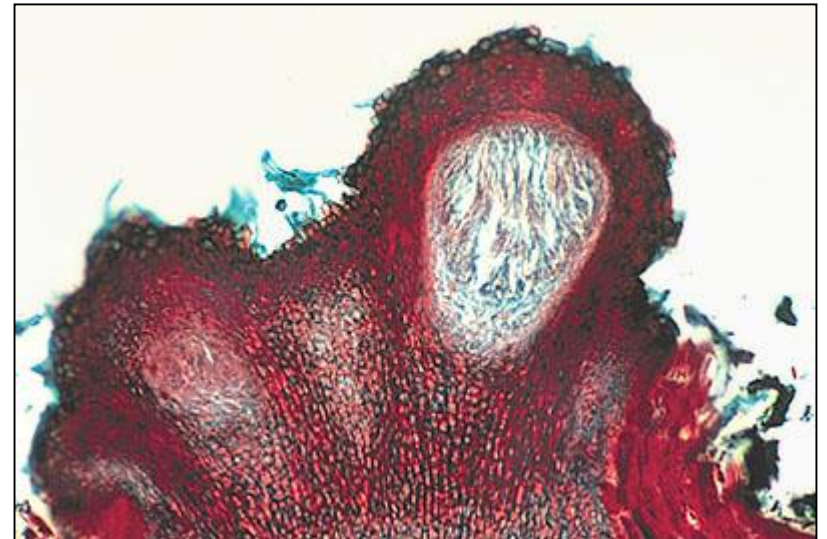
Peritécio



Apotécio

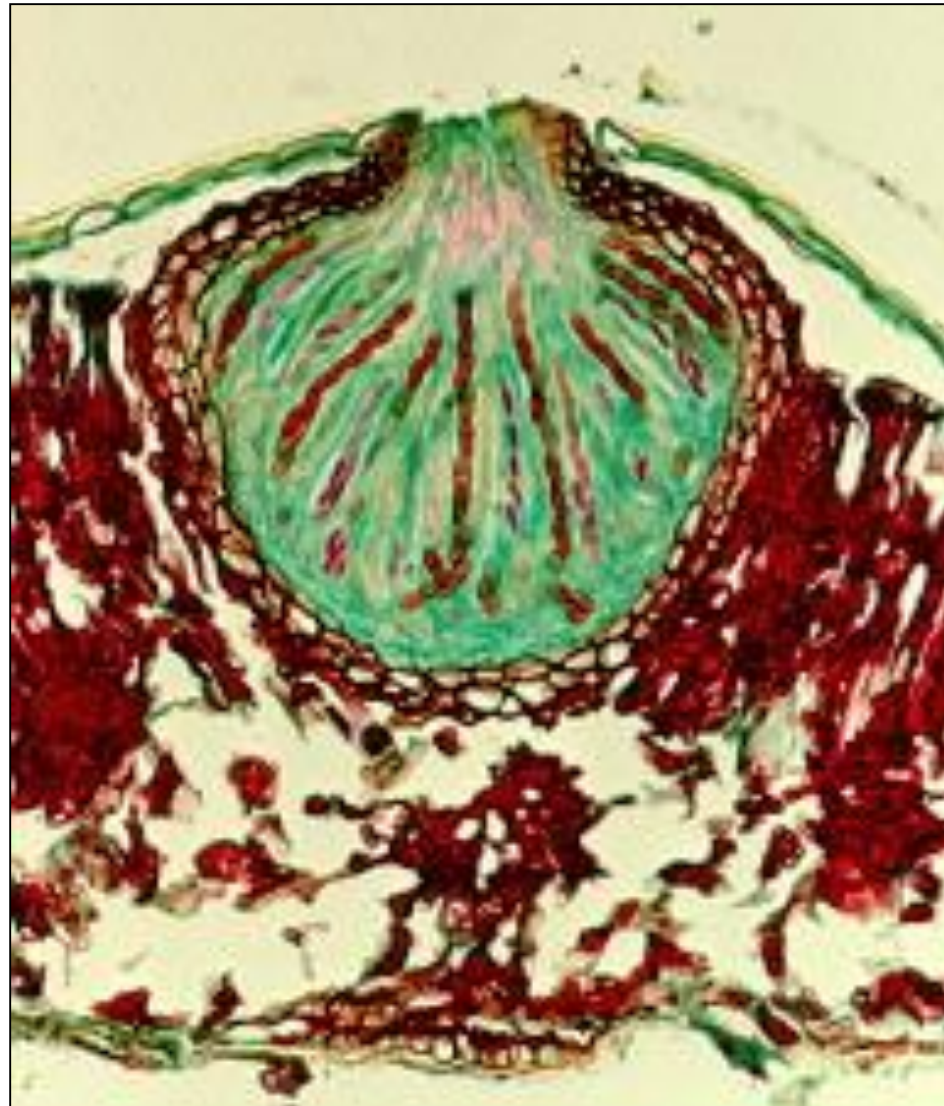


Ascostroma

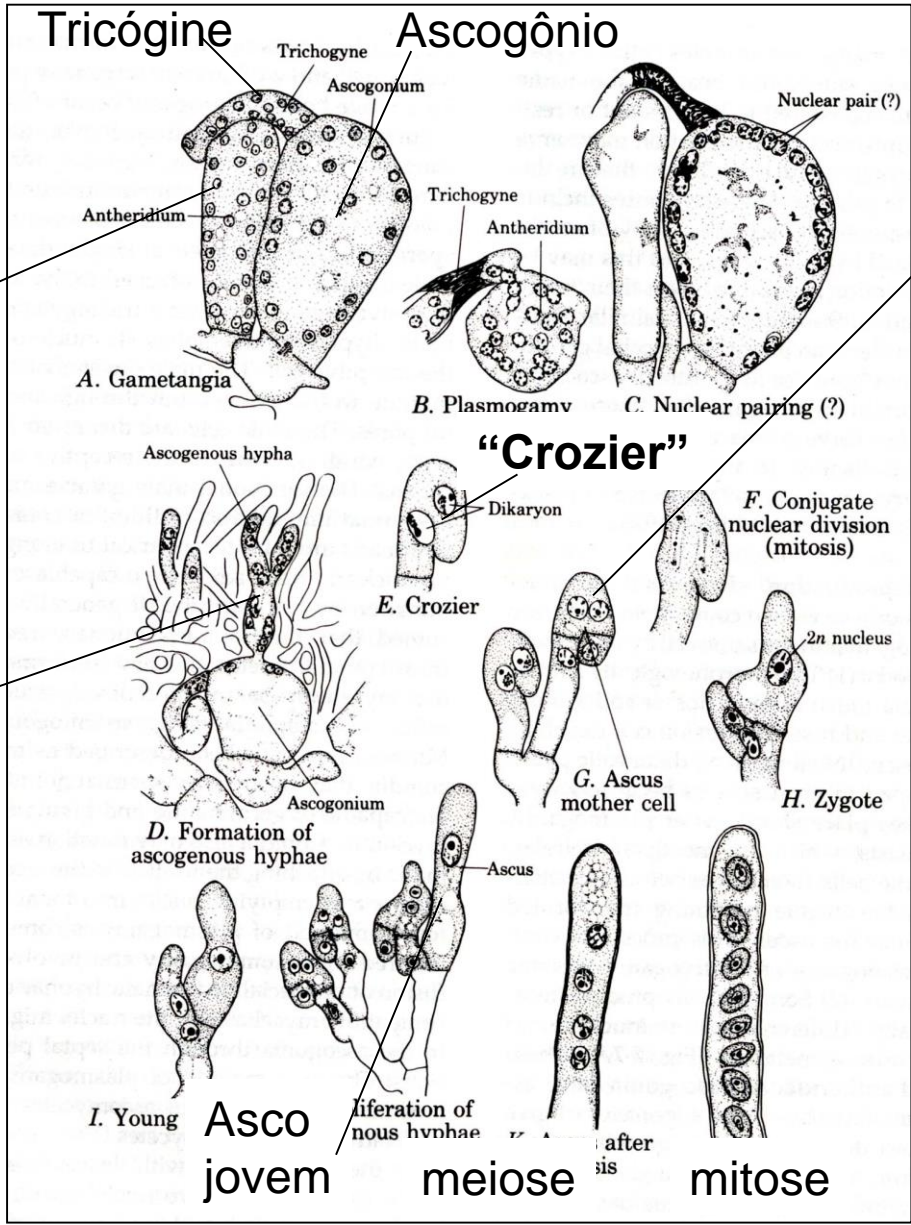


Pseudotécio

Um ascostroma com um só lóculo



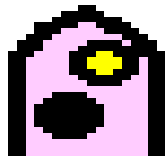
➤ Eventos da reprodução sexuada:



Célula mãe do asco

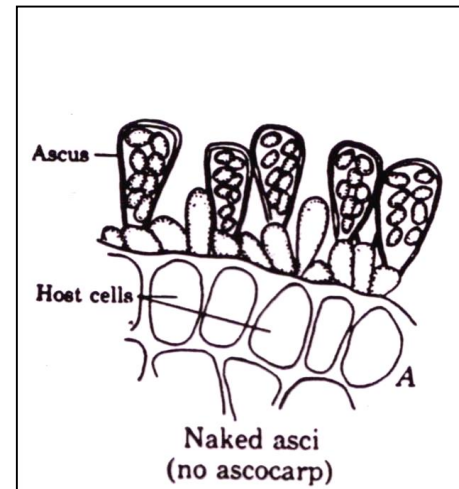
Anterídeo

Hifa Ascógena



3. Principais grupos de Ascomicetos

Hemiascomycetes



ORDEM *TAPHRINALES*

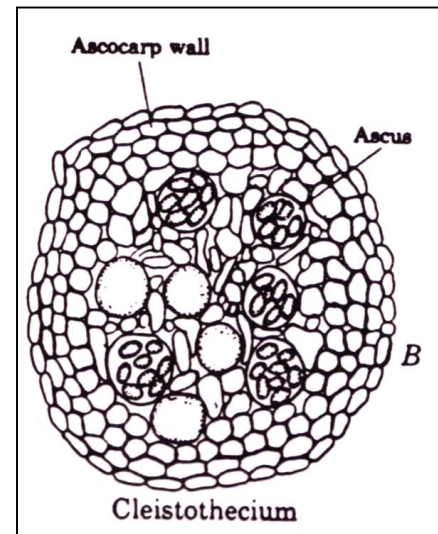
Ex: *Taphrina deformans* – crespeira do pessegueiro

Colônias leveduriformes em meio de cultura
(brotamento de ascósporos)

Micelial no hospedeiro (dimórfico)



Plectomicetos



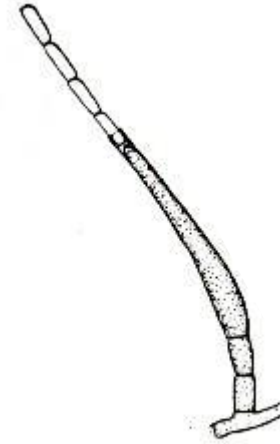
ORDEM EUROTIALES

- *Emericella* = *Aspergillus* (anamórfico)

Fialídico

Alergênicos, micotoxinas

Podridões em sementes e grãos



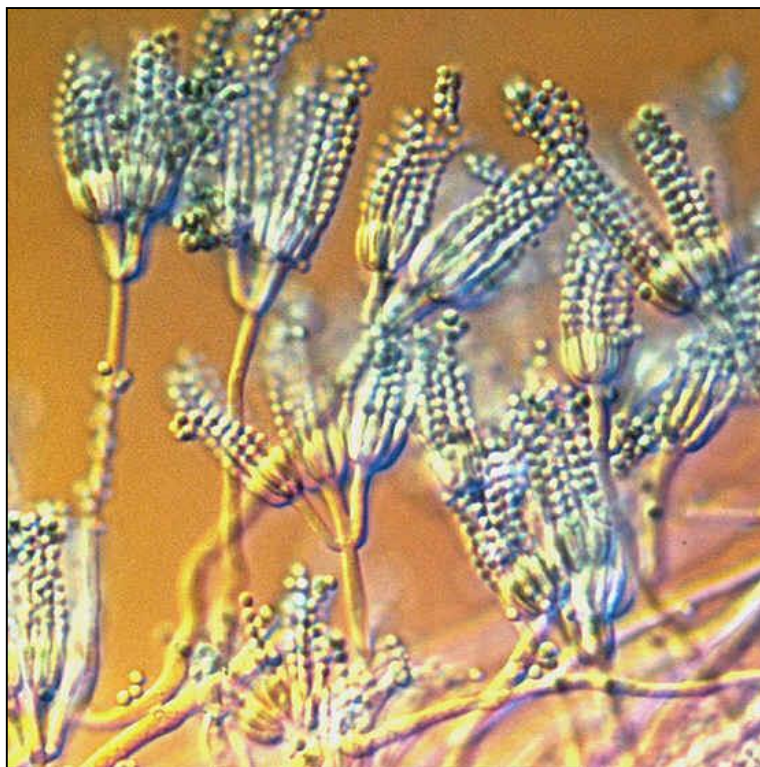
Fiálide



-*Eupenicillium*, *Talaromyces* = *Penicillium* (anamórfico)

