

Seed and Seedling Diseases:

Diseases are important limiting factors in the production of forest seedlings within nurseries. Environmental conditions within nurseries are often ideal for the proliferation of disease-causing pathogens . High moisture and nutrients supplied to nursery seedlings often promote proliferation of important pathogens.

Economic damage of seedling diseases

the cost of producing the dead and culled seedlings.

the cost of a second site preparation of the plantation when plantable seedlings are not available due to disease losses at the nursery.

cost of a second planting or interplanting when seedling diseases continue to cause mortality in the plantation.

Sources Of Plant Disease In Nurseries

Infested Soil

Plant Debris

Plants

Water

Air

Seed

Seed fungi, especially species of *Aspergillus*, *Penicillium*, *Fusarium*, *Trichoderma*, *Phomopsis* and *Alternaria*, affect the seed of all forest tree species.

Types of infections

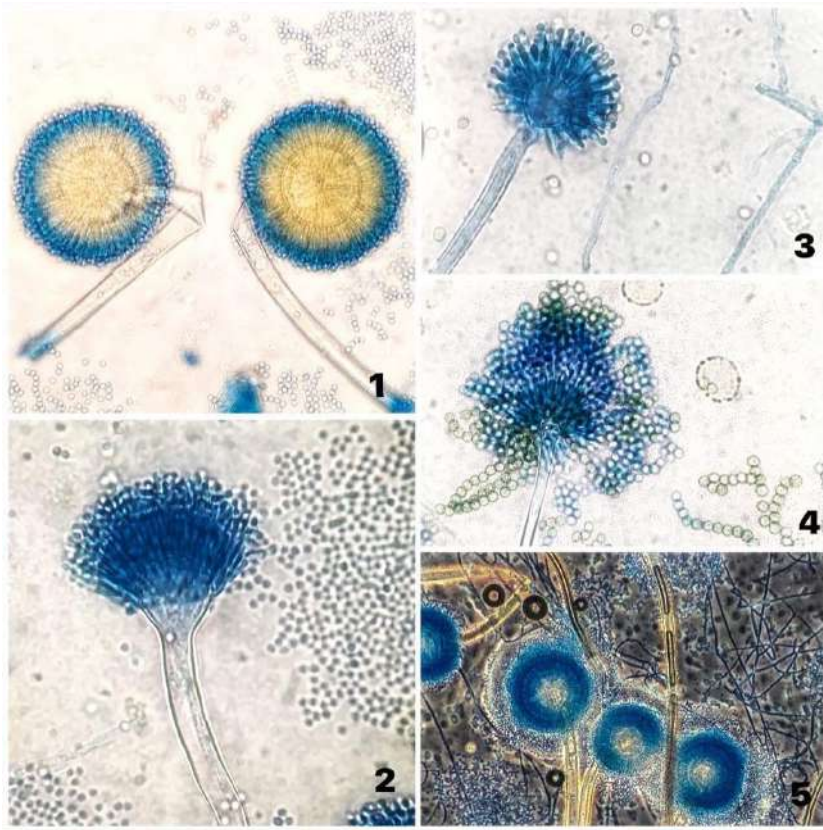
Internally Seed borne : Pathogen attacks endosperm & embryo .

Externally seed borne: Pathogens externally carryover on the seeds

Infected seeds may failed in seed germination, also cause seed rot and seed mummification

Seed fungi

Aspergillus spp



Alternaria alternata



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there are many diseases caused
by seed borne pathogens:

- ❖ Damping off
- ❖ Black rot of Oak and Chestnut
- ❖ Brown and pink rot Oak and Chestnut
- ❖ Cone rust fungi on spruce
- ❖ Dieback of neem

