

Forest Disease Diagnosis

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- **Diagnosis (identification) is the first step in the treatment of a disease.**
- **Accurate diagnosis of tree diseases is a complex activity requiring a combination of many disciplines related to tree health, such as botany, entomology, microbiology, plant pathology, plant physiology and soil science as well as broad exposure to forestry.**
- **The key ingredients of a good diagnostician (plant doctor):**
 - **an inquisitive mind,**
 - **a reluctance to jump to healthy conclusions,**
 - **a persistent determination to find the cause of a problem, and**
 - **a willingness to seek additional information from other tree specialists and reference texts.**

- A thorough understanding of the appearances and functions of a **healthy tree** is necessary before a diseased tree can be recognized.
- Knowledge of **local climatic conditions** and **soil type** - also essential for accurate diagnosis of tree diseases.
- Diagnosis - from study of **symptoms** and **signs** in the field followed by **laboratory examination** of the samples.

Symptomatology – study of disease symptoms

Symptom – any condition resulting from disease that indicates its occurrence - A reaction of the host to a causal agent

Sign - evidence of disease other than that expressed by the host, usually structures of the pathogens

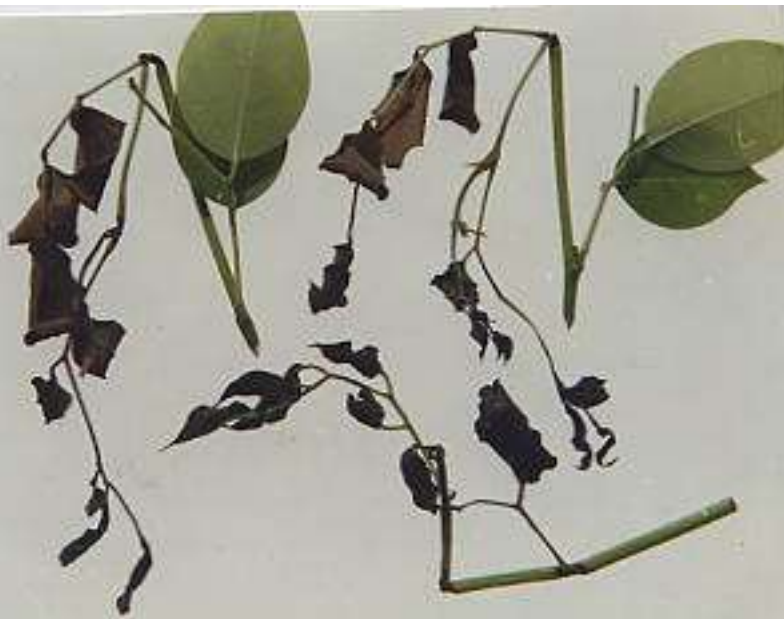
Symptoms:

- 1. Necrotic symptoms – that result from cessation of function leading to death**
- 2. Hypoplastic symptoms – that result from underdevelopment or retardation of function**
- 3. Hyperplastic symptoms – that result from overdevelopment or acceleration of function**

Necrotic Symptoms

Cessation of function leading to death

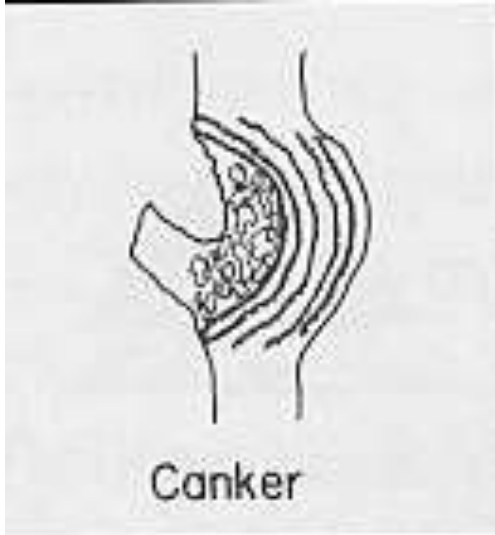
1. Blight – Rapid killing of foliage, blossoms and twigs



