

# SEED-BORNE FUNGAL PATHOGENS Of BC Conifers

Tree Seed Workshops - 2007:

Prince George - Civic Centre, Nov 20

Vernon - Prestige Inn, Nov 22

Kamloops - Best Western, Nov 23

Mesachie Lake - CLRS, Nov 26

Langley - Coast Hotel & Convention Centre, Nov 28

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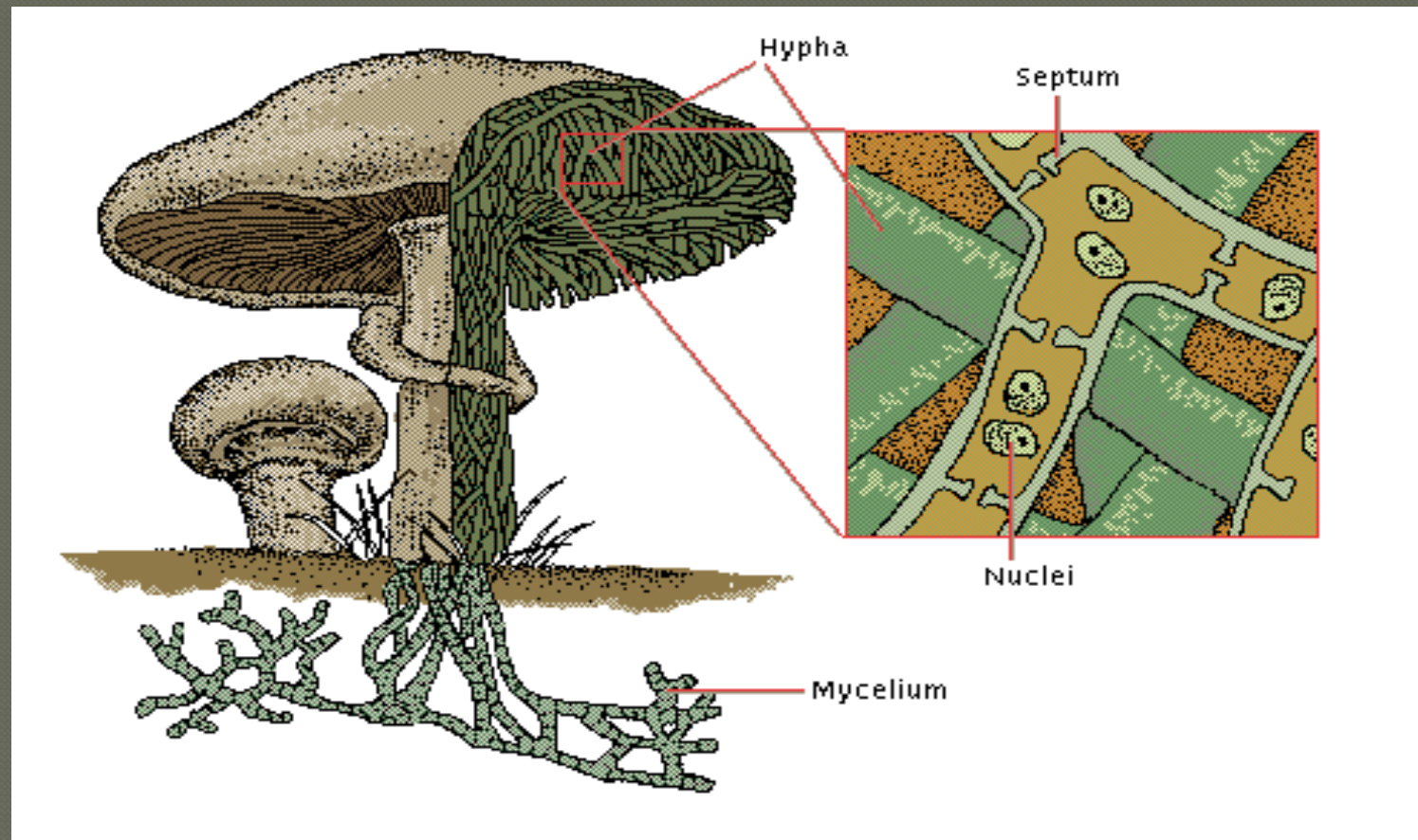
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# SEED-BORNE PATHOGENS

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- ◉ *Caloscypha fulgens*
  - *seed or cold fungus*
- ◉ *Fusarium spp.*
  - *Pre- and post-emergence damping off*
  - *Fusarium shoot blight and root rot*
- ◉ *Sirococcus conigenus*
  - *Sirococcus blight*

# Generalized Fungal Structure



# Some structures of fungi associated with disease (Fungi imperfecti)

Fungi may consist of fine  
filaments - Hyphae



Hyphae may have crosswalls  
- Septate hyphae,



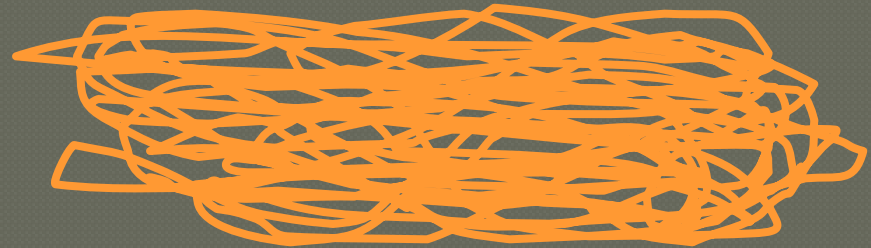
or

hyphae may be continuous



# Fungal structures continued...

Mass of hyphae called a  
Mycelium

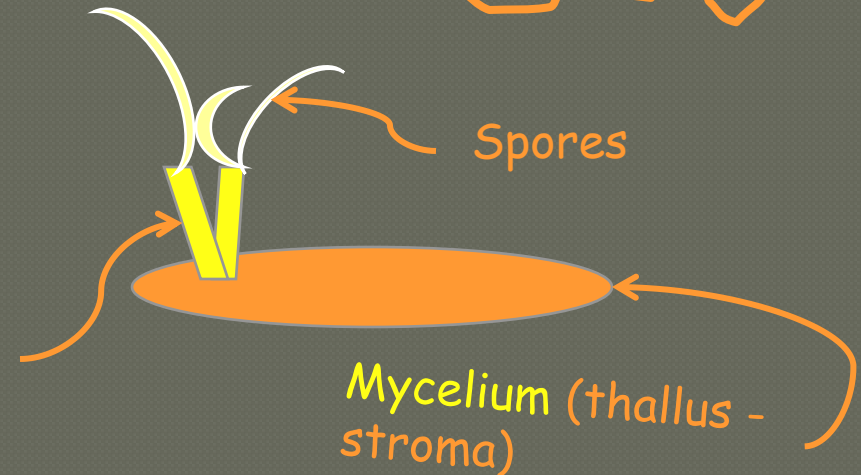


Hyphae may be  
Vegetative or



Reproductive (often  
aerial, look thicker &  
have fruiting bodies and  
spores)