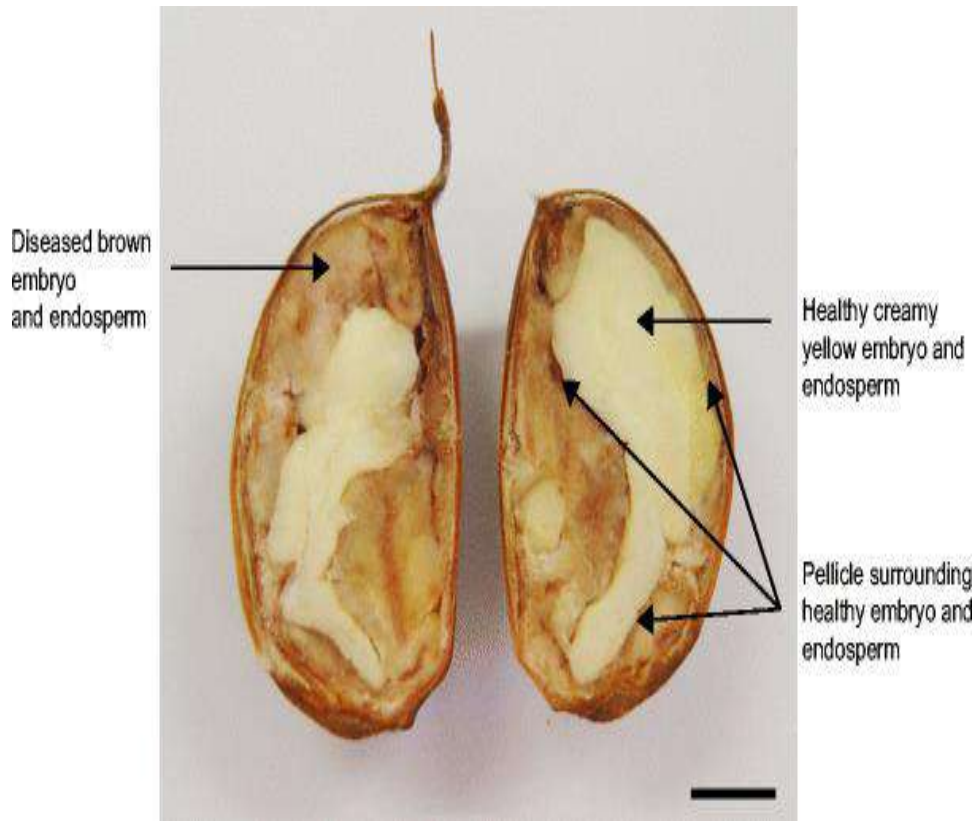
Chestnut Black rot pathogen: *Ciboria* spp



Brown and pink rot

Brown rot

Pathogen: *Gnomonia castaneae*



Pink rot

Pathogen: *Colletotrichum acutatum*



Die-back of neem

pathogen: *Phomopsis azadirachtae*

Typical symptoms of die-back



Seeds infected with *Phomopsis*



Soil – borne fungi :

Soil-borne pathogens prefer to live within the soil

-Pythium: survives as oospores, hyphae and sporangia.

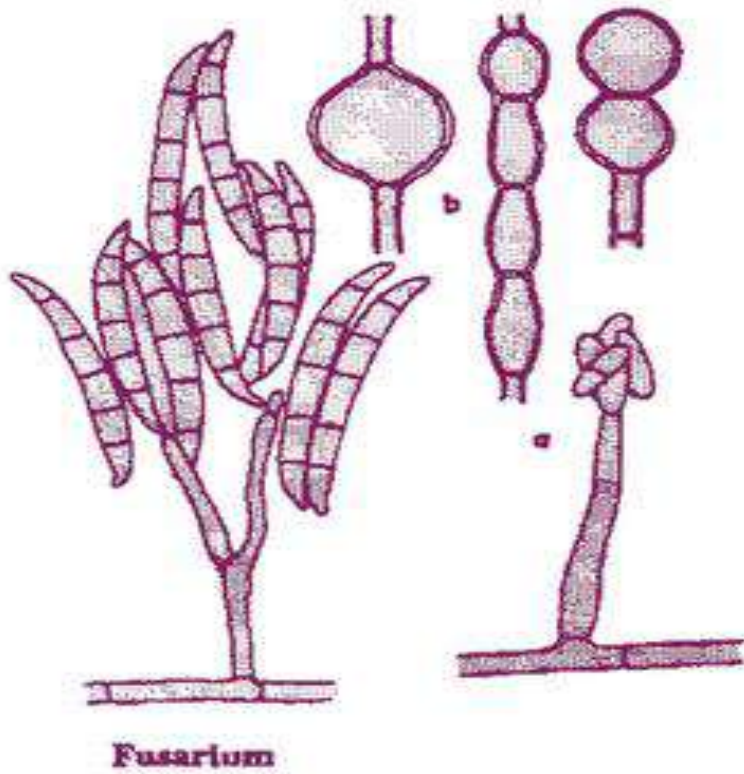
Phytophthora :survives as oospores, hyphae and sporangia.