2. Blotch – Large, irregular lesions on leaves, shoots and stems



3. Canker – Necrotic, often sunken lesions in the cortical tissues of the stems and roots



4. Decay – disintegration of dead tissues



Decay



5. Dieback – Progressive death of twigs and branches from their tips toward the trunk



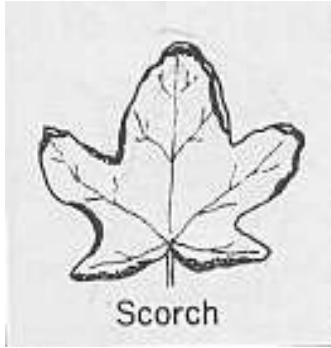
6. Hydrosis – a water-soaked, translucent condition of the tissue due to cell sap passing into intercellular spaces



7. Scald – blanching of the epidermis and adjacent tissues



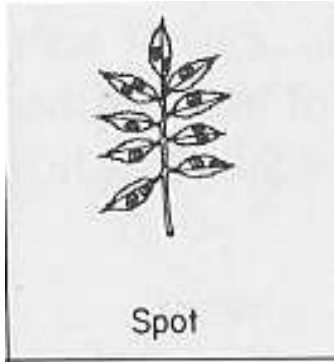
8. Scorch – browning of leaf margins resulting from death of tissues



9. Shot-hole – circular holes in leaves resulting from the dropping out of the central necrotic areas of spots



10. Spot – lesions, usually defined, circular or oval in shape, with a central necrotic area surrounded by variously coloured zones



11. Yellowing – leaves turn yellow due to loss of chlorophyll



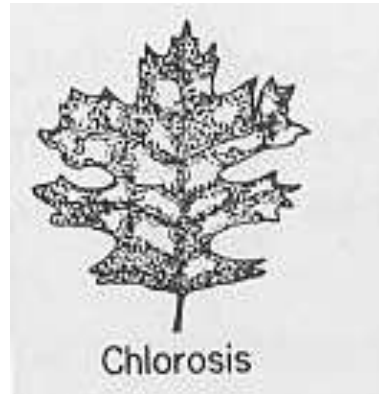
12. Wilt - leaves or shoots lose their turgidity and droop



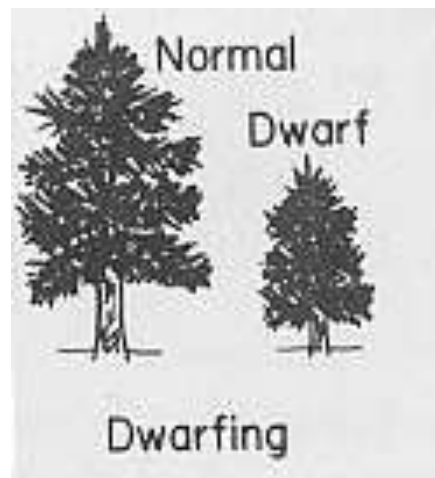
Hypoplastic symptoms

Underdevelopment or retardation of function

1. Chlorosis – failure of chlorophyll development in normally green tissues

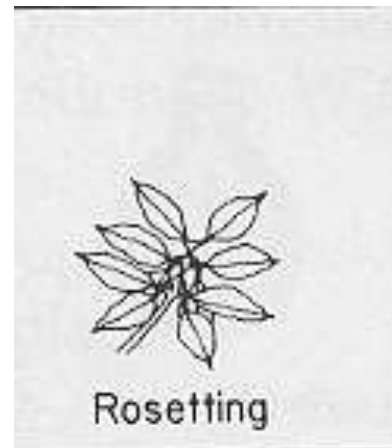


2. Dwarfing – subnormal size in an entire plant or some of its parts



3. Etiolation – yellowing due to lack of light

4. Rosetting – crowded condition of foliage due to lack of internode elongation



5. Suppression – prevention of the development of certain organs

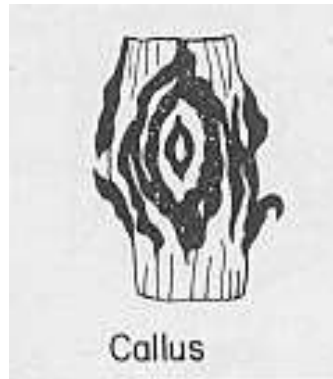
Hyperplastic symptoms

Overdevelopment or acceleration of function

1. **Anthocyanescence** – purplish or reddish colouration of leaves or other organs due to overdevelopment of anthocyanin pigment