Reproductive hyphae (conidiophores)



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# Definitions

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## ◉ Parasite (consumer)

- Organism  $\leftarrow$  nutrients from other live organism  $\Rightarrow$  no benefit in return

## ◉ Saprophyte (decomposer)

- Organism living on dead or decaying tissues



# Definitions

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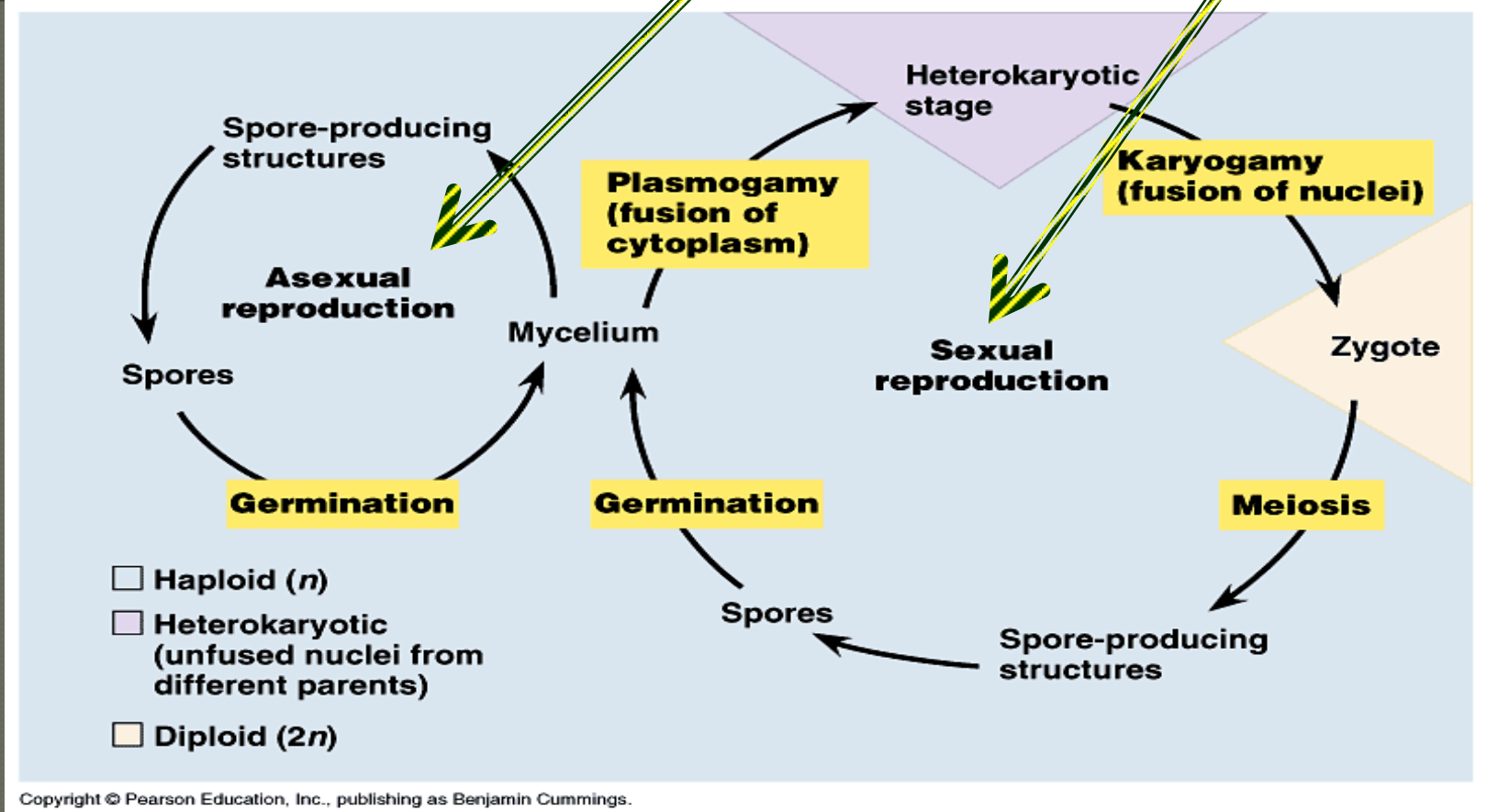
- Facultative

- Ability to grow in presence or absence of an environmental factor

- Facultative parasite

- Organism, usually saprophytic but under certain conditions may become parasitic

