

EMERGING DISEASES OF OIL PALM

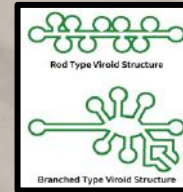
MADIHAH AHMAD ZAIRUN, PhD

Research Officer
Emerging Diseases & Biosecurity (EDB) Group
Plant Pathology & Biosecurity (PPB) Unit
Biology & Sustainability Research Division (BSRD)
Malaysian Palm Oil Board

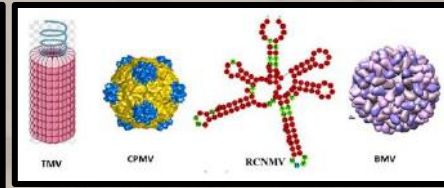


EMERGING DISEASES IN OIL PALM

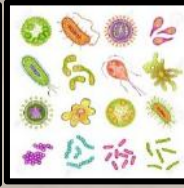
- Emerging diseases are **newly identified, re-emerging, or previously minor diseases** that are now increasing in prevalence, severity, or geographic spread, posing a potential threat to the productivity and sustainability of oil palm industry in Malaysia
- Causal: viroids, viruses, bacteria, nematodes, fungi, or even physiological disorders — triggered or worsened by changes in climate, land use, trade, or agricultural practices.
- Emerging diseases of oil palm are less significant than major diseases (*Ganoderma* disease) but require awareness.
- Monitoring and control are crucial to prevent them from developing into serious threats to the oil palm industry.