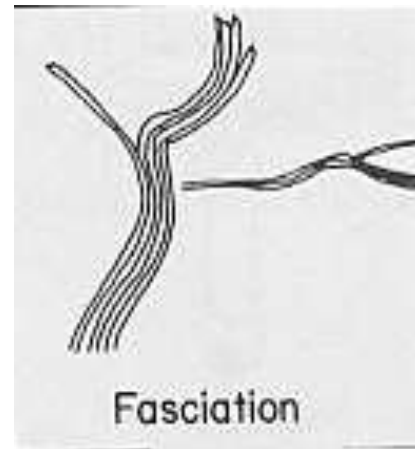
2. **Callus** – overgrowth of tissues at the margins of wounds and diseased tissues (cankers)



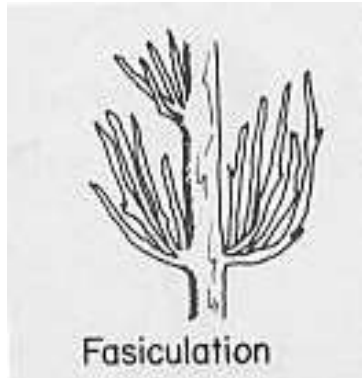
3. Curl – rolling or folding of leaves due to ocalized overgrowth of tissues



4. Fasciation – flattened condition of a plant part that is normally round

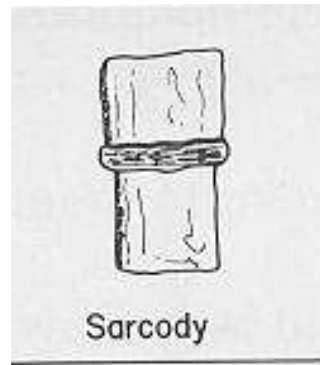


5. Fasciculation or Witches' broom – broom-like growth of densely clustered branches (epicormic branches)

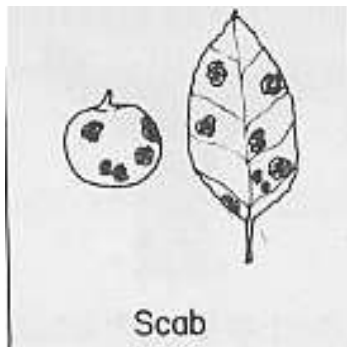


6. Heterotopy – development of more or less normal tissues or organs in the wrong place

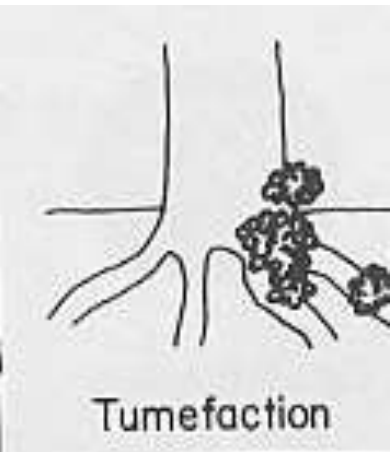
7. Sarcody – abnormal swelling of tissues above girdled branches or stems



8. Scab – roughened, crust-like lesion



9. Tumefaction – tumor-like or gall-like overgrowth of tissue



10. Virescence – development of chlorophyll in tissues where it is normally absent

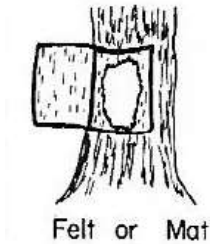


Sign - evidence of disease other than that expressed by the host, usually structures of the pathogens and

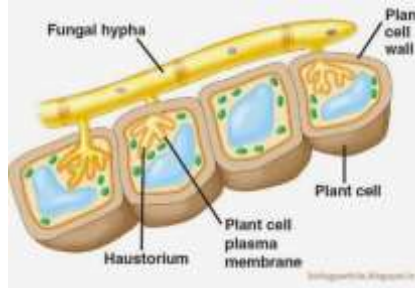
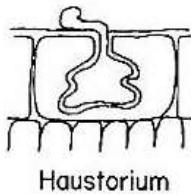
- **Signs are divided into three general categories:**
 1. **Vegetative structures - those pathogen structures that function primarily in absorption and storage of nutrients.**
 2. **Reproductive structures – those pathogen structures that function in reproduction of the organism**
 3. **Disease products – gases and exudation products resulting from disease.**