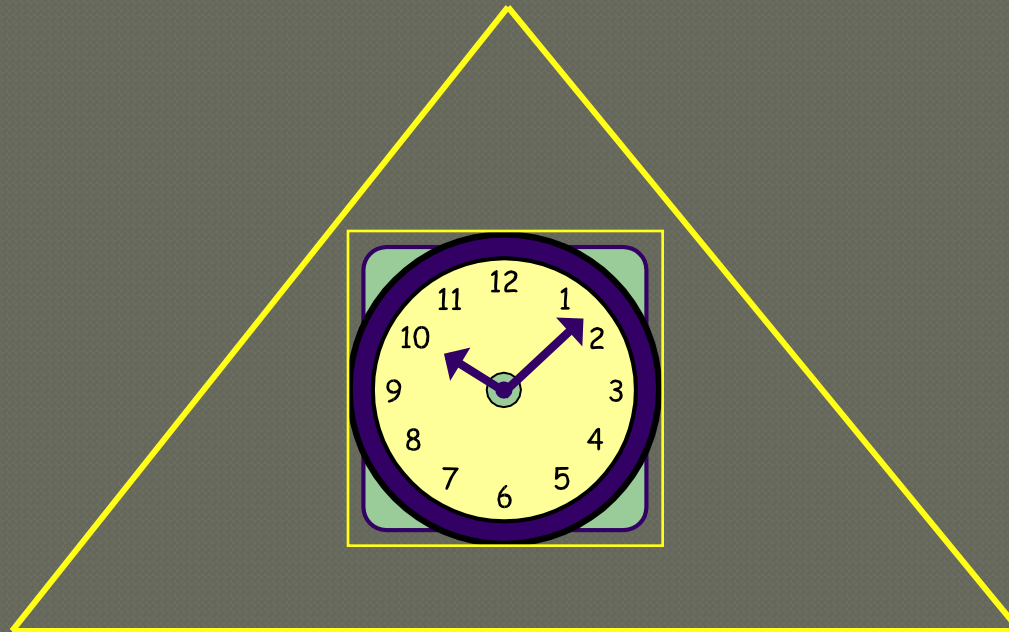
# Reproduction - asexual or sexual





# DISEASE TRIANGLE

ENVIRONMENT



HOST

PATHOGEN

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# *Caloscypha*

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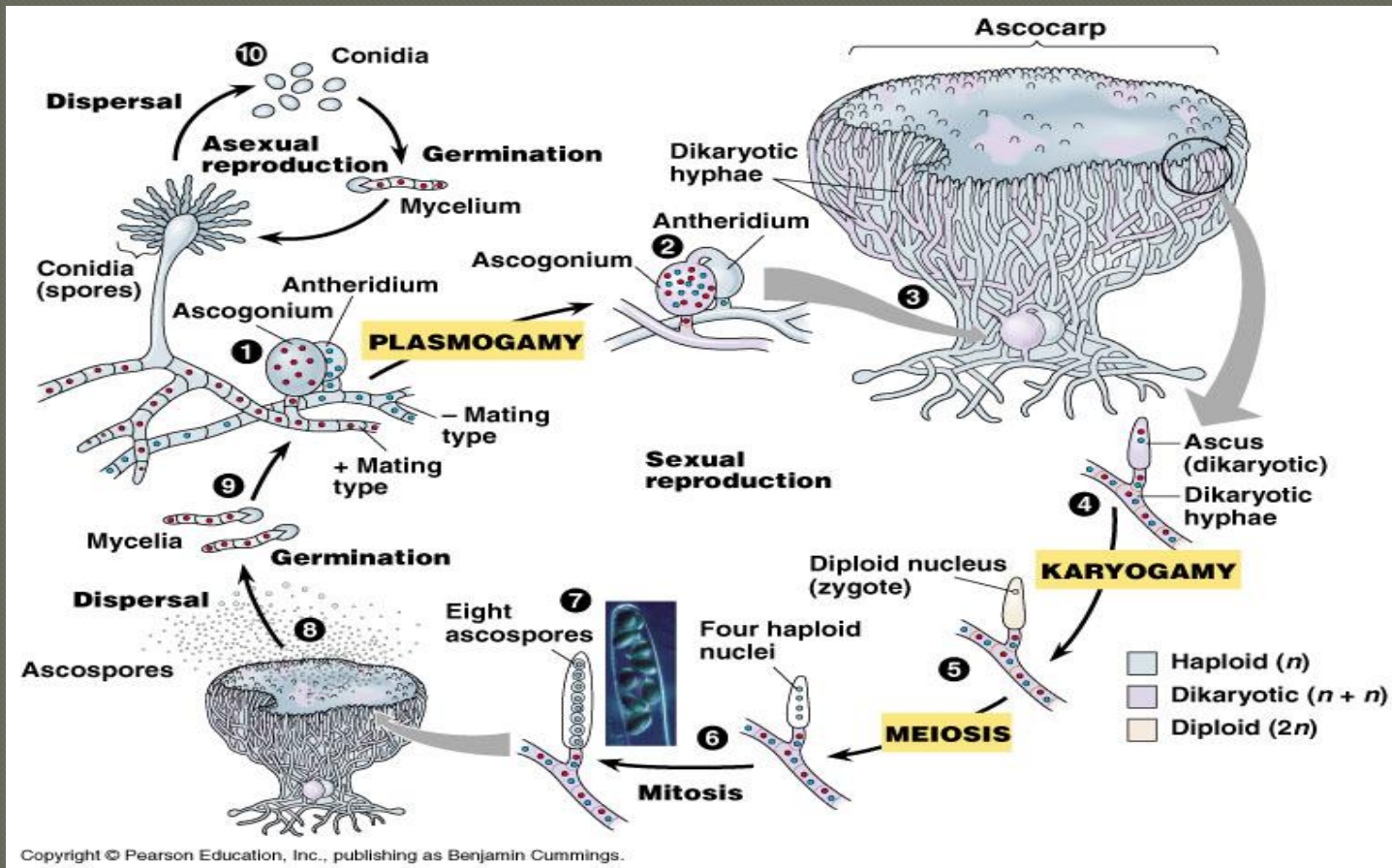
*Ascocarp  
Apothecium*