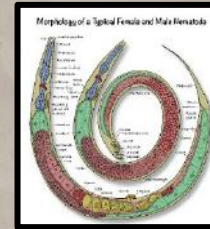
viroids



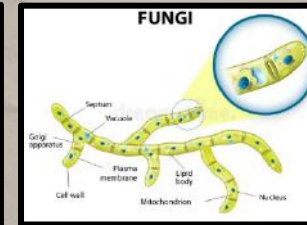
viruses



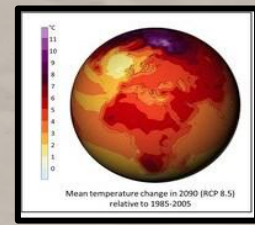
bacteria



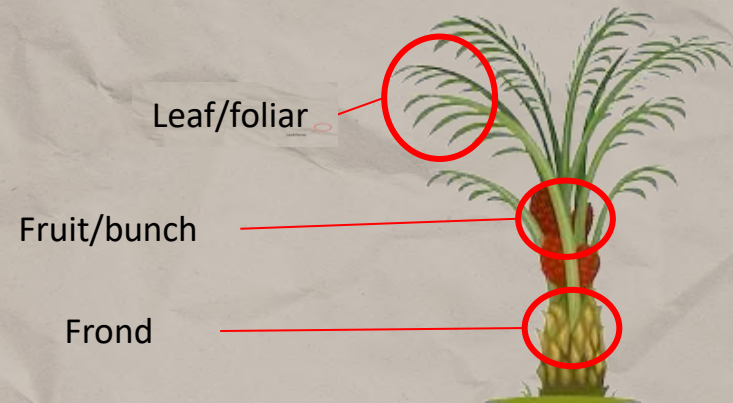
nematode



fungi

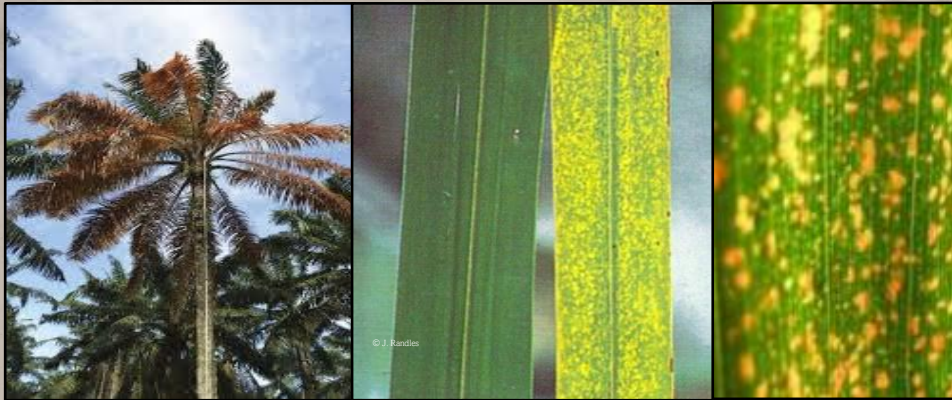


climate change



LEAF / FOLIAR DISEASES

- 1**
- **Disease: Orange spotting**
 - **Pathogen:** Variants of Coconut cadang-cadang viroid (CCCVd)
 - **Spread:** vertical transmission
 - **Symptoms:** orange spotting on the leaf, no-necrotic orange spots on leaflets, water-soaked leaf, growth stunted, smaller fruit bunches or no fruit bunch
 - **Effect:** photosynthetic process disrupted, yield reduction up to 50% in a single palm compared to healthy adjacent palm
 - **Distribution:** Philippines, Solomon Islands (CCCVd), Malaysia (CCCVd-variants)
- (Forde & Leyritz, 1968; Hanold & Randles, 1991; Randles, 1998)

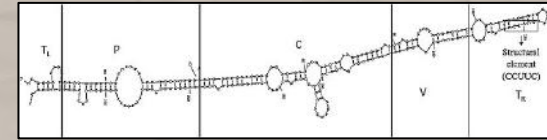


Associated with nutrient deficiency – Pottassium/ K (Coulter and Rosenquist, 1955)

Genetic origin (GOS) (Forde and Leyritz, 1968)

Biotic agent (OS) (Gascon and Meunier, 1979)

CCCVd (Hanold and Randles, 1991; Vadamalai, 2005; Joseph, 2012)



- Discovered 30 viroids as crop pathogen
- Low molecular weight, single stranded, circular RNAs
- Transmitted mechanically
- Some are seed & pollen transmissible



LEAF / FOLIAR DISEASES

Variants of CCCVd in Oil Palm

- Orange spotting on leaves, trunk
- Water/ oil-soaked appearance
- Single standing palms – isolated
- Adjacent palm were not affected
- Crown discoloration appearance (orange/ yellowish/ bronze)
- Detection:
 - Reverse transcription loop-mediated isothermal amplification (RT-LAMP) for detection of CCCVd Variants
 - Real time-qPCR using hybridization probe
- Management:
 - No control
 - Breeding programme to avoid mother palms with orange spotting
 - Removal of affected palm



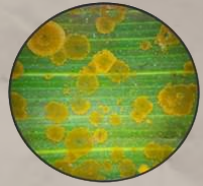
LEAF / FOLIAR DISEASES

2

- **Disease: Algae leaf spot**

- Causal: algae- species- *Phycopeltis* sp. (non-pathogenic algae) (Malaysia), *Cephaleuros virescens* (pathogenic algae) (Indonesia)
- Spread: spores via high humidity & wind
- Symptoms: 'reddish-brown' colonies on the surface of leaves/fronds
- Effect: pathogenic algae- photosynthetic process disrupted, yield affected if infestation is severe
- Distribution: Malaysia, Indonesia

- The first case was reported to MPOB in 2017, where light spot intensity was observed on the lower fronds of mature palms.
- By 2024, more reports were received, with symptoms extending from the lower to the middle fronds.
- Epidemiology: associated with frequent rainfall (2000 – 4000 mm), high humidity, and warm conditions. Initially, found near milling and biogas areas, but it is now commonly observed along roadsides and has spread a few rows into the plantation.
- A survey on Invasive Alien Species (IAS) was conducted in 2022-2023, recording 49 cases of ALS since 2023 (385 responses from 4000 registered estates)
- A meeting between MPOB and stakeholders to discuss the status of ALS incidence was held on 19 March 2025
- To date, no economic impact has been associated with ALS incidence
- Ground survey & sampling- ALS in Johor, Kelantan, Melaka, Negeri Sembilan, Pahang, Perak, Terengganu, Sabah and Sarawak.

