

Forest Entomology & Pathology Final Study Sheet

Student Name: _____

Must be original, complete in your own hand-writing and must be handed in upon completion of test.

Definitions: Fruiting Body: The mushroom or type of reproductive structure formed by a fungus
Stalk: (lamellae) thin pieces of tissue hanging down from the underside of the cap of the mushroom where basidiospores are produced & released, Spore: the reproductive unit of a fungus. Universal veil: the tissue that protects the developing gills
Annulus: (ring) remaining tissue of the inner veil that remains attached to the stalk as the cap expands. Hypogly: the thread like filaments produced by the germinating spores that obtain nutrients. Mycelium: the large network of hyphae. Primordia: the nodules formed on the mycelium where the fruiting body develops from. Material veil: a fibrous sac that enveloped the young mushroom. Xylem: (wip) remnants of the universal veil at the base of the stalk.



Types of wood decay

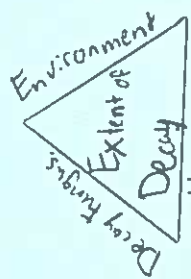
White Rot - Degrades lignin first, Degrades small amount of cellulose & hemicelluloses, Attacks cellulose at the ends of the molecule

Brown (Cubical) Rot - Degrades cellulose & hemicellulose all random points along molecules, Causing loss in strength along annual rings & rays, Degrades small amount of lignin, more common in conifers, denser wood more resistant to decay. Soft rot (white) - Degrades cellulose a long length of molecule causing loss of wood strength, Enzymes attack links between cell walls & lignin creating a "sori" texture of the wood.

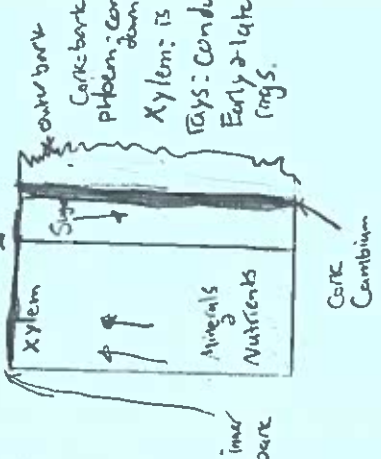
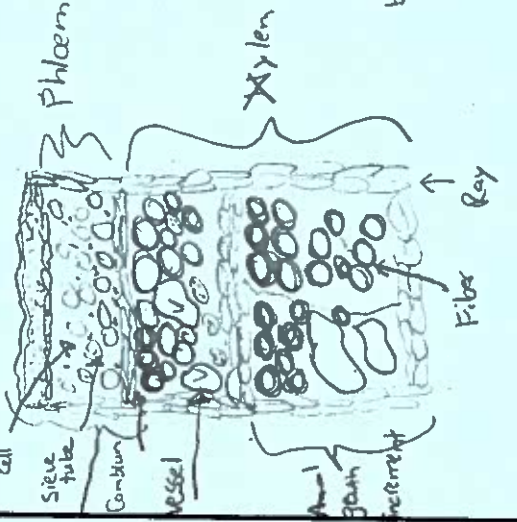
Cellulose - main structural component of the cell wall
Hemicellulose - a secondary component found in cell walls, less organized than cellulose.
Lignin - important component of cell wall, makes cell walls rigid, brown in colour.

Annual F.B. - often fleshy decompose after spore release
Perennial F.B. - Hard & woody remain on host all year round, growing new pore layer annually

Wall 1: Chemicals plug up vessels
Wall 2: annual growth rings
Wall 3: Rays
Wall 4: new wood (Callus tissue)



Tools for measuring tree decay
 - sounding mallet
 - A coughie measuring instrument
 - resistograph



Phloem: conduct sugars down stem
Xylem: is wood
Rays: Conduct fluids & cross grain
Early & late wood in growth rings.

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Agents Causing Disease

Fungi

Lack chlorophyll
Decomposition
reproduce by spores.

(wind, water, insects, animals)

- i) Parasitic - feed on living tissue/kill
- ii) Saprophytic - feed on dead tissue
- iii) Symbiotic - both organisms benefit.

Nutrients
Temp
Moisture.