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# *Caloscypha fulgens*





# *Caloscypha fulgens*

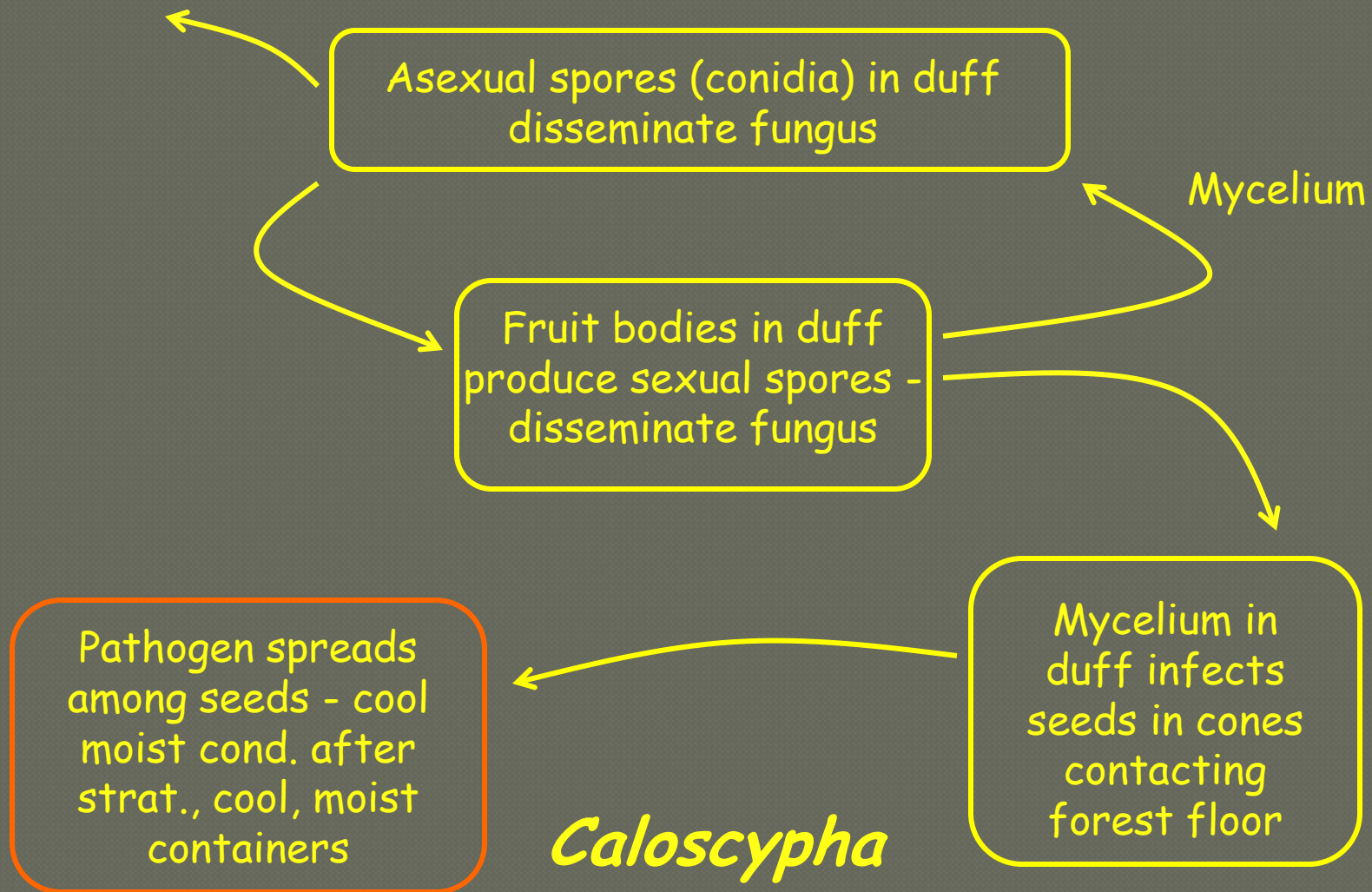
blue or indigo stain

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A microscopic image of a seed cross-section, likely of a cereal grain, showing extensive decay. The seed is stained blue, and the internal structure is heavily disorganized and fragmented, indicating significant damage. The text "BI seed decay - Caloscypha fulgens" is overlaid in yellow.

BI seed decay - *Caloscypha fulgens*

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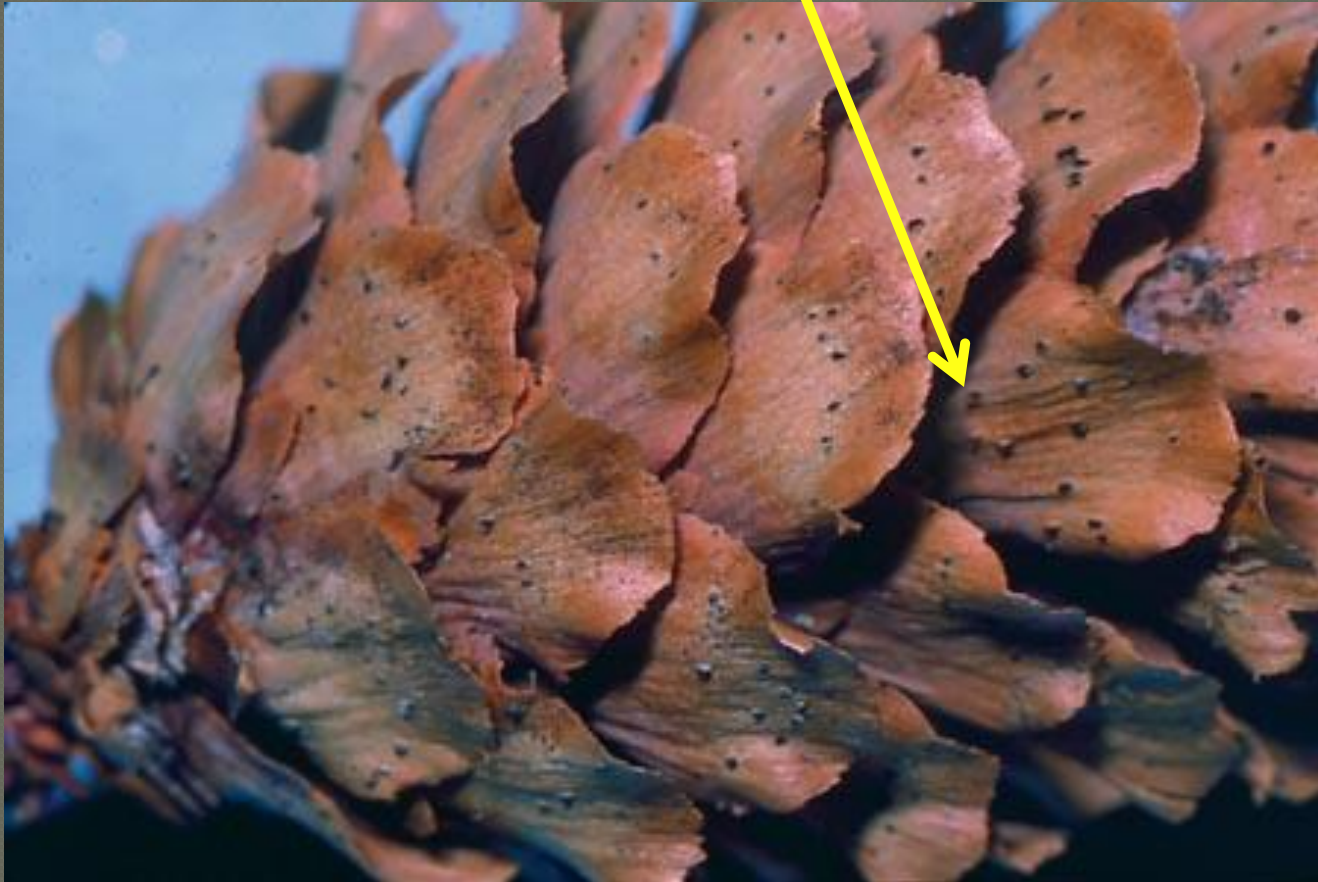
# BI seed decay - *Caloscypha fulgens*

