Section 1.4. PowerPoint presentations
Diseases of Rubber an overview

**DISEASES OF HEVEA RUBBER**
- Leaf diseases;
- Stem diseases;
- Panel disease;
- Root diseases.

**LEAF DISEASES OF RUBBER**
- Colletotrichum secondary leaf fall;
- Oidium secondary leaf fall;
- Phytophthora abnormal leaf fall;
- Corynespora leaf fall;
- Fusicoxum leaf disease;
- Bird’s eye spot;
- Cylindrocladium leaf disease.

**LEAF DISEASES**
- Colletotrichum secondary leaf fall;
- Oidium secondary leaf fall;
- Phytophthora abnormal leaf fall;
- Corynespora leaf fall.

**Distribution of Rubber Diseases in Malaysia**
- Associated with rainfall pattern

**MAJOR LEAF DISEASES**

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colletotrichum</td>
<td>Brazil, Cameroon, China, Gabon, Guyane, India,</td>
</tr>
<tr>
<td>leaf fall</td>
<td>Indonesia, Malaysia, Vietnam</td>
</tr>
<tr>
<td>Corynespora</td>
<td>Cameroon, India, Indonesia, Malaysia</td>
</tr>
<tr>
<td>leaf fall</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Oidium leaf</td>
<td>China, India, Indonesia, Malaysia, Vietnam</td>
</tr>
<tr>
<td>Phytophthora</td>
<td>Brazil, India</td>
</tr>
<tr>
<td>leaf fall</td>
<td></td>
</tr>
</tbody>
</table>

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Colletotrichum secondary leaf fall

- Fungus – *Colletotrichum gloeosporioides*;
- Occur in Brazil, Cameroon, China, Gabon, India, Indonesia, Malaysia, Vietnam;
- Causes leaf fall and shoot dieback;
- Important in nurseries, young and mature rubber;
- Reduces plant growth and yield;
- Common during annual wintering;
- Needs rainfall.

Impact of Diseases

- To the tree:
  - Damage and defoliate leaves;
  - Cause shoot and stem dieback;
  - Damage the tapping panel and affect bark renewal;
  - Kill branches and trees.
- Economics:
  - Lengthen the immaturity period (>13 years for SALB);
  - Reduce latex yield (30 to 70% reduction);
  - Increase cost of production;
  - Affect the environment.

Oidium secondary leaf fall

- Fungus – *Oidium heveae* (powdery mildew);
- China, India, Indonesia, Malaysia, Vietnam;
- Important on young and mature rubber;
- Cause leaf defoliation and reduces latex yield;
- Light rain with cool misty nights.

Phytophthora abnormal leaf fall

- Fungus *Phytophthora palmivora* or *P. botryosa*;
- Brazil, India, Thailand, Malaysia, Vietnam;
- Prolong heavy rainfall;
- Infects young and mature leaves, petioles, shoots, fruits;
- Causes leaf fall and shoot dieback.

Corynespora leaf fall

- Fungus *Corynespora cassicola*;
- Two races identified;
- Cameroon, India, Indonesia, Sri Lanka, Vietnam;
- Symptoms – spots or characteristic railway track symptoms;
- Infects young and old leaves.

Corynespora leaf fall

- Causes leaf fall, shoot dieback;
- Increase immaturity period, reduces yield;
- Kills plants.
**Fusiccocum leaf disease**

- Fusicoccum sp.;
- Occurs only in Malaysia;
- First detected in 1988 in a FELDA holding;
- Spread to other areas;
- Common on immature rubber;
- Causes leaf fall.

**OCCURRENCE AND SEVERITY OF CORYNESPORA LEAF FALL**

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Severity</th>
<th>Clones affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>1980</td>
<td>Severe</td>
<td>RRIC 103, PPN 209A, PPN 2447, GI 1, KRS 21, RRIM 725, RRIM 600, FA 25, IAN 873</td>
</tr>
<tr>
<td>India</td>
<td>1960</td>
<td>Severe</td>
<td>RRRI 105, GI 1, RRIM 600, Tjr 1, RRRI 118</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1999</td>
<td>Severe</td>
<td>LHRK072, RRIC 103, RRIC 104</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1960</td>
<td>Severe</td>
<td>RRIM 725, RRIM 600, IAN 873, RRIC 103</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1987</td>
<td>Severe</td>
<td>RRIC 110, RRRI 105, RRIM 600, GI 1</td>
</tr>
<tr>
<td>Thailand</td>
<td>1985</td>
<td>Severe</td>
<td>RRIC 103, KRS 21, Songkla 36, RINT 351, PH 205</td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td>–</td>
<td>–</td>
<td>RRIC 103, RRIC 110, PB 260, PB 28/59</td>
</tr>
</tbody>
</table>

**Management of leaf diseases**

- Enviromax planting;
- Planting of resistant clones;
- Cultural practices:
  - Artificial defoliation to avoid secondary leaf fall and Corynespora leaf fall;
  - Increase nitrogen manuring for Oidium secondary leaf fall.
- Chemical control.

**CHEMICAL CONTROL OF LEAF DISEASES**

<table>
<thead>
<tr>
<th>DISEASES</th>
<th>CONTROL METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oidium leaf fall</td>
<td>Sulphur dusting, tri demorph spray, artificial defoliation</td>
</tr>
<tr>
<td>Colletotrichum leaf fall</td>
<td>Spray with Daconil, propineb-effective for nurseries and immature rubber</td>
</tr>
<tr>
<td>Phytophthora leaf fall</td>
<td>Copper oxychloride – aerial spray, fogging</td>
</tr>
</tbody>
</table>

**Methods of applying fungicides**

- Dusting;
- Ground spraying;
- Aerial spraying;
- Fogging.