Fialídico

Podridões em sementes, grãos e frutos

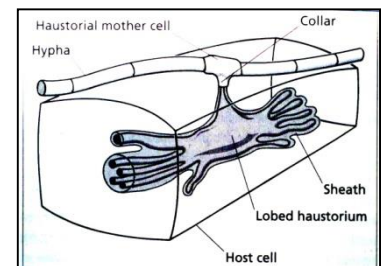


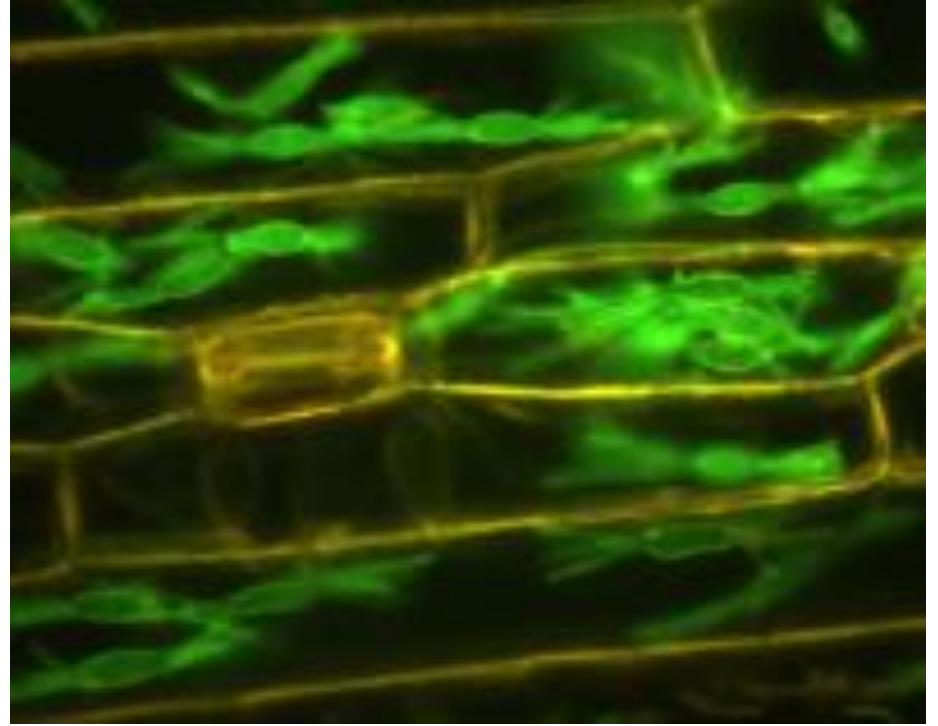
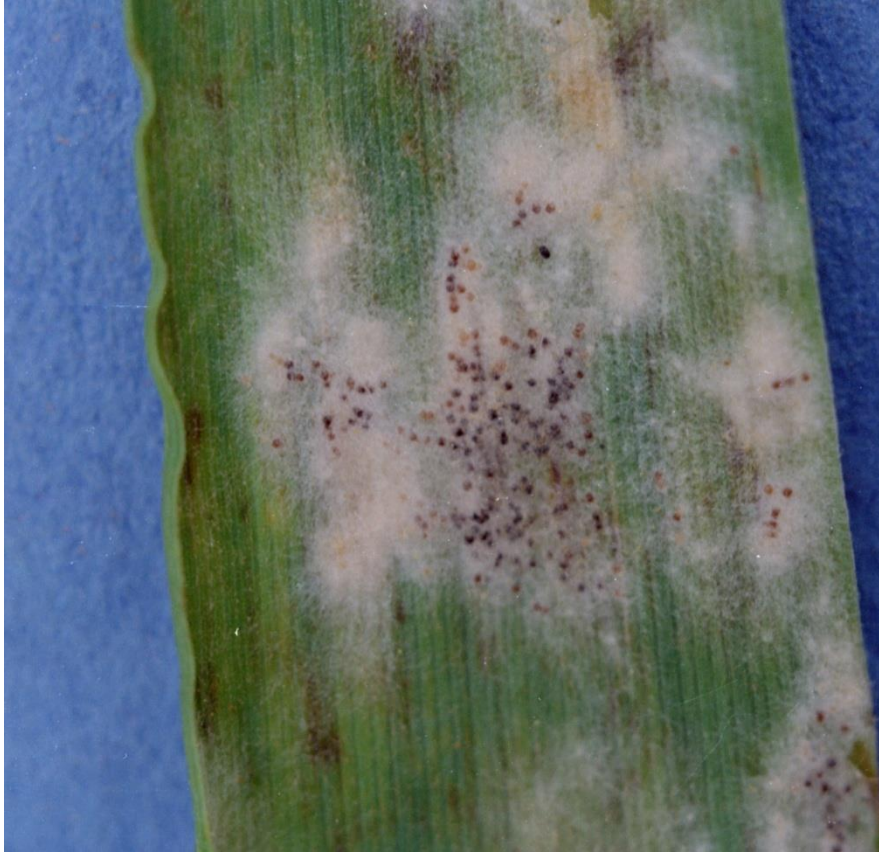
ORDEM ERYSIPTHALES

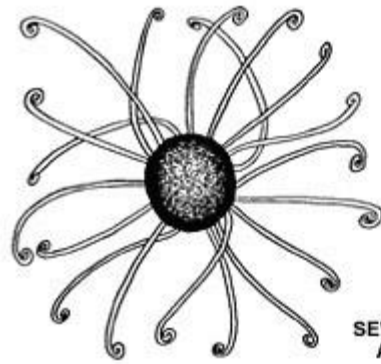
Parasitas biotróficos de plantas

Causadores de doenças conhecidas como “oídios” (powdery mildews)

Gr. “oidion” = pequeno ovo

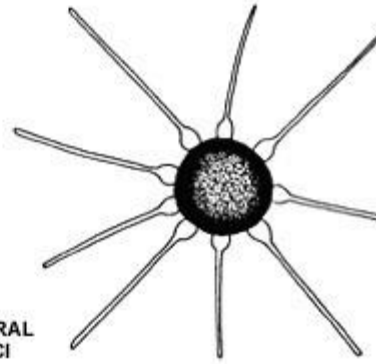




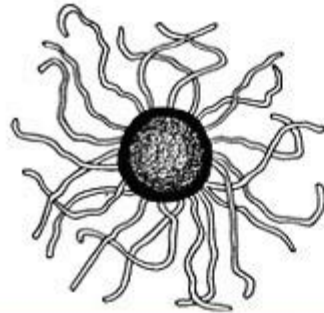


UNCINULA

SEVERAL ASCI



PHYLLACTINIA



SPHAEROTHECA

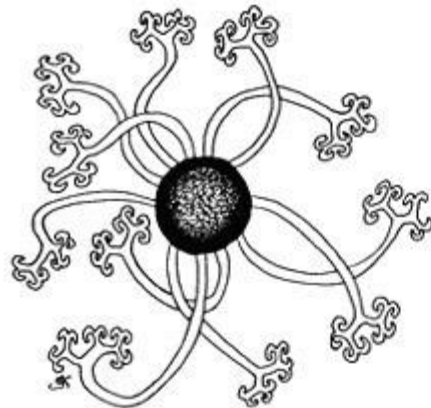


ONE ASCUS



SEVERAL ASCI

ERYSIPHE



PODOSPHAERA



ONE ASCUS

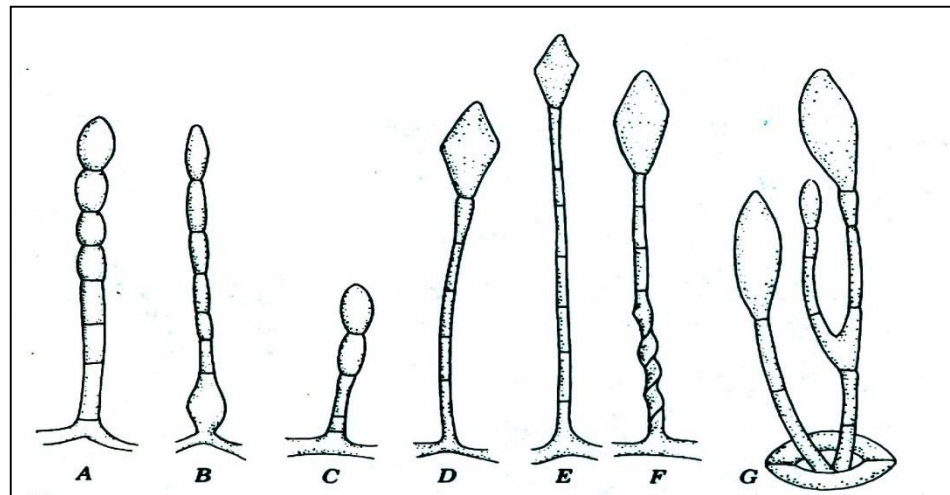
MICROSPHAERA



SEVERAL ASCI

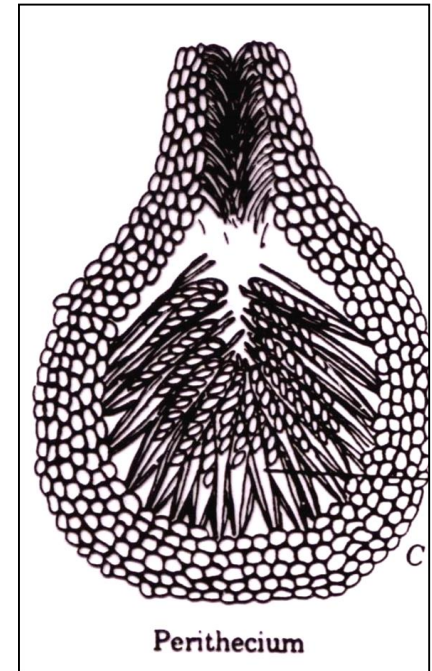
Associação fase sexuada/fase assexuada

<i>Erysiphe</i>	}	<i>Oidium</i>
<i>Blumeria</i>		
<i>Sphaerotheca</i>		
<i>Microsphaera</i>		
<i>Podosphaera</i>		
<i>Uncinula</i>		
<i>Phyllactinia</i>	→	<i>Ovulariopsis</i>
<i>Leveillula</i>	→	<i>Oidiopsis</i>