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# *Sirococcus conigenus*

on spruce cone scales

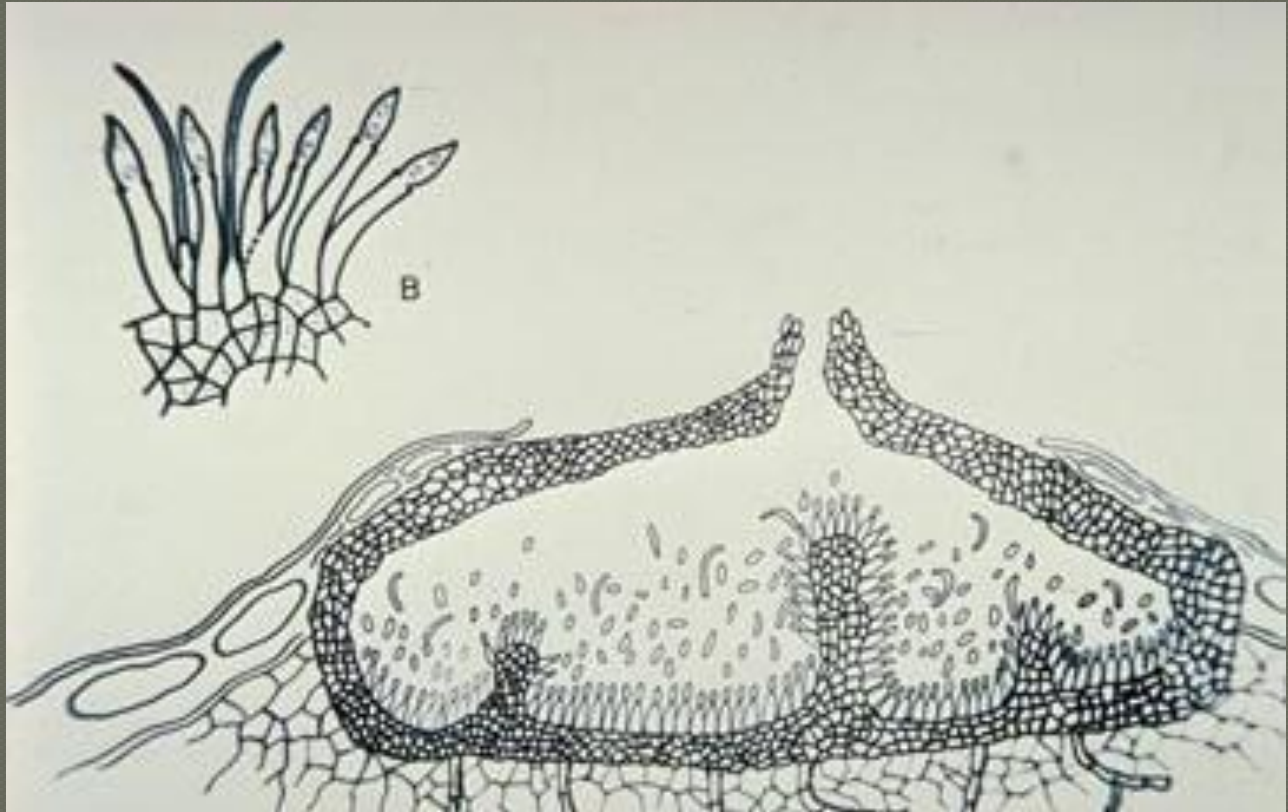


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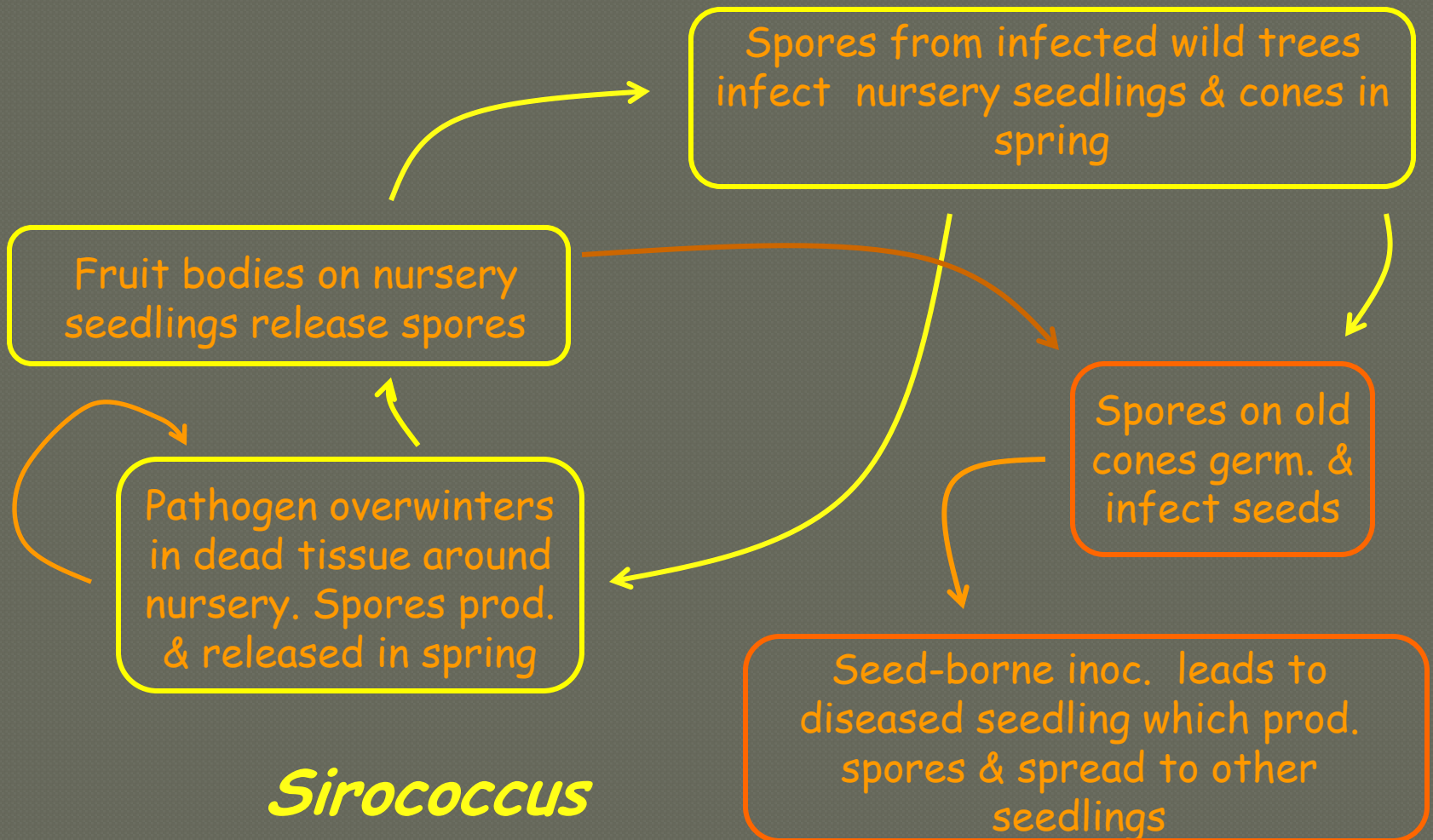
# *Sirococcus*