Fusarium : survives as Chlamydoconidia

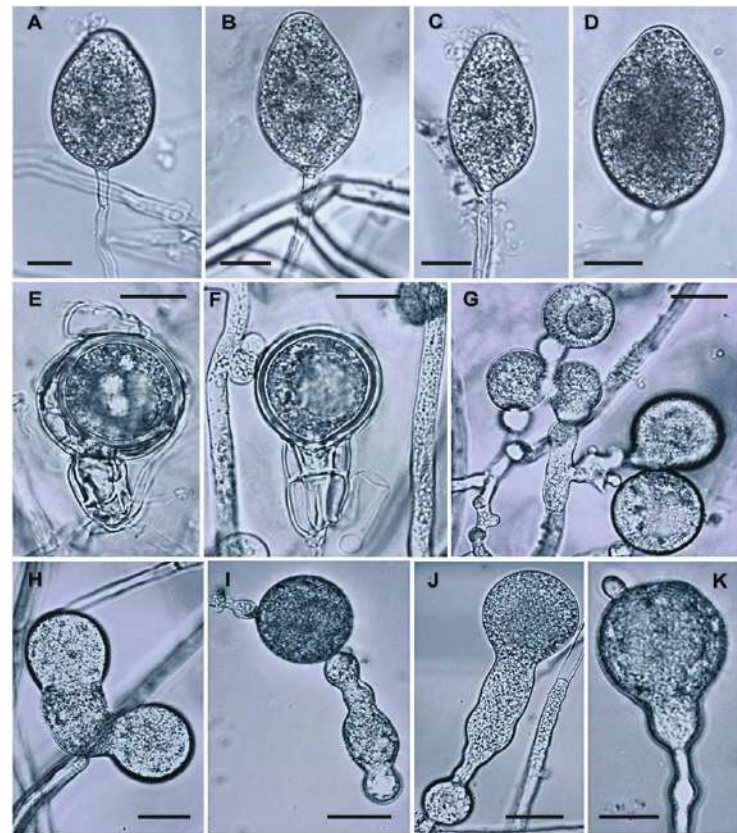
Rhizoctonia : survives as *mycelium* , *Sclerotia*

Soil born fungi

Fusarium spp



Phytophthora sp.



1- Damping-off in Tree Nurseries :

caused by such seed- and soil-borne fungi as Rhizoctonia, Pythium, Phytophthora, Fusarium, *Cylindrocarpon destructans* and Alternaria.



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Symptoms of the diseases

Seed decay :

the seedborne pathogens can infect seeds and the infected seeds become soft, rotten and fail to germinate.

Pre emergence damping off:

stems of germinating seeds are affected with characteristic water-soaked lesions formed below the soil line. Seedlings may wilt and die soon before emergence.

Damping off can reduce number and size of seedlings.



Post emergence damping off

attack is seen in the first few weeks after the plants appear above ground, and occurs on the succulent roots and hypocotyls of the growing plants. The seedlings, mainly those in the cotyledon stage, tend to wilt, and collapse at ground level, where the tissues are brown and shrivelled, and often show extensive rotting of the roots.



Control of Damping off

- 1- Using pathogen free seed.
- 2- seed treatment with thiram.
- 3- avoiding overwatering, overcrowding and too deep planting
- 4- reducing soil PH by adding inorganic acid (sulphuric acid or phosphoric acid).
- 5- Regulation soil moisture may reduce losses from certain fungi.
- 6- soil fumigation with formaldehyde give excellent control of damping off.

Root rot

Caused by soilborne pathogens:

Phytophthora spp

Fusarium spp

Rhizoctonia spp

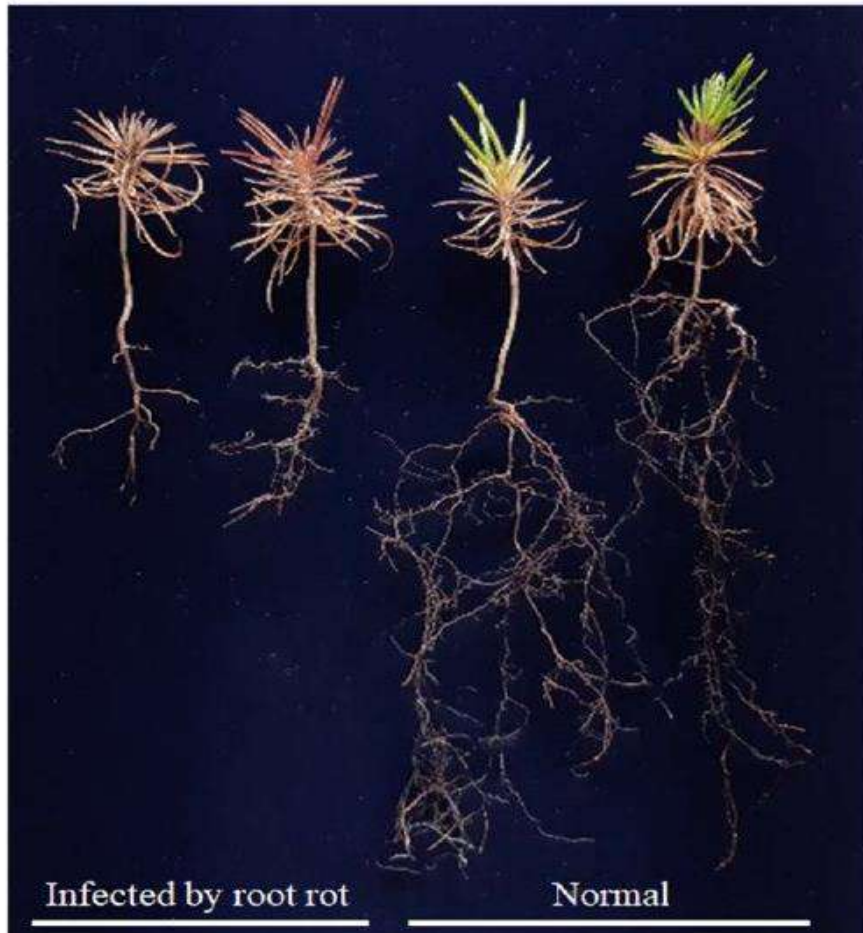
Pythium spp

symptoms

- The first sign of root disease is the loss of vigour.
- Roots appear as dark brown or black and have few laterals
- The shoot of infected seedlings might be wilting, stunted or chlorotic, and eventually the seedlings might die.

symptoms

Fusarium root rot



Phytophthora root rot



Control of Root rot

- 1- avoiding overwatering, overcrowding and too deep planting
- 2- reducing soil PH by adding inorganic acid (sulphuric acid or phosphoric acid).
- 3- Regulation soil moisture may reduce losses from certain fungi.
- 4- soil fumigation with formalin give excellent control of root rot.

3- Gray Mold

caused by :*Botrytis cinerea*

Fungus can **overwinter** by **sclerotia**
sclerotia are found in **cankers** or **infected plant parts**.

Hosts: All the common conifers are known to be susceptible, though some are more often affected than others. some of them are **pine , sequoia, doglas fir, thuja and spruce**

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symptoms

The disease usually occurs on young seedlings of most tree species, or on the lower parts of older seedlings.



Sometimes the disease cause top dieback



symptoms

After severe infection of needles the disease spread into healthy shoots. When shoots are attacked first, the disease may move downward. Brown, sunken areas called cankers, caused by the fungus growing in the phloem, girdle healthy stem tissue causing the entire shoot or leader to collapse and hang down in a withered mass of dead needles