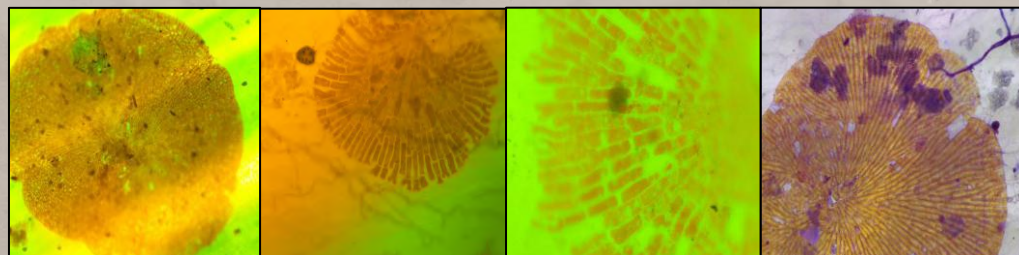


LEAF / FOLIAR DISEASES

- Causal green algae, *Phycopeltis* sp. (Division Chlorophyta)
- A type of lower plant, have chlorophyll, capable of producing its own food through photosynthesis; epiphytic in nature.
- Considered as minor disease, therefore it was less studied
- Often mistaken for *Cephaleurus virescens* (pathogenic algae) in many crops
- Morphology: Flattened, irregular thallus cells on the leaf surface.
- Reproductive organs: Zoospores and aplanospores
- Distribution: common in tropical and subtropical regions
- Ecologically non-pathogenic epiphyte, harmless or mildly epiphytic on leaves, stems, and bark
- MPOB distributed the ALS Survey in July 2025.
- To date, 135 estates (32.5%) reported ALS out of 415 responses.
- MPOB is currently conducting studies on ALS, focusing on epidemiology, management, economic impact, and incidence
- Management: Copper-based fungicides to eliminate algae



Algae wipe out using wet tissue



Thallus structure of *Phycopeltis* sp. (non-pathogenic algae) in oil palm plantations in Malaysia



DSI 0 (Healthy)

DSI 1 (<25% Spots)

DSI 2 (25-50% Spots)

DSI 3 (50-75% Spots)

DSI 4 (>75% Spots)

Algae Severity Index (ASI) for ALS

LEAF / FOLIAR DISEASES

3

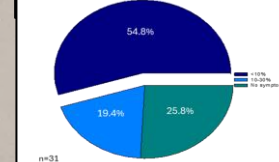
- **Disease: Leaf Spot Disease (Nursery)**

- Pathogen: fungi
- Spread: conidiospores, spores
- Symptoms: water-soaked lesions with black, yellow, brown, reddish-brown or grey discoloration
- Effect: yield affected if infestation is severe
- Distribution: Malaysia, Indonesia, Thailand, China and Africa

- One of the most common diseases infecting oil palm foliar in the nursery, and several reports in the field
- Leaf spot disease is minor disease and not fatal
- Influenced by environmental conditions notably relative humidity, water stress, genetic composition of the seedlings & fungi infection
- Molecular identification confirmed the presence of *Pseudopestalotiopsis*, *Curvularia*, and *Colletotrichum*, with potential roles in disease progression
- Associated fungi- *Cercospora* sp, *Pestalotiopsis* sp., *Neopestalotiopsis* sp. and *Phylosticta* sp.
- Leaf spot disease survey was conducted in collaboration with the Code of Practice Certification Unit (CoPCU), as of July 2025, 31 nurseries participated, with 55% reporting a low infection rate (<10%)



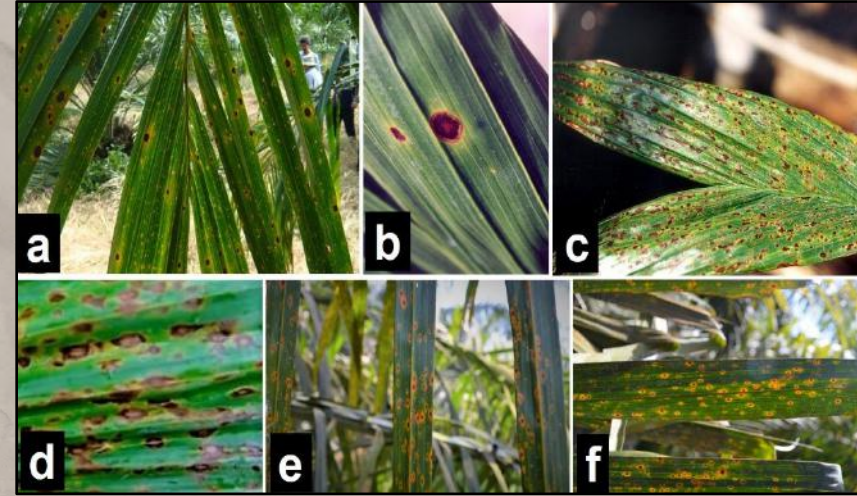
Number of oil palm seedlings showing symptoms of leaf spot disease