*Pycnidium*



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***Sirococcus***

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*Sirococcus conigenus* hyphae - Ss seed

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# *Fusarium*

## Sporodochium on Fdc

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# *Fusarium*

## Sporodochia on Bc

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# Fusarium

Stroma  
called a  
Sporodochium

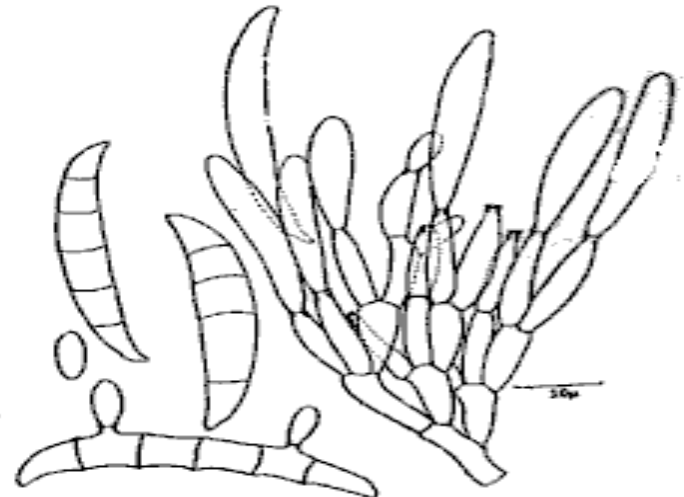


'Sporodochia' formed, closely packed conidiophores.

*Fusarium culmorum*

*Points to note:*  
Careful examination  
of colony under the  
microscope may  
show phialides.