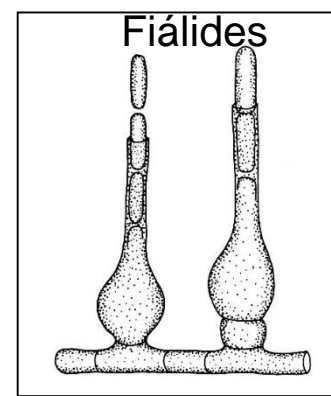


Oidium Ovulariopsis Oidiopsis

Pirenomicetos



ORDEM HYPOCREALES



Nectria/ – *Tubercularia, Fusarium* (cancros em árvores, podridões de raízes)

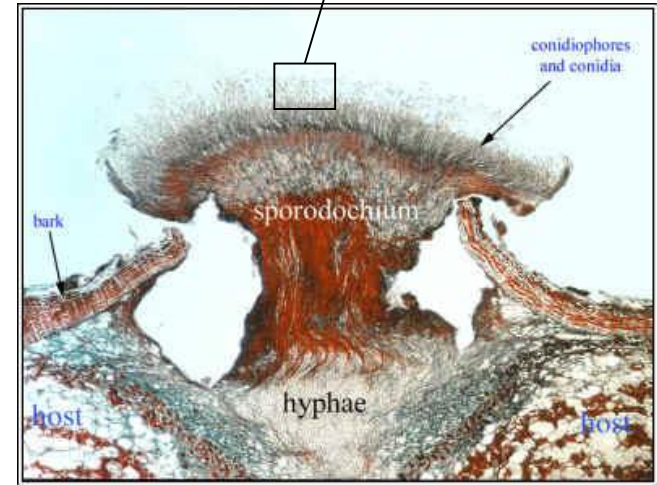
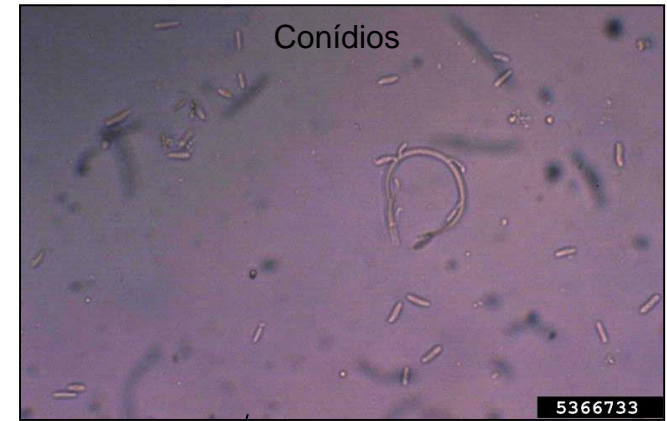
Haematonectria

Gibberella – *Fusarium* *F. verticillioides/F. graminearum* – micotoxinas

F. oxysporum - murchas

Claviceps purpurea - “ergot” dos cereais

Nectria / Tubercularia



Esporodóquio de *Tubercularia* em corte

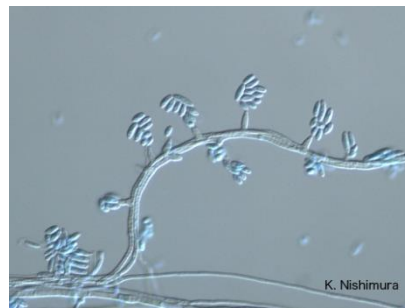


Esporodóquio

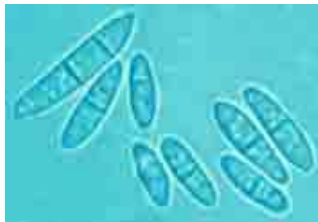
Nectria / Fusarium solani



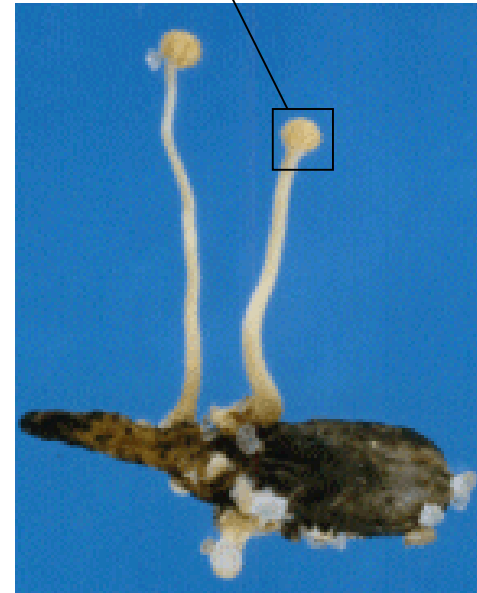
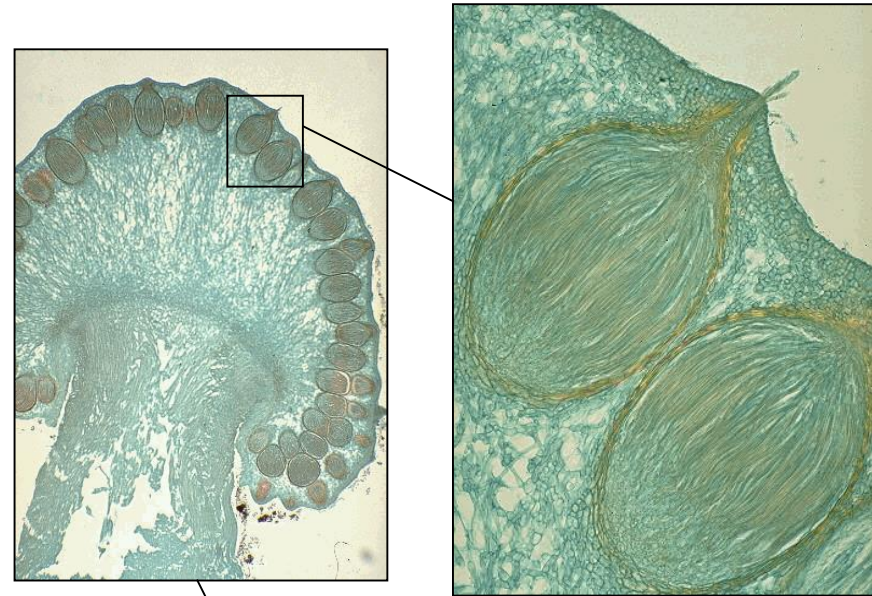
Gibberella / Fusarium graminearum, F. verticillioides, F. oxysporum



Fiálides, macroconídios, microconídios, clamidósporos



Claviceps purpurea

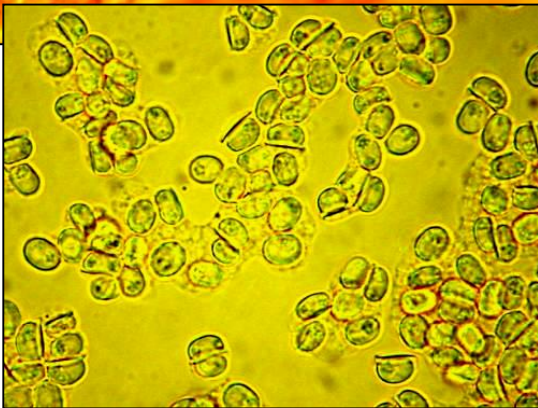
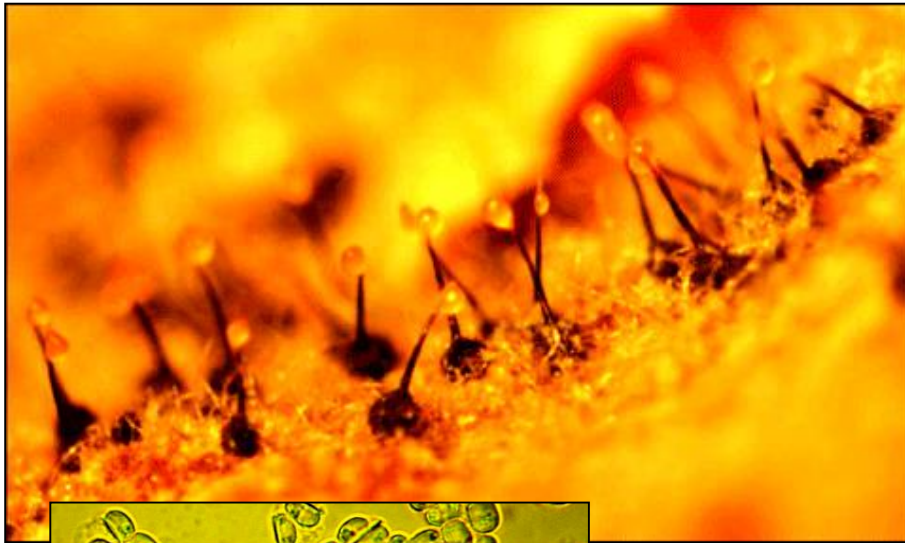
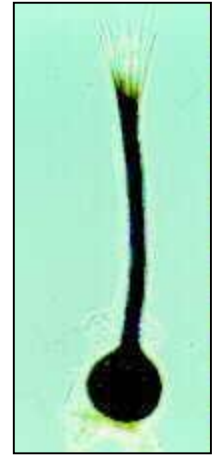