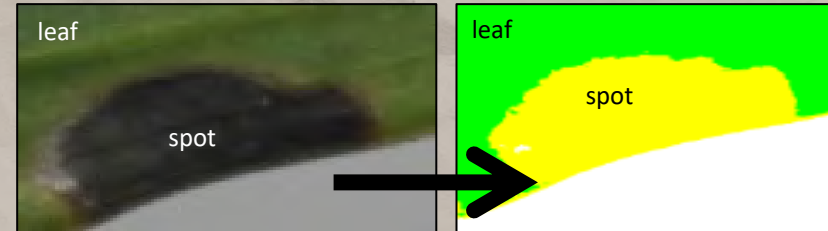
LEAF / FOLIAR DISEASES

Leaf Spot Disease

- Detection:
 - Image processing and neural network classification using mobile device
 - Molecular approach
- Management:
 - **Chemical:**
 - Addition of potassium to balance the application of nitrogen to minimise disease incidence
 - Foliar spraying using mancozeb and benomyl
 - **Cultural practices:**
 - Chemical foliar spray coupled with pruning of dead, old, severely infected leaves
 - Water management by elimination of overhead irrigation or protection from rainfall
 - Increase air circulation to keep plants drier by increasing spacing between plants and making sure larger plants are not blocking air movement to smaller plants.
 - **Biological:** Organic cyclic peptide fungicide and biocontrol agent bacteria, *Paraburkholderia* sp. CP01



(a) Leaf spot symptoms on mature oil palm caused by *Curvularia oryzae*, and (b) *Curvularia* sp. (c) Leaf spot symptoms on oil palm seedlings caused by *Curvularia* sp. (d) *Cercospora* leaf spot. (e and f) *Pestalotiopsis* sp. leaf spot.