multiseptate  
spores

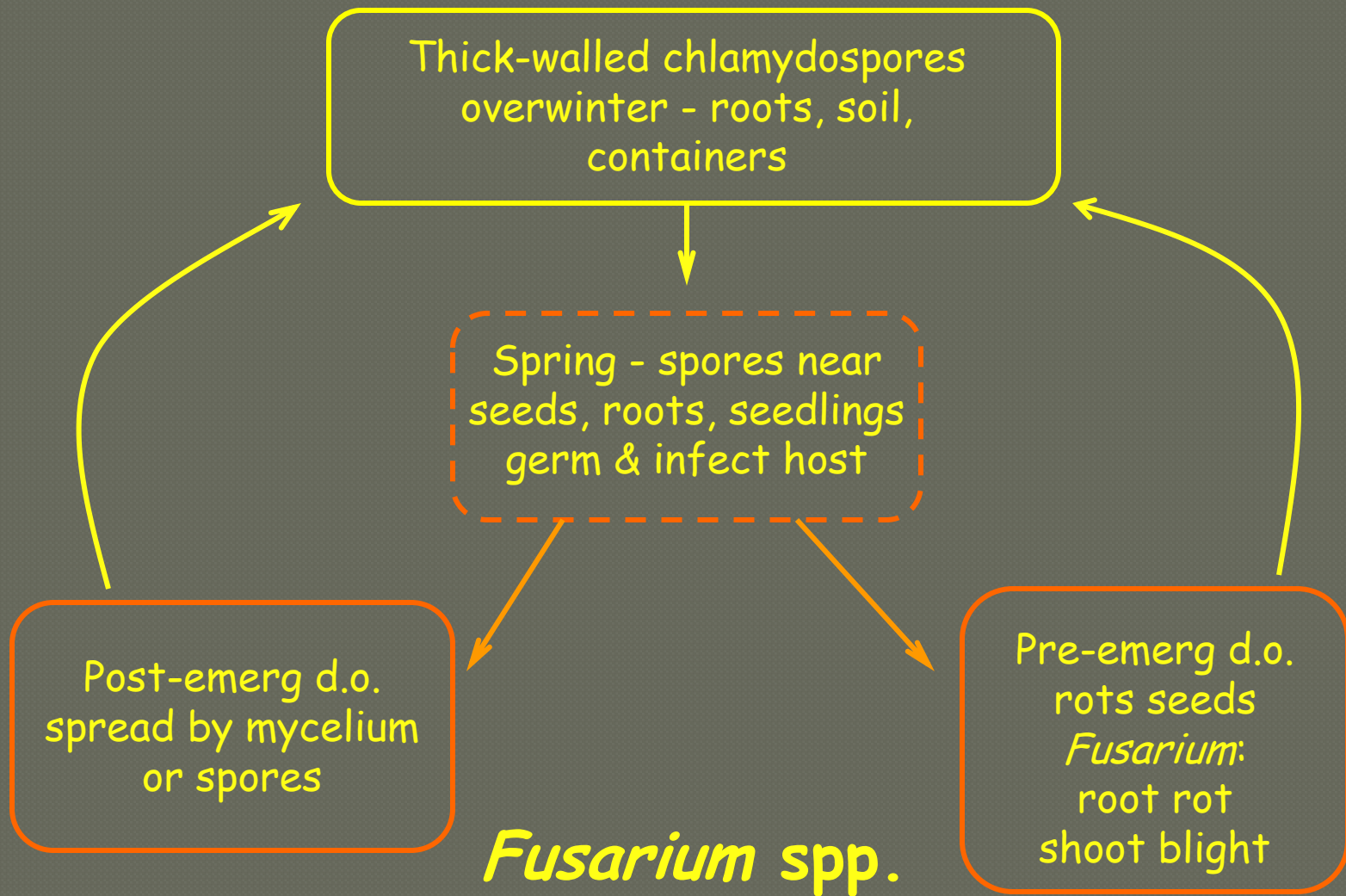


# *Fusarium*

## VIP re: Forest Nurseries

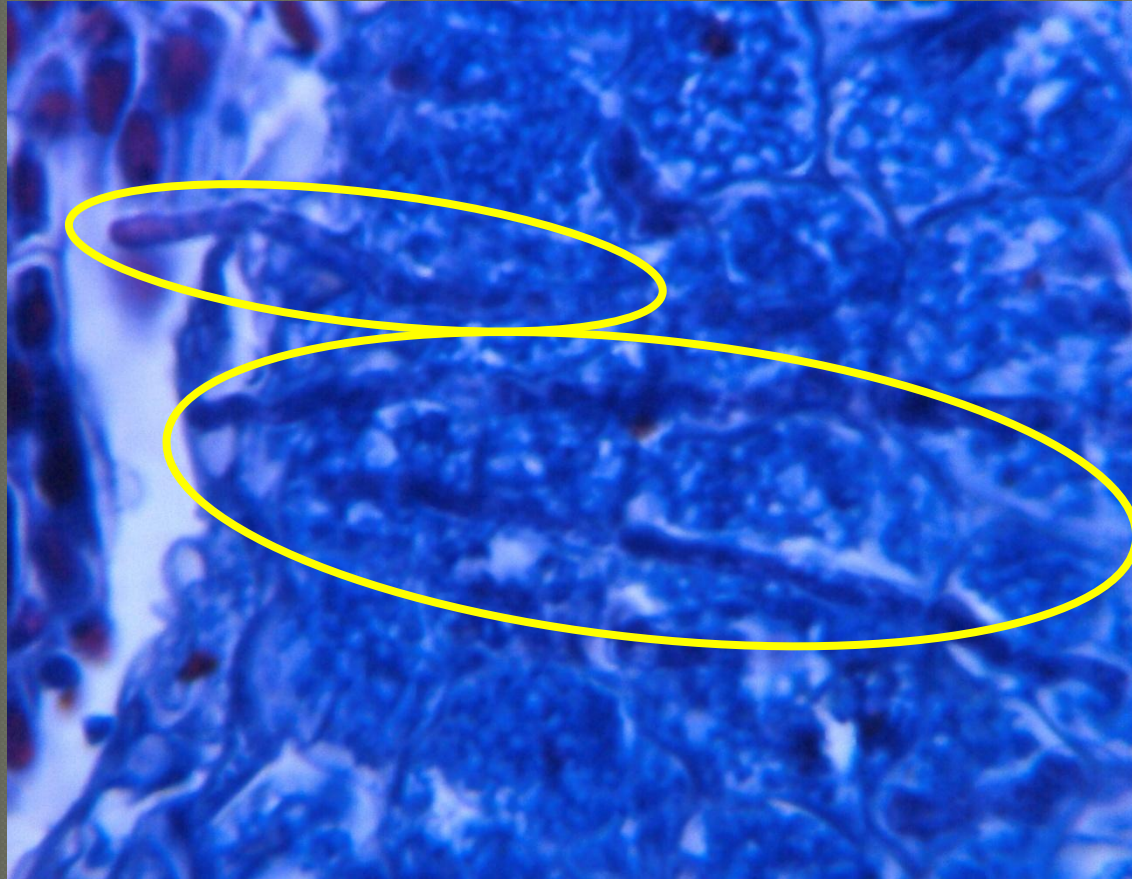
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- ◉ Weak pathogens - not all spp. pathogenic but...
- ◉ Very persistent ability as pathogen because...
- ◉ Facultative parasite adapted to survive in...
- ◉ either dormant...
  - chlamydospores
- ◉ or saprophytic states
  - in dead root fragments



# Fusarium in BI 400x

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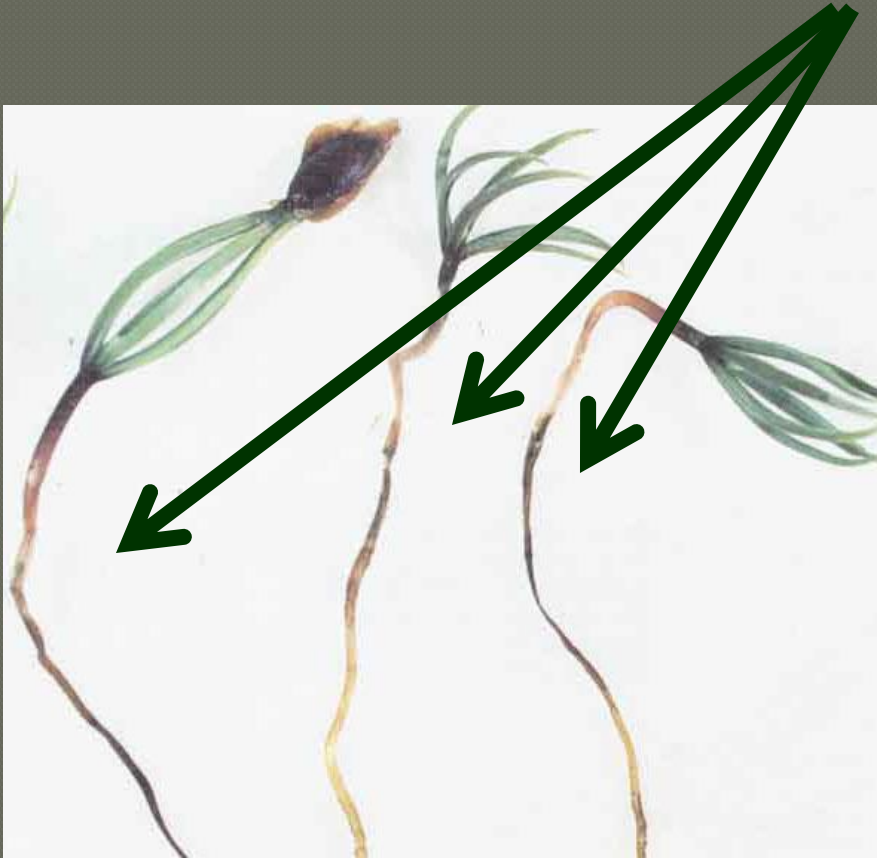
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# *Fusarium* spp.

Rots germinant at ground or seedling dies later



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# Why Test Seed?

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- Seed-borne pathogens
  - Seed decay
  - Damping-off
  - Root disease
  - Blight
    - *Fusarium*
    - *Sirococcus*



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A microscopic image showing a dense network of fine, white, thread-like mycelium growing on a dark, textured substrate. The mycelium is highly branched and appears to be spreading across the surface. The substrate has a mottled appearance with shades of brown and black.

*Caloscypha  
mycelium*

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# BENEFITS OF SEED TESTING

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- ◉ Detect seedlots needing special treatment
- ◉ Put disease at disadvantage
  - i.e. with cultural controls
- ◉ Reduced fungicide usage
- ◉ Ultimately reduced seedling losses



# Dealing with acquired infections

- often possible

- usually expensive!



Prevention - usually a preferred option!