ORDEM MICROASCALES

Ceratocystis – *Chalara*, *Thielaviopsis* (fialídicos)

C. fimbriata – seca em árvores

C. paradoxa – podridão abacaxi da cana-de-açúcar



Sexuadas



Assexuadas

Dutch Elm Disease – Seca do Olmo



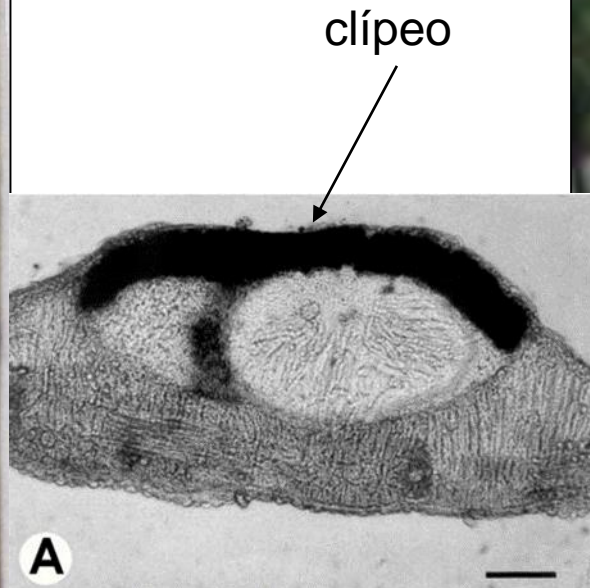
Galerias de Coleoptero

ORDEM PHYLLACHORALES

Phyllachora – Crosta Negra /Mancha de asfalto – *Cassia* sp., milho, etc.

Apiosphaeria – Crosta marrom do Ipê

Phyllachora



Apiosphaeria



ORDEM DIAPORTHALES

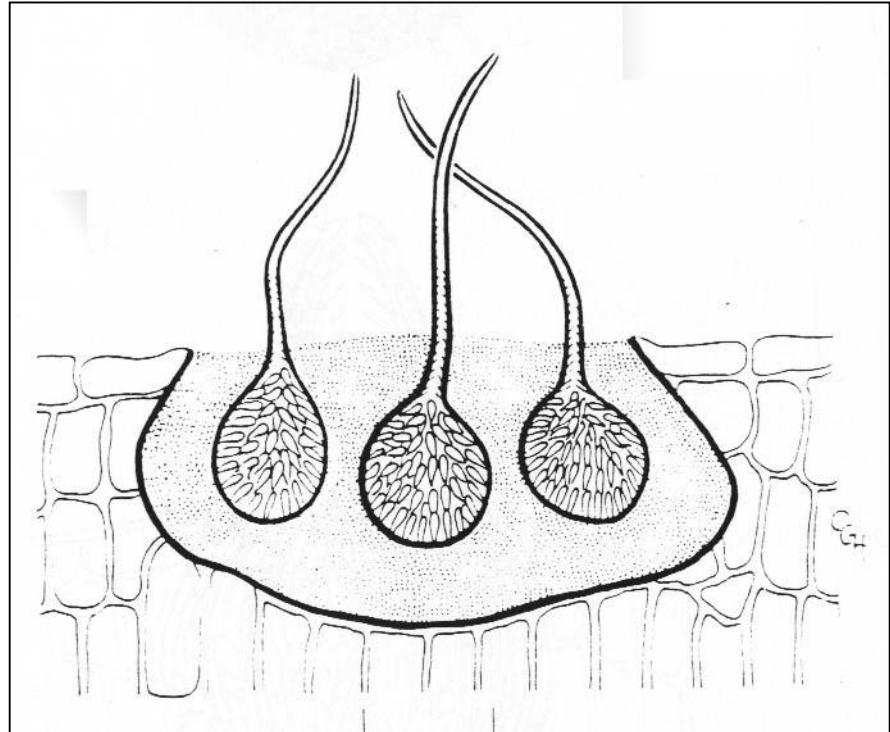
Diaporthe – *Phomopsis*

D. citri – melanose dos citros

D. phaseolorum f.sp. sojae – seca da haste da soja

D. phaseolorum f.sp. meridionalis – cancro da haste da soja

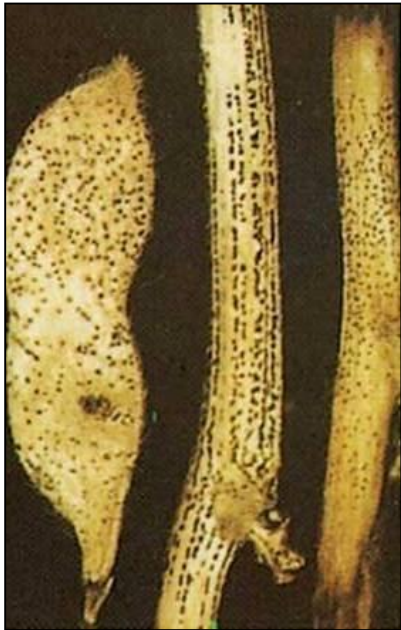
Cryphonectria – cancro em espécies arbóreas



Melanose (*Diaporthe/Phomopsis*)



***Diaporthe* (rostros)**

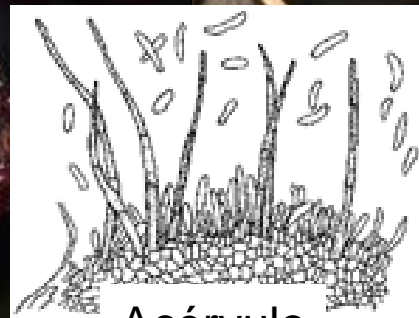
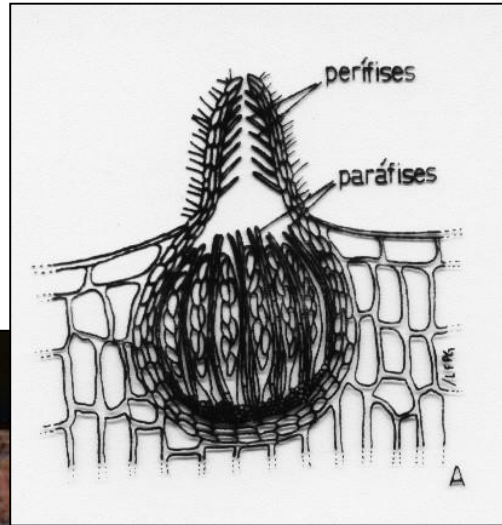