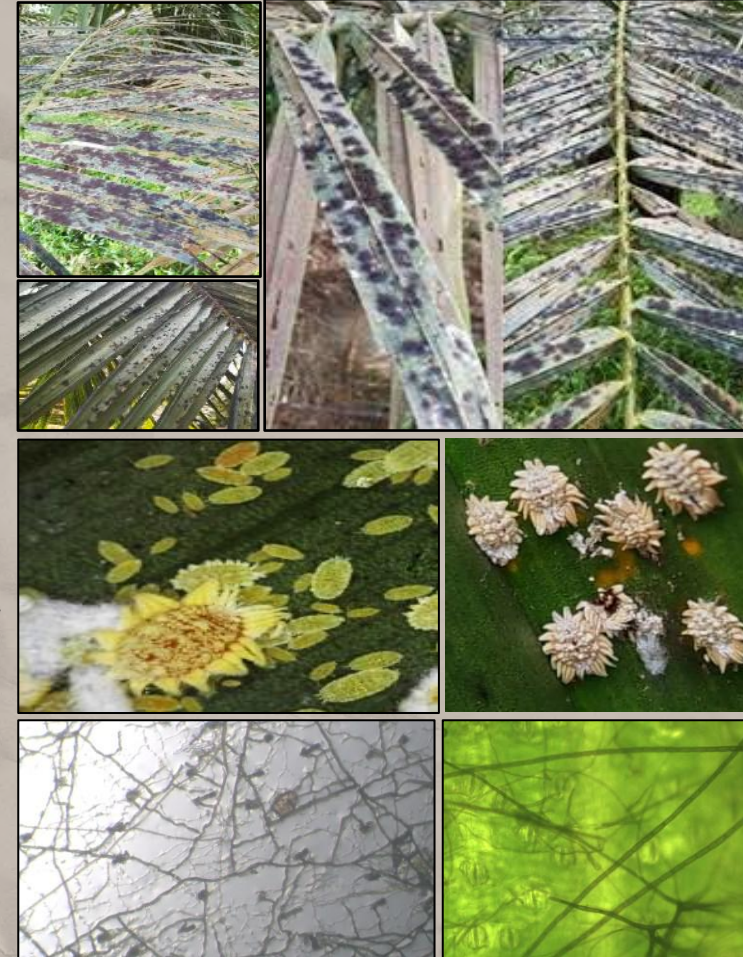


LEAF / FOLIAR DISEASES

4

- **Disease: Sooty mold**
- Cause: mealybug insect
- Symptoms: black mycelium, growing on and under the surface of the leaves
- Effect: disruption of the photosynthesis process, yield affected if the infestation is serious severe
- Distribution: Malaysia, Thailand, Indonesia

- Sooty mold was observed in Peninsular Malaysia & Sarawak, but in control conditions. Report found outbreak in Tawau, Sabah.
- Causal by mealybug infestation, producing honeydew, sticky, sugary liquid (waste) during feeding on plant sap
- Attract vectors- ants , whitefly
- Sooty mold is an epiphytic fungal growth on honeydew causing blackening leaves, black mold, signs of hidden mealybug colonies nearby
- Sampling done in Lahad Datu & Tawau (Sabah)
- Fungi identification using molecular approach found *Capnodium* sp., *Cladosporium* sp., *Aureobasidium* ep., *Lasiodiplodia theobromae*, *Cyanoporus fuligo*, *Pestalotiopsis* sp., *Aspergillus* sp., *Nigrospora sphaerica*, *Trichoderma* sp., *Penicillium* sp.
- Management: Pesticides to combat mealybug, will reduced sooty mold

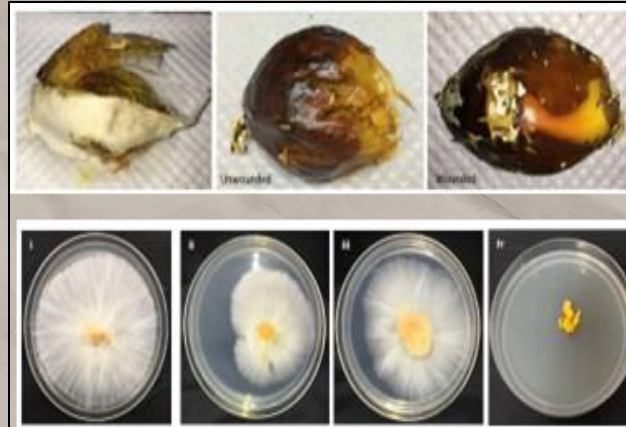


FRUIT / BUNCH DISEASES

1

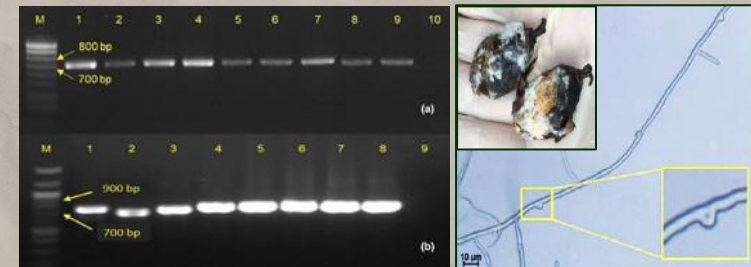
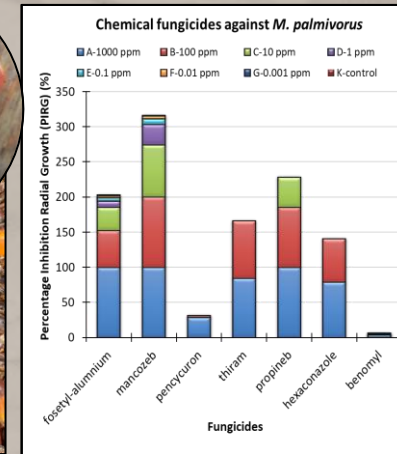
- **Disease: *Marasmius* bunch rot**
- Pathogen: *Marasmius palmivorus* (fungus)
- Spread: mycelium & spores through contact with infected fruit/ rainwater/ wind/ insects
- Symptoms: white mycelium grows on the surface of overripe/rotten fruit, mesocarp becomes soft & foul smelling
- Effect: low oil quality
- Distribution: Malaysia, Indonesia, Thailand, SEA