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# TESTING PRODEDURES

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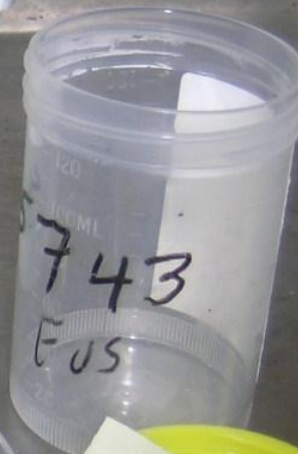
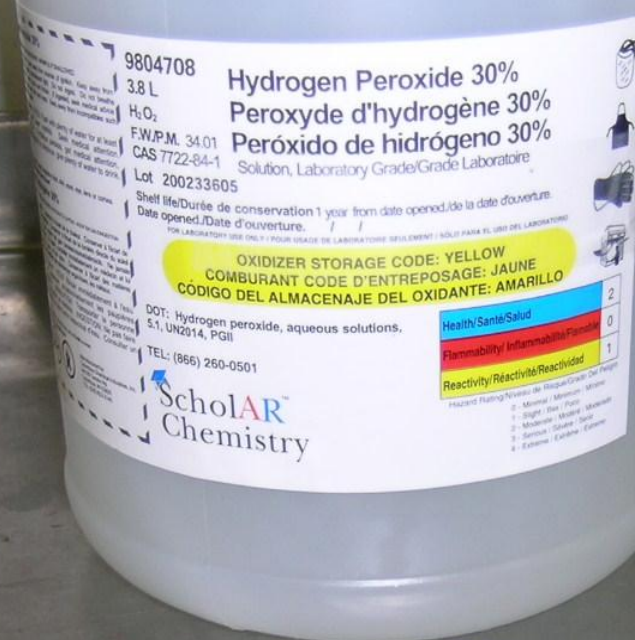
- Seed is shipped by courier
- Shipped in insulated container - kept cool
- Processed immediately
- 500 seeds plated on culture media and incubated for up to 3 weeks
- % affected seeds calculated for seedlot



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# *Sirococcus & Caloscypha*



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# Seed plated on selective agar



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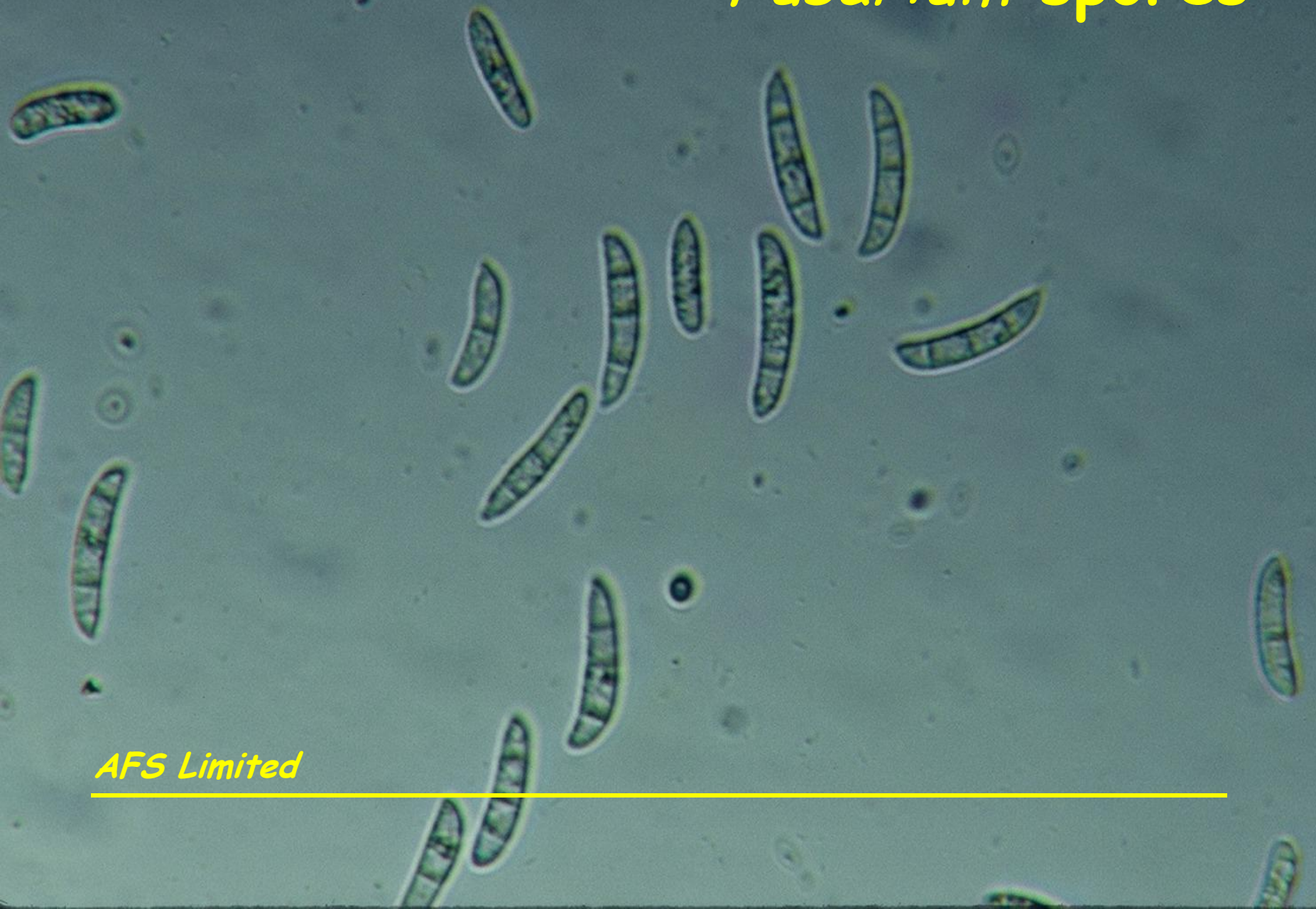


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# *Fusarium* spores



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*Sirococcus*

fruiting bodies

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*Sirococcus*  
*spores*

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Blue colour helps identify  
*Caloscypha fulgens*





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## *Caloscypha* - 5% of seedlot

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- Sow non-strat. seed - need to balance
  - even germination - infection intensification
- Avoid multiple sowing if possible
  - reduces contact between seeds
- Avoid cool, moist germination
  - slow germ. but fungus can still spread
- Encourage rapid germination with heat



# *Sirococcus* - 1% of seedlot

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- ◉ Single sow seed if possible
- ◉ Avoid mixed species in greenhouses
  - infected Sx can spread & infect Pl
- ◉ rogue infected germinants
  - pull & destroy plants
- ◉ No infected germinants in cull piles
  - spores still released & infect healthy trees



## *Fusarium on 5% of seedlot*

- MoFR practice running water imbibition
- Sanitize seed handling equipment
- Encourage rapid germ. - avoid heat stress
- Avoid heat or water stress during growth
- Sanitize growing containers

## *Fusarium* on roots at lift

- Not a sole reason to reject stock
- *Fusarium* normal forest soil inhabitant
- Screen stock on morphology & ability to meet target specs
- Extra care needed during thaw
  - *Seedlings must not overheat in boxes*