Vegetative structures

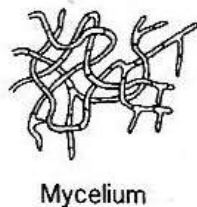
1. Felt – Densely woven mat of mycelium



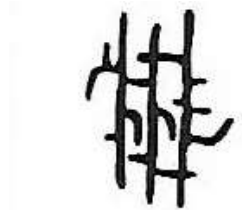
2. Haustorium – Absorbing organ of a fungus which penetrates a host cell without penetrating the plasma membrane.



3. Mycelium – A mass of fungal threads or hyphae.



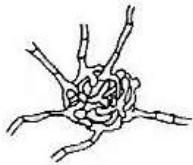
4. **Pathogen cells** – Generally mass of bacterial cells.
5. **Plasmodium** – naked mass of protoplasm
6. **Rhizomorph** – Cord-like strands of fungal hyphae.



Rhizomorph



7. **Sclerotium** – A hard, compact, resting body composed of fungal hyphae.

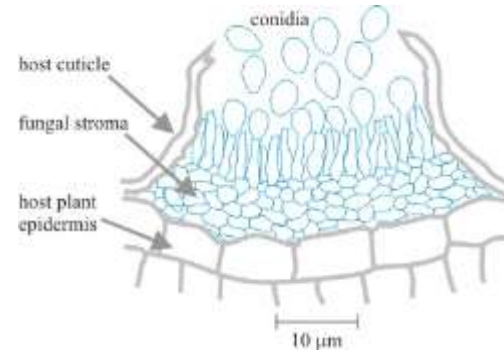


Sclerotium

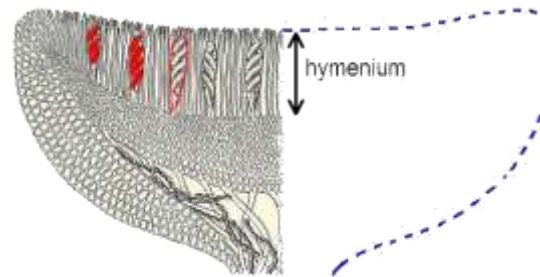


Reproductive structures

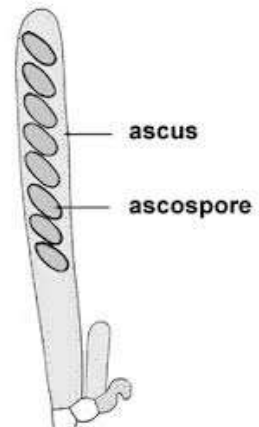
1. **Acervulus** – Mat of hyphae, generally associated with a host, forming erumpent lesions with short, densely packed conidiophores.



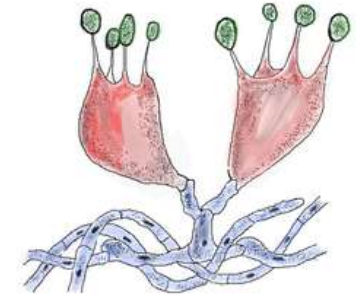
2. **Apothecium** – Open, cup-like, ascus containing fruiting body.



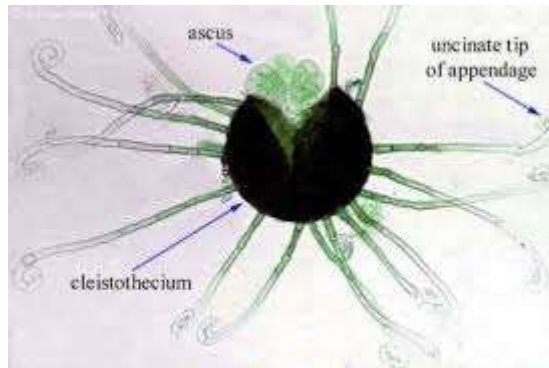
3. **Ascus** – Sac-like structure containing ascospores formed as a result of karyogamy and meiosis