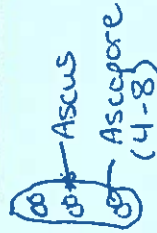
Fungi Groups

i) Basidiomycota

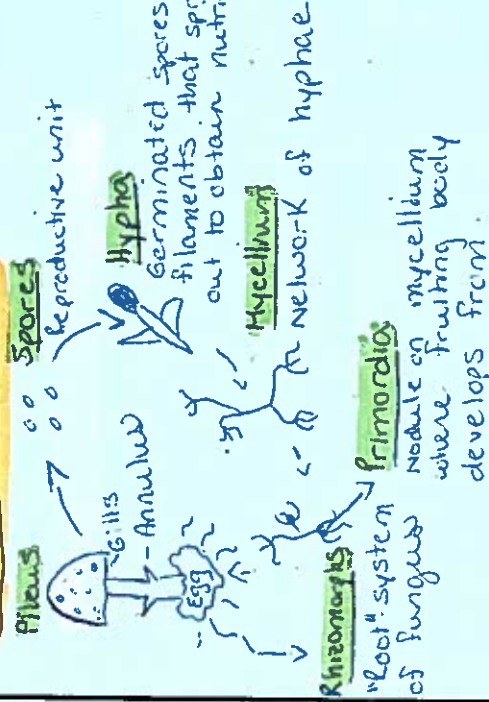
Basidia



ii) Ascomycota - Sac Fungi



Reproduction Process



Bacteria

- Single celled
Produce toxins

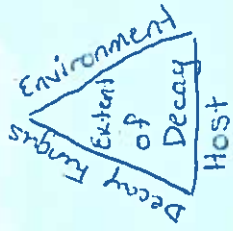
spread by water, plant material
tools/equipment.

Types of Rot:

Tree Decay

Cellulose - main component of the cell wall
(carbohydrates)

Hemicellulose - secondary component in cell wall
Lignin - (fibers, tracheids, vessels), brown in
colour. E. structure



WOOD

In response to attack, tree attempts to
'compartmentalize' spread of disease.
-> 4 major walls

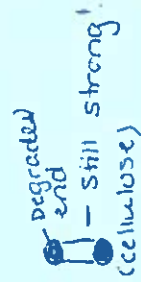
- Wall # 1 - Prevent spread moving up/down - weak
- Wall # 2 - Stop decay to spread to heartwood
- Wall # 3 - Rays, stop decay around circumference
- Wall # 4 - New wood formed, strongest wall.

Rot:

Sap-Rot. - secrete toxic enzymes
Heart-Rot - tough ($\downarrow O_2$, $\uparrow C$, \downarrow moisture)

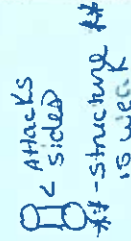
White Rot

Degraded Lignin
Bleached colour.



Brown Cubic Rot

Degrades Cellulose - cubes
conifer spp common.



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1) Mature mushroom

gills (lamella) arranged in rows
stalk (stipe)
volva (cup-like structure)
spores

2) Cross-Section of Woody System

Growth ring pith
Pith
Heartwood
Sapwood
Cork cambium
Cork
Bark

3) Decay Triangle

Fungus
Environment
Extent of Decay
250H

Trees are susceptible to colonization if:
• They are unable to form CODIT
• Conditions are met for colonization (moisture, nutrients, etc.)
• Adequate Number of spores (inoculum) present.

4) Anatomy of a Lichen

The body of the lichen organism is called the Thallus

Fungal hyphae
Thallus
Fungal cell

5) Types of fungi

Basidiomycota
Ascomycota
Zygomycota

6) Why is tree decay important?

- Soil fertility
- wildlife habitat

7) What are the two main areas where tree decay affects humans?

- forest product quality (quality of wood materials)
- Public Safety

8) First Step in detecting wood decay fungi?

- Understanding how decay fungi react to trees

9) How do trees resist the spread of decay?

• CODIT, combination of chemical/anatomical boundaries

10) How do decay fungi enter standing trees?

- Wounds
- breaks in bark

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20) How do decay fungi enter standing trees?

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Why is tree decay important?
• Soil fertility • wildlife habitat

First Step in detecting wood decay fungi?
• Understanding how decay fungi react to trees

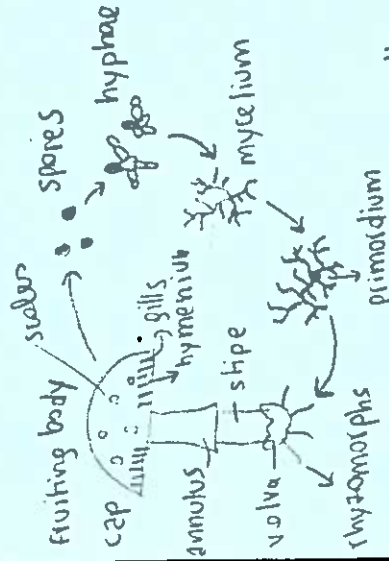
How do trees resist the spread of decay?
• CODIT, combination of chemical/anatomical boundaries