- In Malaysia, during the early period of the oil palm expansion & COVID19 pandemic, several outbreaks of the disease were recorded, causing some economic losses
- Isolation and Koch's postulates confirmed *Marasmius palmivorus* as the causal agent of bunch rot (BR)
- Fungus characteristics
 - Small basidiocarps with white spores
 - Naturally saprophytic fungi
 - Decomposers that recycle nutrients by breaking down forest litter



FRUIT / BUNCH DISEASES

- MPOB conducted studies on pathogenicity, growth conditions, economic impact and genetic diversity of the pathogen
- Detection: Species-specific primers developed with >95% accuracy for rapid detection
- Management:
 - Application GAP management- proper pruning & harvesting
 - Removal rotten bunches
 - Chemical treatments (mancozeb and propineb) showed >80% disease reduction at 100 ppm
 - *Trichoderma* spp. exhibited strong biocontrol potential with >82% PIRG *via in vitro*



TRUNK DISEASES

1

- **Disease: Stem wet rot**
 - Pathogen: unknown (symptoms of bacteria?)
 - Symptoms: young leaf shoots wilts & die, wet stem tissue at base of stem, basal tissues destroyed & fibrous bodies
 - Effect: tree dies
 - Distribution: Malaysia, Indonesia
-
- Externally characterized by sudden and simultaneous death of all unexpanded spears and surrounding young leaves, followed by wilting and death of the crown.
 - Advanced stage: trunk hollowing, watery oozing that later dries, secondary infection, and fibrous structure remains before palm death.



TRUNK DISEASES

- A disease showing symptoms similar to stem wet rot has been reported in Ulu Tiram, Johor, and Klang, Selangor.
- The disease has been observed mostly on young oil palms, though a few cases (1–2 palms) were also recorded in mature palms (Ulu Tiram); Klang (8-10 years old palms)
- Field observations indicate that disease incidence is most likely initiated by rhinoceros beetle infestation.
- Trunk tissues: Healthy parts feel firm, while infected tissues are spongy, soft, water-soaked, and emit a foul odor.
- Fronds and petioles bend softly when snapped (not brittle).
- On young palms:
 - Severe infestation damaging the heart of palm often leads to palm death
 - Less severe cases, where the heart of palm is only partially damaged, affected palms may gradually recover as they mature



TRUNK DISEASES

2

- **Disease: Crown / Spear rot**

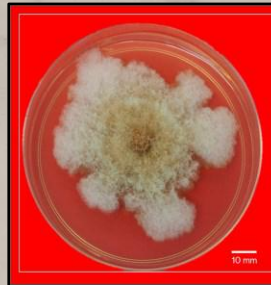
- Pathogen: unknown; caused by physiological or genetic factors / nutrient/ fungi?
- Symptoms: 'crowning-like' where the leaf fronds bend downwards
- Effect: stunted tree growth, affecting early yield
- Distribution: Malaysia, Indonesia

- The disease was first reported in North Sumatera in the 1920s (Turner, 1981)
- Affecting young oil palm (*Elaeis guineensis* Jacq.) 12- 18 months after field transplanting
- Occur in dry season followed by rainy period after replanting (Suwandi et al., 2012)
- In Malaysia, incidences rarely exceeded 1%
- Predisposing factor:
 - Poor root system development
 - Altered water balance
 - Low potassium availability
 - Imbalance in nutrient

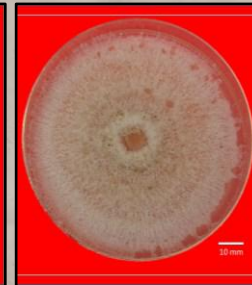


The tissues at the tips of the youngest leaves appear rotting or known as wither tip (Turner, 1981)