4. Basidium – Club-shaped structure on which basidiospores are produced as a result of karyogamy and meiosis

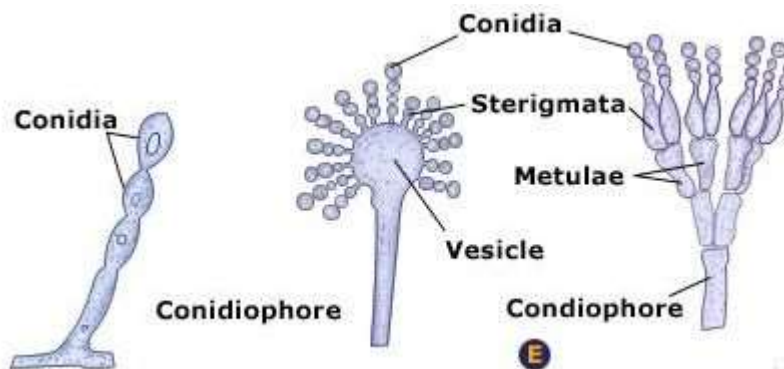


5. Cleistothecium – Closed ascus containing fruiting body.

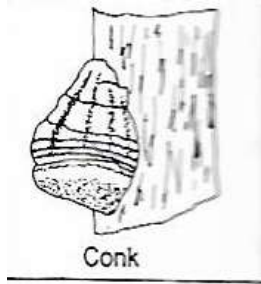


6. Conidia – Asexual reproductive one to several-celled units borne on conidiophores.

7. Conidiophore – Specialized hyphal branch on which conidia are produced.



8. Conk – Woody shelf-like structure characteristic of many wood decaying fungi



9. Mildew – Cobwebby or powdery superficial growth usually on leaves.



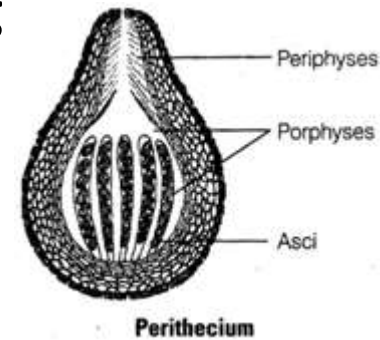
10. Mould – Woolly or furry surface growth of mycelium.



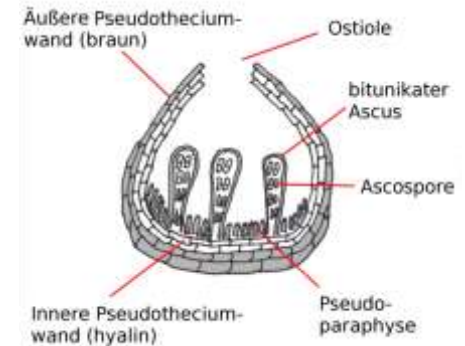
11. Mushroom – Umbrella shaped fruiting structure of many Basidiomycetes.



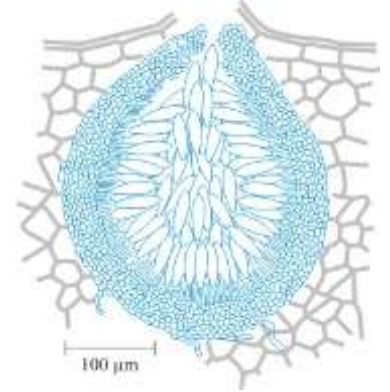
12. Perithecium – Flask-shaped, ascus containing fruiting body with a small opening (ostiole) and a wall of its own.