**Seca/Cancro – soja
(*Diaporthe/Phomopsis*)**

ORDEM GLOMERELLALES

Glomerella

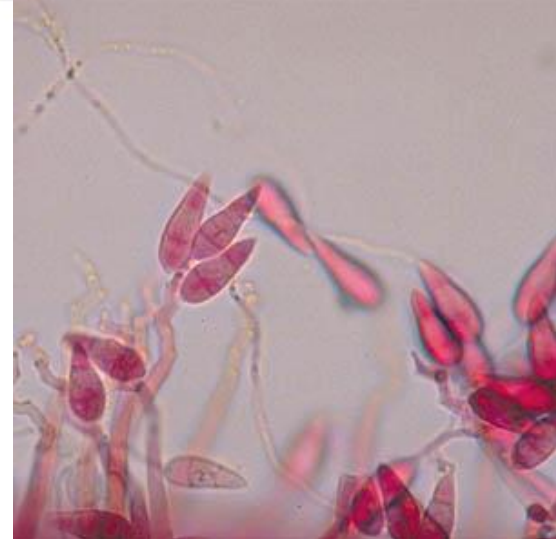
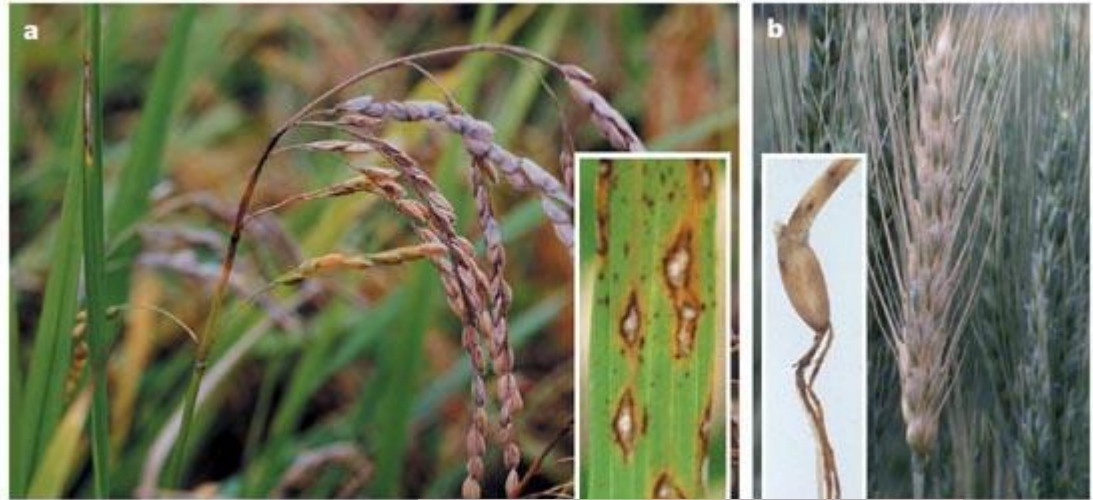
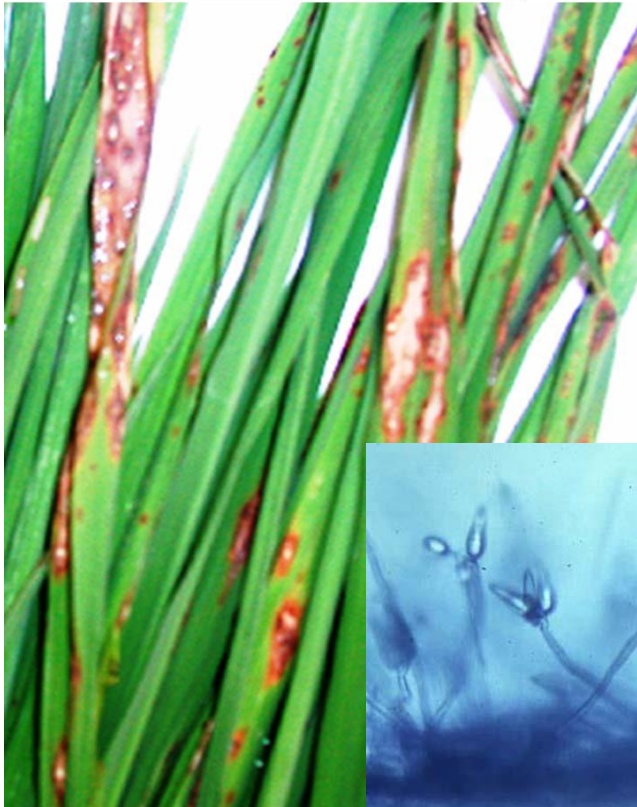
Anam.: *Colletotrichum*
(antracnoses)



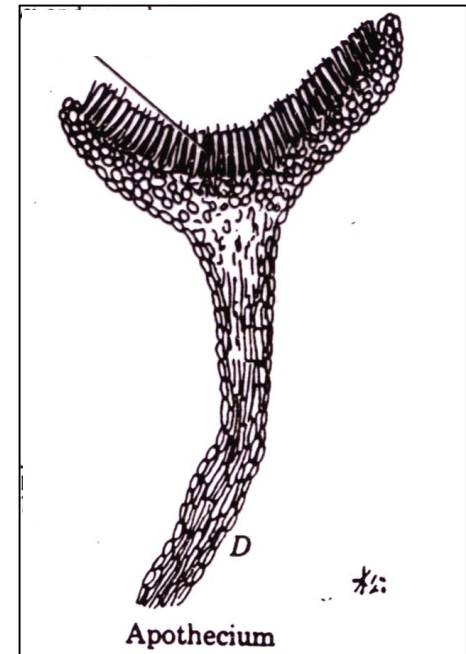
ORDEM MAGNAPORTHALES

Magnaporthe
Anam.: *Pyricularia*
brusone do arroz, trigo

SYMPTOMS OF LEAF BLAST



Discomicetos



ORDEM HELOTIALES

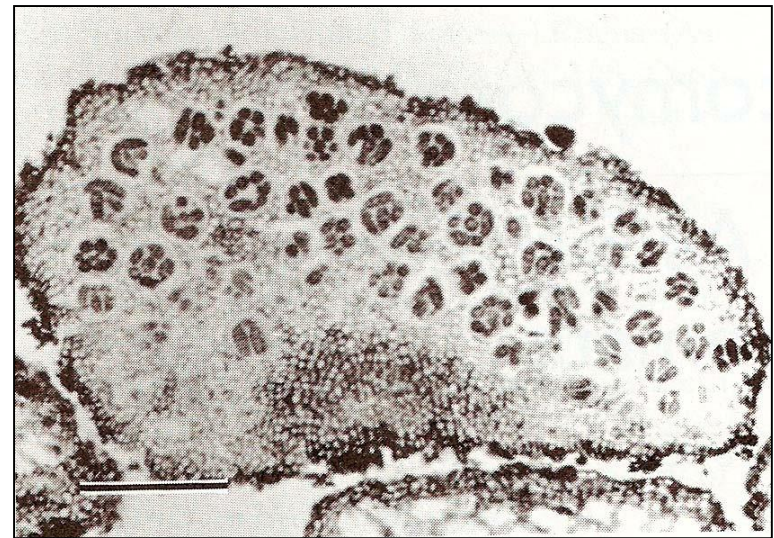
Sclerotinia – mofo branco do feijoeiro

Monilinia – anamorfo: *Monilia* – podr. parda pêssego

Botryotinia – anamorfo *Botrytis* – mofo cinzento morango/
uva/roseira

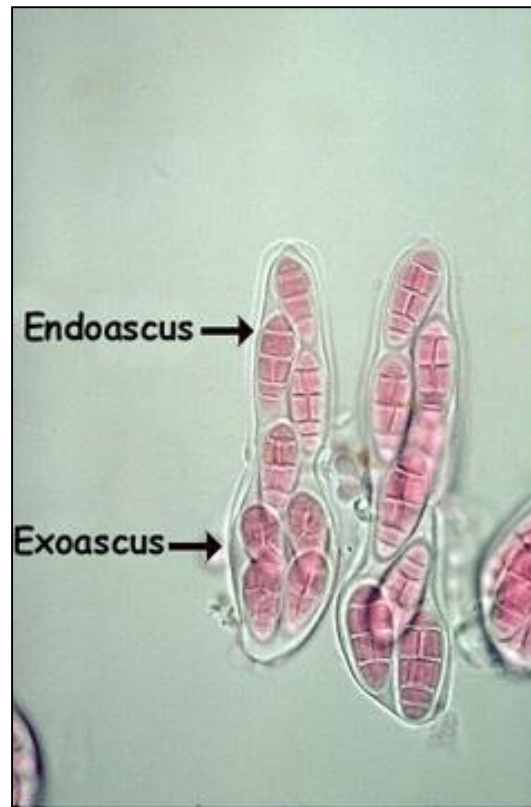


Loculoascomicetos



Loculoascomicetos

Característica comum a todos:



Ordem *Botryosphaerales*

Botryosphaeria = *Dothiorella*, *Botryodiplodia*

Guignardia = *Phyllosticta*

Microcyclus ulei = *Fusicladium* (Mal-das-folhas da seringueira)

Ordem *Capnodiales*

Mycosphaerella = *Cercospora*, *Cercosporidium*, *Pseudocercospora*,
Cercosporella, *Ramularia*, *Septoria*.