F. incarnatum



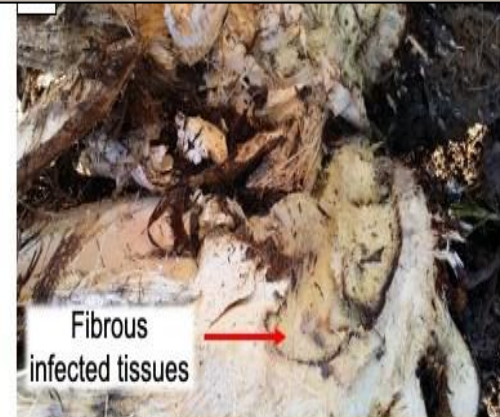
F. solani



TRUNK DISEASES

Crown / Spear rot Disease

- Disease development:
 - Necrotic lesions form on spear leaf leaflets
 - Young leaves appear shorter and distorted
 - Rot develops but does not progress towards the meristem
 - Parts of the spear show rotting and drying.
 - The rachis bends characteristically at its central portion
 - In severe cases, all leaves surrounding the spear bend downward (Suwandi et al., 2012)
- Management:
 - Maintain good soil aeration
 - Promote healthy root development
 - Apply nitrogen fertilizer at a suitable ratio
 - Implement breeding programs by discarding progenitors that confer susceptibility



Symptoms of common spear rot of oil palm. A) Emergence of spear rot on 3-years-oil palm. B) Cross-section of oil palm basal area, revealing the fibrous infected tissues at the inner part.

TRUNK DISEASES

3

- **Disease: Charcoal rot**
 - Pathogen – *Thielaviopsis paradoxa* (fungi) (syn. *Ceratocystis paradoxa*)
 - Symptoms: leaves 'yellow on one side' / stem tissue – rot at the base of the stem, black as charcoal
 - Effect: tree dies
 - Distribution: Malaysia
-
- A minor disease with only a few reported cases in Malaysia
 - Usually infects young palms through wounds on the trunk, crown, or roots
 - Symptoms: dark brown to black rotting tissues at the infection site; tissue becomes dry, brittle, and covered with black powdery masses (chlamydospores) resembling charcoal
 - In severe cases, basal stem infection causes crown collapse and palm death
 - Survival: Fungus survives in soil and plant debris through resistant chlamydospores
-
- Management:
 - Minimize injuries during harvesting and pruning
 - Remove and destroy infected tissues
 - Practice sanitation and good field hygiene



STAKEHOLDERS ROLES

1

An ideal tool kit for biosecurity risk management and emergency response plan for the Malaysian oil palm industry

>> Free, fast, easy, anywhere & anytime

2

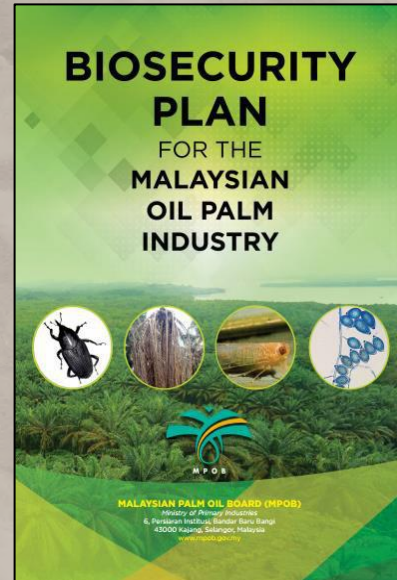
Quick reference to recognize the exotic diseases, pests or weeds

>>Provide direction & guidance

3

Emergency Report: Stakeholders can promptly report any unusual sightings in plantations or ports of entry by submitting details or attaching photos directly to MPOB through the application.

>>Real-time report



FREE



Website
sawitsecure.mpob.gov.my

Email: sawitsecure@mpob.gov.my

Visitor: Total view 135,276

Total users 27,508

TAKE HOME MESSAGE

- Emerging diseases pose a growing threat to oil palm sustainability and productivity
- To continue monitor the presence of emerging diseases in Malaysia and report to MPOB if found any incidence of diseases
- Strong biosecurity and continuous surveillance before developing into serious threat to safeguarding the industry



**THANK YOU FOR
YOUR ATTENTION**