How do decay fungi enter standing trees?
• Wounds • breaks in bark

External signs of decay?
• Cracks • Cavities • Flaking bark

Lepidoptera: Complete: Butterflies/moths: chewing-sucking
Coleoptera: Complete: Beetles: chewing-chewing
Diptera: Flies: Complete: Maggot
Hemiptera: Jumpers: incomplete
Heteroptera: Cicadas, Hoppers, White Flies, Aphids, scales, wingless
Hymenoptera: Sawflies, Ants/Wasps: Complete: ovipositor: chewing
Isoptera: Incomplete: Termites
Orthoptera: Incomplete: Katydid, grasshoppers, crickets - chewing
Thysanoptera: Thrips: incomplete
Arachnida (Mites): Acari (Mites), Ticks, spiders: incomplete: 8 legs

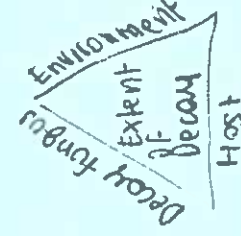
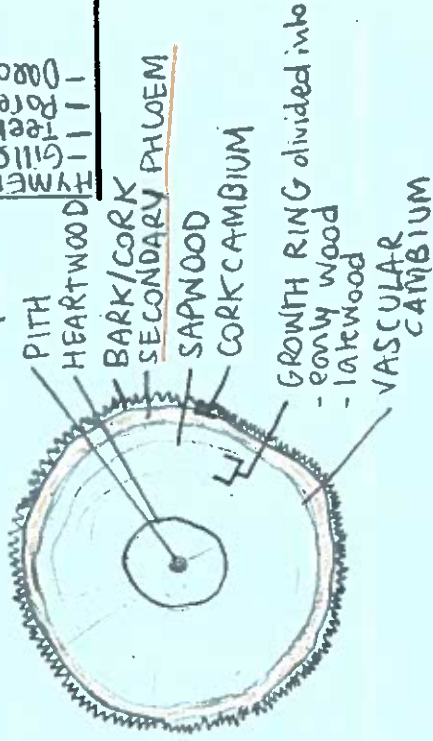
LICHENS: Algae + Fungus
 Algae: provide food source (photosynth)
 Fungus: substrate for algae to live



algae cell → fungal hyphae

① BASIDIOMYCOTA → basidia → basidiospores

② ASCOMYCOTA → sacs → ascus → ascospores



WHITE ROT: degrades lignin, small amounts of cellulose & hemicellulose; attacks cellulose at the end of the wood cell (maintain strength)
BROWN ROT: degrades cellulose & hemicellulose at random points. More common in conifers.

ENTOMOLOGY NOTES

- Lepidoptera: 2 pairs of scaly wings, coiled tube, larvae chewing mouthparts, 2 abd segs, COMPLETE
- Coleoptera: FW (elytra) straight line down the back, chewing mouthparts, 10-3 pairs of legs, COMPLETE
- Hemiptera: FW thickened at base, membranous at tip, ∇ scutellum, piercing/sucking mouthparts, all habitats, plant feeders, predatory insect, INCOMPLETE
- Hymenoptera: 2 pair of wing w hamuli, many spp r waspwaisted, ovipositor, social & solitary spp.
- Diptera: HW (halteres), sucking mouthparts, COMPLETE, larvae are maggots
- Isoptera: 2 pairs of wings, = length, chewing mouthparts, INCOMPLETE
- Orthoptera: FW (tegmina) muscular for jumping, chewing mouthparts, INCOMPLETE
- ACANI (ARACHNIDA): 4 pairs of legs, head + thorax (Cephalothorax), Sucking, INCOMPLETE



MANAGING

1. Prune to increase air flow
 2. Keep host trees apart from alternate hosts
 3. Remove infected wood, Verticillium: prune infected trees
 4. Remove infected areas, needles
 5. rake and destroy leaves
 6. pruning out infected branches on leaders (shoot blight)
 7. generally: remove infected parts → control the vectors and remove them → remove infected trees
 8. remove and destroy
 9. monitoring tree for signs of decay → remove tree or branch if it is a hazard → remove stumps →
- LICHENS 2
ELIOSE: leaf-like, can have different colour/texture on upper and lower surface, can have lobes
CRUSTOSE: flat or single-plane growth form, forms a tight bond with substrate common on rocks
FRUTICOSE: bush or shrub-like
 important requirement for the substrate:
 - texture
 - ability to absorb/retain moisture
 - chemistry acid/buffering
USES food, clothing, dyes, perfumes, habitat, ...