Patógeno não parasita: *Capnodium* (fumaginas)

Ordem *Myriangiales*

Elsinoe = *Sphaceloma* (Verrugoses)

Série Loculoascomicetos

Ordem *Pleosporales*

Lewia = *Alternaria*

Venturia inaequalis = *Spilocaea pomi* (Sarna da macieira)

Didymella = *Ascochyta*, *Phoma*

Cochliobolus = *Bipolaris*, *Curvularia*

Setosphaeria = *Exserohilum*

Pyrenophora = *Drechslera*

“*Helminthosporium*”



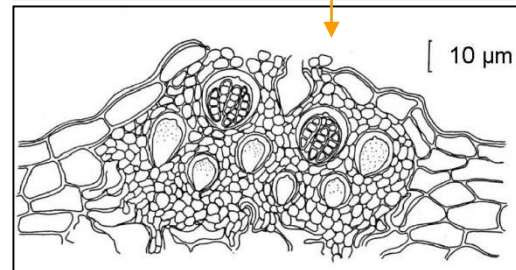
**Cancro – *Botryosphaeria*
esp. arbóreas**



**Mancha foliar – *Cercospora*
Diversas culturas (fase assexuada)**



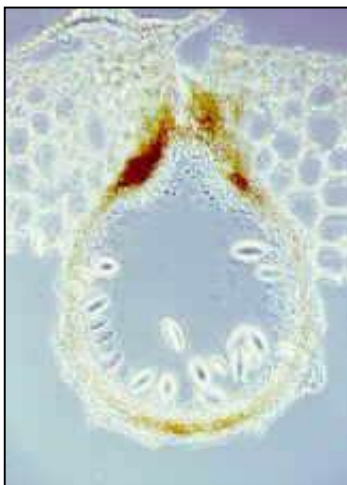
**Verrugose – *Elsinoe*
citros**



Pinta preta dos citros

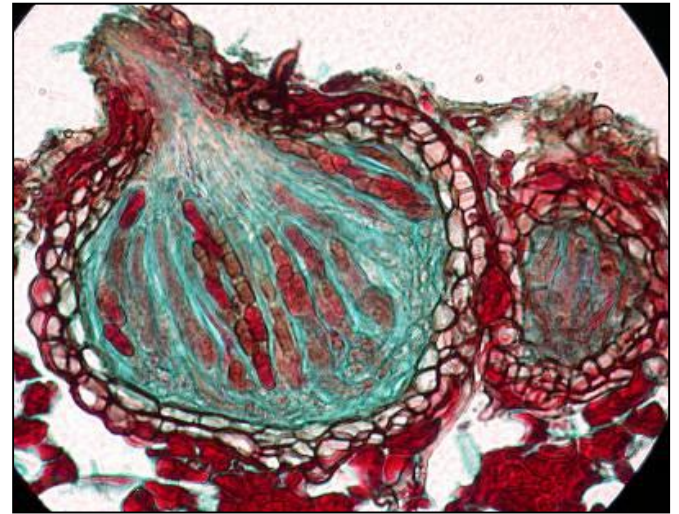


Fase assexuada: *Phyllosticta*



Fase sexuada: *Guignardia*





Sarna da macieira
Venturia inaequalis

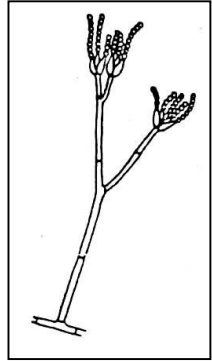
4. Fungos Anamórficos

- Contém as fases assexuadas de ascomicetos e basidiomicetos, além de fungos cuja conexão anamorfo-telomorfo ainda é desconhecida
- Produção de esporos assexuados por mitose (conídios)
- Classificação: segue regras dos “Fungos Anamórficos” (Dictionary of Fungi), baseada nas estruturas assexuadas – **Grupamento artificial, não filogenético**

Morfologia dos Fungos Anamórficos

Conidióforos

Isolados

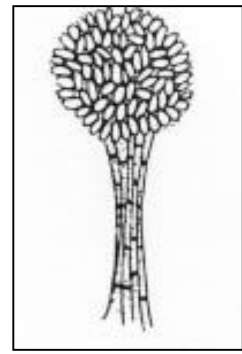


Agrupados

Desprotegidos

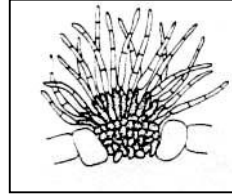
Sinema (Corêmio)

(ereto e alongado)



Esporodóquio

(achatado, "almofada")

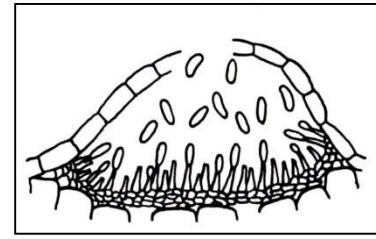


Protegidos

(corpos de frutificação)
(conidiomas)

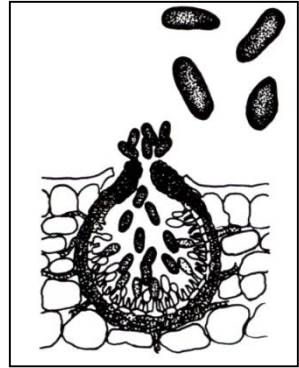
Acérvulo

(achatado)



Picnídio

(globoso)



Conidiogênese

“Conidióforos ou céls. conidiogênicas possuem parede dupla”

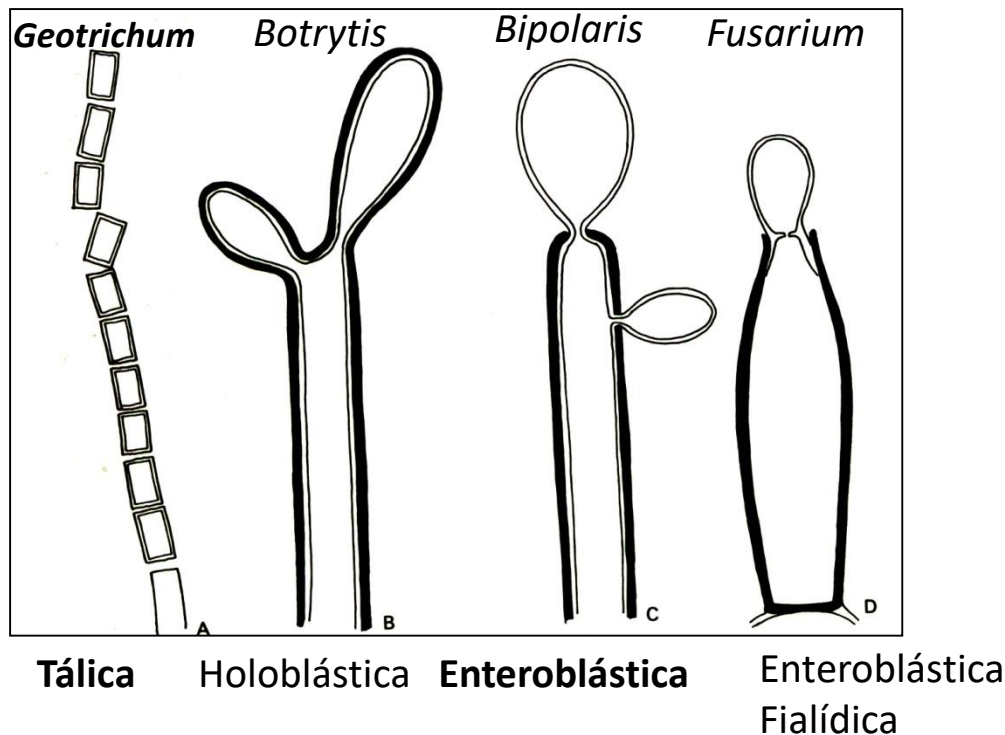
Tálica = formação do septo antes da diferenciação do conídio