13. Pseudothecium – Fruiting body bearing asci in locules (chambers) within a stroma.



14. Pycnidium – Asexual, follow fruiting body containing conidia

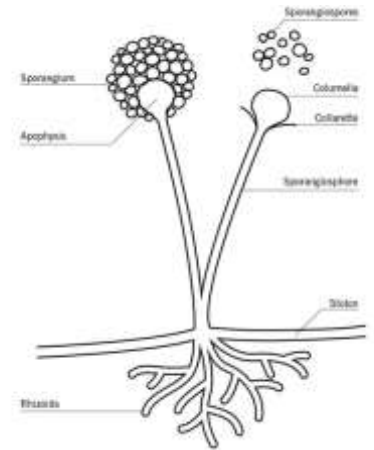


15. Seed bearing plants – Higher plants that parasitize trees.

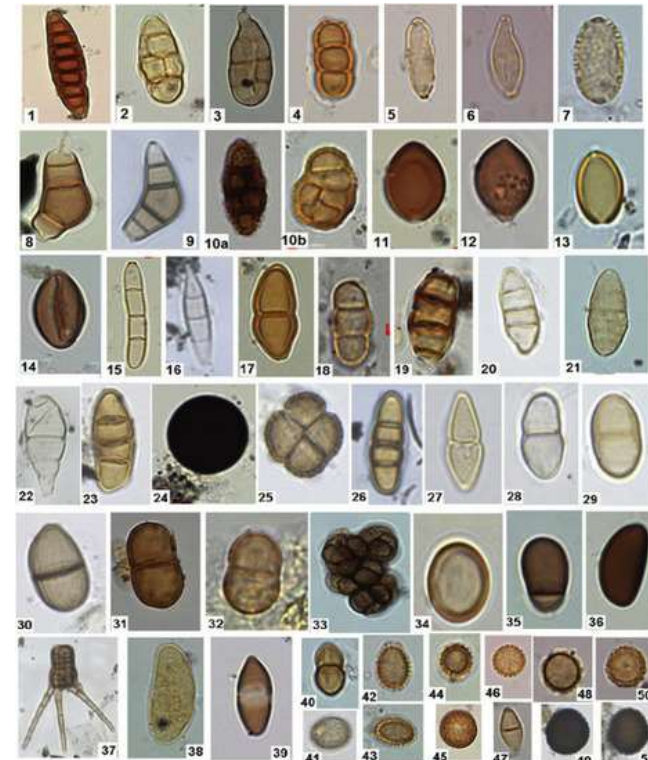


16. Sorus – Mass or cluster of spores born on short stalks.

17. Sporangium – Enlarged tip of specialized hyphal branch in which sporangiospores are produced.



18. Spore – General name for single to several-celled propagative unit in the fungi namely ascospores, basidiospores, zoospores, oospores, sporangiospores, aeciospores, pycniospores, urediospores, chlamydo spores and teliospores.



19. Stroma – Compact mass of fungal hyphae or within which fruiting structures are formed.



20. Worms – Generally nematodes which are microscopic worm-like animals that can cause disease.



Disease Products

1. **Odour** – Characteristic smell associated with some host-pathogen interactions.
2. **Ooze** – Viscid mass made up of plant extract and often pathogen cells.



Disease identification request - Seeking advice for diagnosis of forest diseases

Following details about the tree species and its surroundings are of immense help in seeking opinion and advice from a forest pathologist:

1. Tree species Name, Age (approx.), Height (m), Girth at breast height (GBH) (m/cm)
2. What is wrong about the tree species that invites attention?
3. What is the condition of other individuals of same species in the locality? Whether are they also showing the same symptoms?
4. Has the problem also witnessed earlier? If yes then noticed since when
5. Has the species received any treatment? Yes/ No, Pesticide, Fertilizer, Date of application
6. Is there any evidence of mechanical injury? Motor vehicle, construction, Pruning, Lopping, Axe wounds
7. Local climate, comment on any unusual weather conditions (hot, cold, wet, dry, flooding, storm, hailstones, etc.)

8. Soil type whether sandy, loamy, clay or bouldery, well drained or poorly drained, compaction
9. Biotic stresses, if any, grazing, fire, extraction of forest produce
10. Roots exposed or not
11. Describe the symptoms, appearance
12. Describe the fruit bodies of fungi, if any (conks, mushrooms, etc.)
13. Provide the samples of roots, twigs, leaves, fruit bodies, soil, etc. as soon as possible.
14. A digital photo can also be shared using e mail, WhatsApp, or other platform
15. Any other specific detail
16. Name, address, mobile number, e mail of the person seeking diagnosis

THANK YOU
ANY QUESTIONS?