signs

Development of
Gray mold on the
lower foliage of
douglas-fir
seedlings



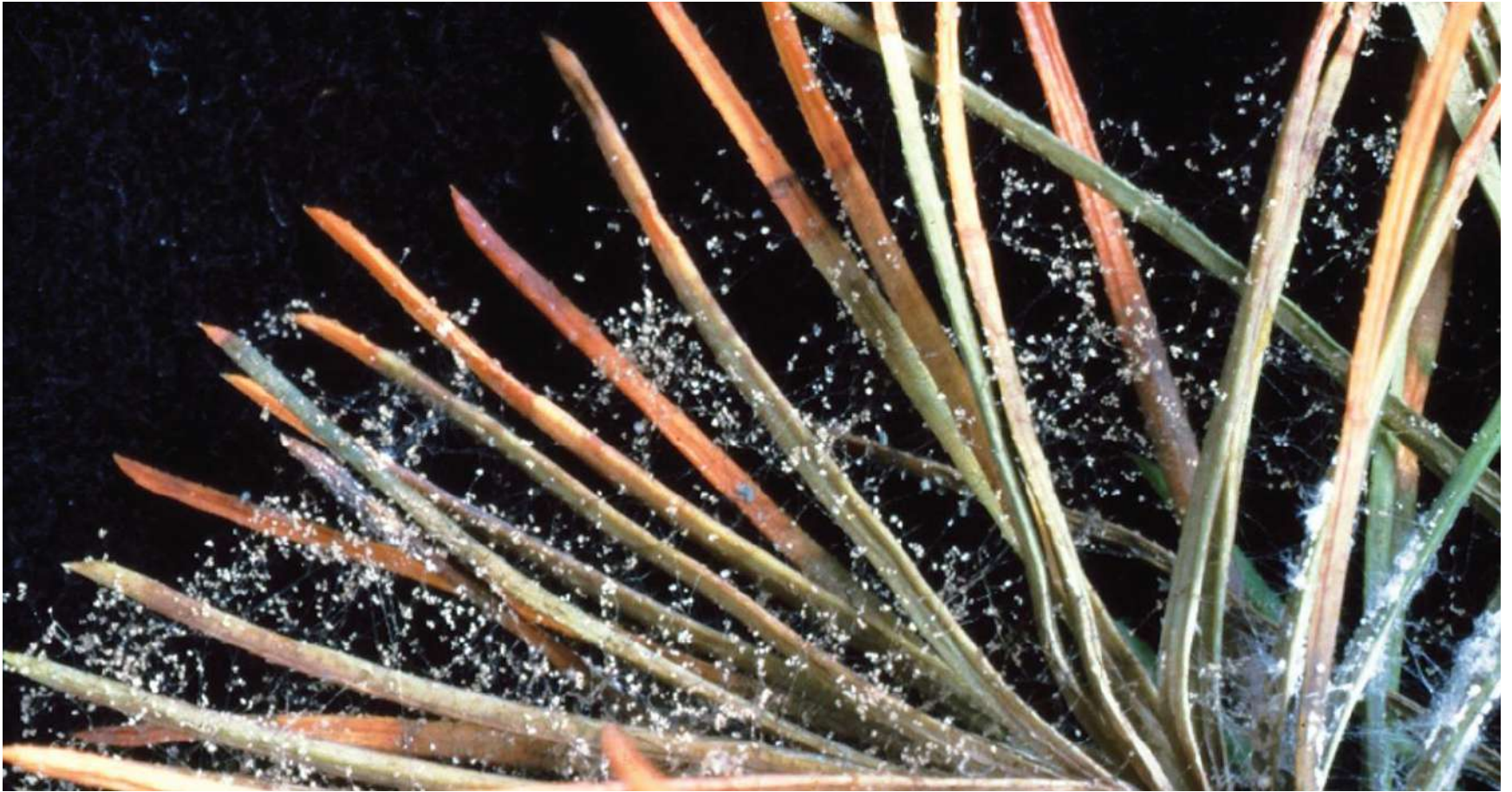
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Botrytis cinerea is commonly present on dead or dying matter as saprophyte when conditions are suitable it can cause infection. The conidia germinate between 0°C and 25°C, and the rate is temperature dependent, being optimal at 7–20°C.



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infection can take place after just 3 h at 15–20°C and 98% relative humidity (RH) if there is free water on plant surfaces.



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Control of Gray mold

- 1- Keep the microclimate within the canopy as dry and well aerated as possible.
- 2- Irrigation can be applied in early morning to ensure foliage dries during the day.
- 3- Lowering seedling bed density to produce a more open stand.
- 4- Removing the diseased and dead seedling to minimize the rate of inoculum.
- 5- Using effective fungicide (captan, benomyl, thiram, carbendazim, chlorothalonil) to prevent seedling damage.

4- Dothistroma needle blight

Causal organism

Dothistroma septosporum (Dorog.)

Hosts: seedlings of all pine species

Symptoms

Early needle symptoms consist of yellowish or pale brown bands.

The bands become brown and then typically develop a characteristic brick red colour, which remains apparent long after the needles have died.



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symptoms

irregular , black
fruiting bodies can
be found on the
red bands.



Symptoms

Generally only the lower needles are affected .

Severely attacked needles turn brown as a whole and will eventually be cast prematurely.



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Dothistroma septosporum



Control of Dothistroma

- ❖ Removal of old infected seedlings and removal of inoculum sources.
- ❖ DNB may be reduced by avoiding planting susceptible species on high-risk sites.
- ❖ Disease control is achieved by spraying with copper products; copper hydroxide, cuprous oxide or copper oxychloride monthly from October to March.