**STEM DISEASES**

- Pink disease – most important stem disease
- Ustulina stem rot – minor importance
- Bark necrosis – minor importance
**Pink disease**

- *Corticium salmonicolor*
- India, Indonesia, Malaysia, Vietnam
- Infects young rubber at the fork
- Pink colour mycelium and latex
- Kills branches and prolong immaturity period
- Occurs during wet season

**Control of pink disease**

- Spraying of Bordeaux mixture for trees not in tapping (weekly)
- Painting with fungicides (tridemorph, thiram, chlorothalonil)
- Spraying with thiram or chlorothalonil
- Rainfast formulations had been developed
- Most effective on less severe diseases
- Motorised sprayers for big areas
- Resistant clones

**CHEMICAL CONTROL OF PANEL DISEASES**

<table>
<thead>
<tr>
<th>DISEASES</th>
<th>CONTROL METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink disease</td>
<td>Bordeaux mixture spray, tridemorph painting</td>
</tr>
<tr>
<td>Black stripe</td>
<td>Ridomil spray, thiram, chlorothalonil</td>
</tr>
<tr>
<td>Mouldy rot</td>
<td>Benomyl spray</td>
</tr>
</tbody>
</table>

**PANEL DISEASES**

- **Black stripe** – most important
- **Mouldy rot** – localised
- **Panel necrosis** – rare

**Black stripe**

- *Phytophthora palmivora*
- Brazil, Cameroon, China, Cote d’Ivoire, India, Indonesia, Malaysia, Thailand, Vietnam
- Dark depressions with dark streaks on wood
- Long heavy rainfall
- Spreads by rain splash and tapping knives
- Damage bark and wood
- Interferes with bark renewal and develop burls that interfere future tapping
- Control by applying fungicides (ridomil-mancozeb)

**Mouldy rot**

- *Fungus Ceratocystis fimbriata*
- Brazil, Indonesia, Thailand
- White moulds above the tapping cut
- Damages bark and wood and affects bark renewal
- Common in high moisture and weedy conditions especially on panels reaching the ground
- Control with fungicides (benomyl)
**Chemical control of panel diseases**

- Spraying of fungicides using hand held sprayers;
- Painting with brush.

**Hevea Root Diseases**

- White root disease – most important;
- Red root disease – less important;
- Brown root disease – less important;
- Armillaria root rot – important in Africa;
- Purple root disease – Only in China.

**Distribution and severity of root diseases of Hevea (1994)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Ganoderma</th>
<th>Rigidoporus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Malaysia</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Indonesia</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>India</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>French Guiana</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>China</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Brazil</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

1-Disease absent; 2-Disease occurs sporadically, localized, minor disease of no economic significance; 3-Disease occurs generally, moderately severe in certain localities, chemical control is required; 4-Severe occurrence of the disease can be localized or widespread, chemical control is necessary; 5-Very severe occurrences, large to widespread, cause severe economic loss.

**Red root disease**

- *Ganoderma philippii*;
- *China, Malaysia, Brazil*;
- Fungus growth slower and disease more prominent on older rubber;
- Similar foliage symptoms;
- Roots covered with a layer of sand/soil;
- Red coloration on roots.

**Brown root disease**

- *Phellinus noxius*;
- *Côte d’Ivoire, India, Malaysia*;
- Less common;
- Can cause stem rot;
- Similar foliage symptoms;
- A layer of soil/sand with brown spots;
- Honeycomb structures on wood surface and inside wood.
ROOT DISEASE CONTROL

- Pre-planting
  - Correct land clearing procedures;
- During planting
  - Application of sulphur (150 to 200 g/plant);
  - Planting of creeping legume cover plants;
- Immature rubber
  - Chemical control
- Mature rubber
  - Isolation trenches

CHEMICAL CONTROL OF ROOT DISEASES

- Identifying infected trees:
  - Quarterly foliage inspection for symptoms of root disease (discoloration) followed by collar inspection of infected and neighboring trees;
  - Foliage inspection is expensive and laborious;
  - Requires expertise.
- Applying of fungicides:
  - By painting;
  - By drenching.

Painting with fungicides

- Not being carried out due to high cost and lack of labour;
- PCNB for white root disease and tridemorph for white and brown root disease;
- Commercial product is unavailable.

Drenching of fungicides

- Most commonly used method;
- More effective on young and less severe disease;
- Normally not effective on trees with foliage symptoms;
- Carry out collar inspection to detect disease;
- Dig furrow and pour fungicides (1 or 2 l/tree);
- Repeat after 6 months;
- Effective fungicides – triadimefon, propiconazole, hexaconazole etc.

NURSERY DISEASES

- Bird’s eye spot (Drechslera hervei);
- Dieback (Colletotrichum Phytophthora);
- Control with fungicides.

EXOTIC PESTS AND DISEASES OF RUBBER

- South American leaf blight;
- Black crust;
- Target spot;
- Mosca de renda;
- Mosca branca (white moth).
South American leaf blight

- Microcyclus ulei;
- South and Central America;
- Most serious disease of rubber;
- Most Asian and African clones are susceptible;
- Suitable climate in Asia and Africa.

Black crust and target leaf spot

- Black crust (Catacauma huberi)
- Target leaf spot

Thank you