Blástica = formação do septo depois da diferenciação do conídio

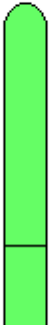
Holoblástica = as duas camadas da parede

Enteroblástica = apenas a camada interna

Enteroblástica fialídica = a partir de fiálides (repetitivas)



Conidiogênese



Tálica

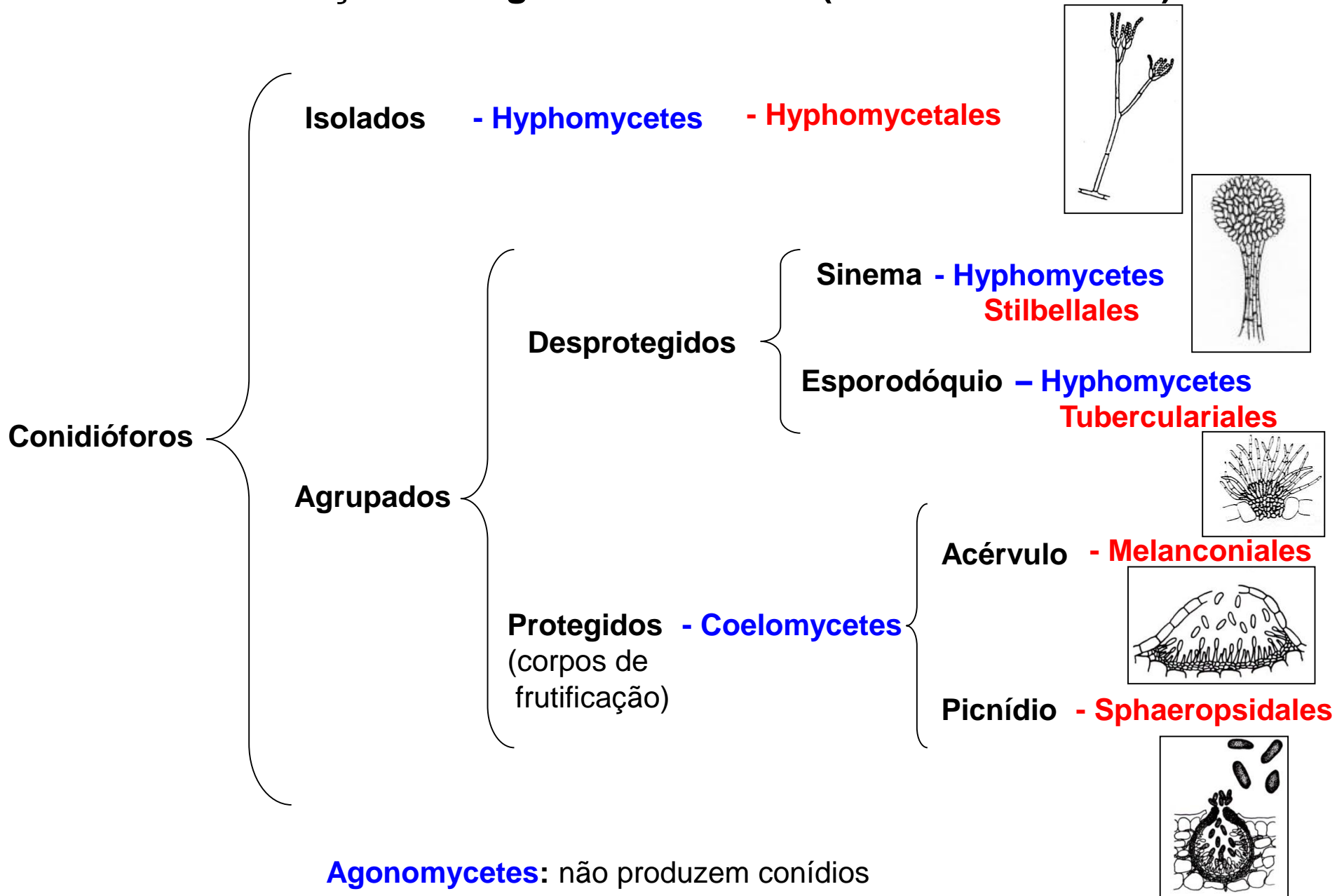


Blástica



**Blástica
Enteroblástica Fialídica**

Classificação – Fungos Anamórficos (Fases assexuadas)



Agonomycetes: não produzem conídios
Ex: *Rhizoctonia*, *Sclerotium*



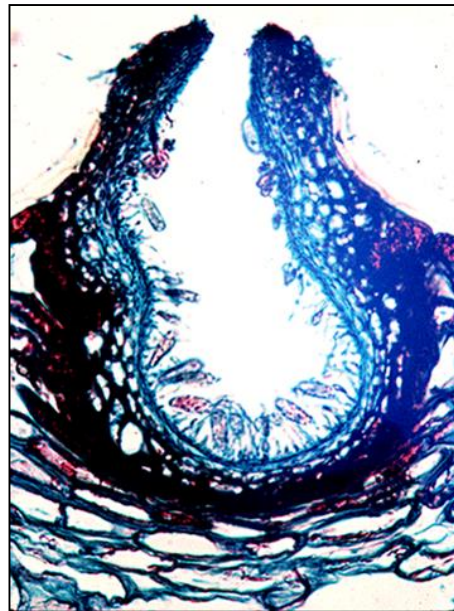
Hyphomycetes - Hyphomycetales



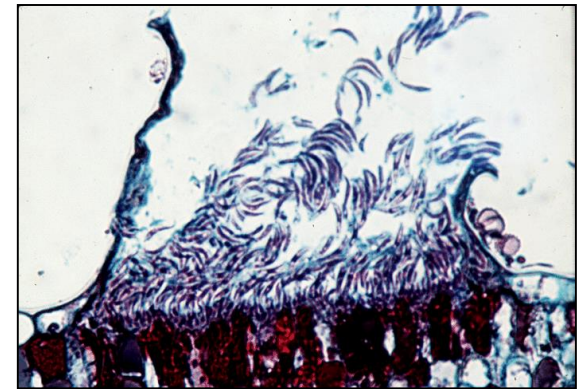
Hyphomycetes - Stilbellales



Hyphomycetes - Tuberculariales



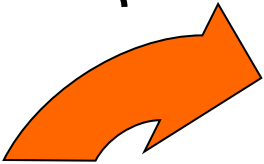
Coelomycetes - Sphaeropsidales



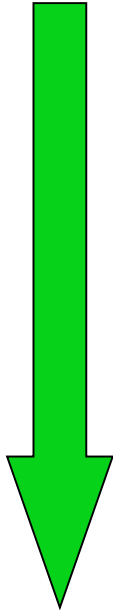
Coelomycetes - Melanconiales

5. CICLO DE VIDA

Fase assexuada
ou anamórfica
ou imperfeita



GERMINAÇÃO

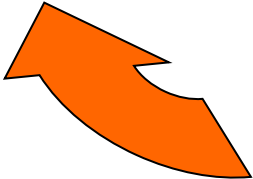


ESPOROS ASSEXUADOS
(Reprodução rápida / Clones)



REPRODUÇÃO
ASSEXUADA

Mitose



MICÉLIO
(crescimento somático)