

# 都市行道樹病害管理要領

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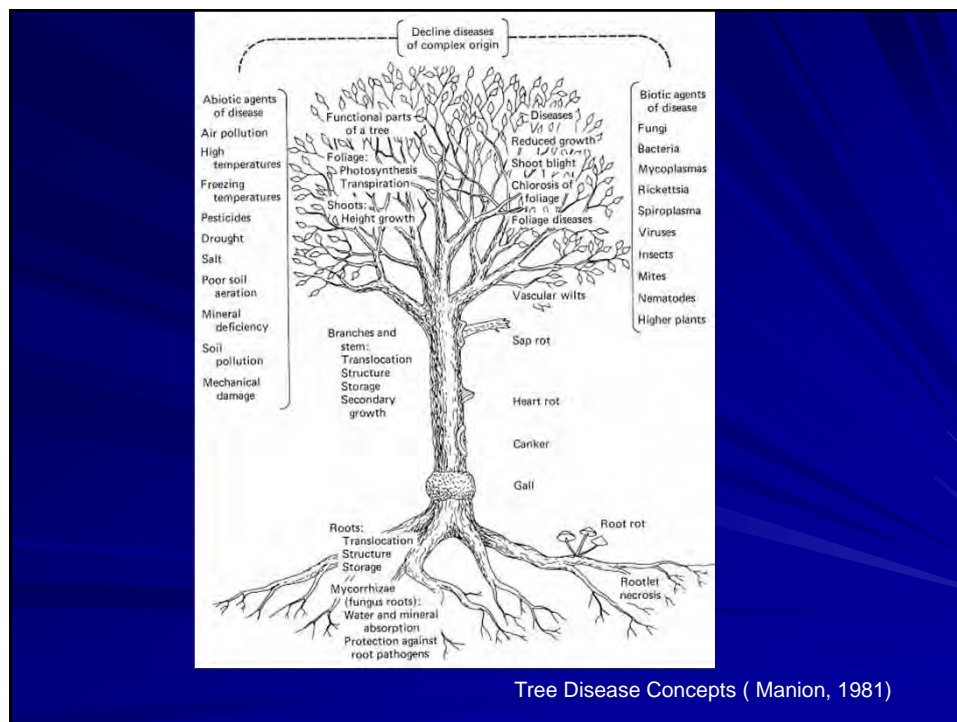


## Categorizing Types of Tree diseases

Abiotic plant diseases

Biotic plant diseases

Decline plant disease



Tree Disease Concepts ( Manion, 1981)

## Abiotic Agents of Tree Diseases

## Soil condition affecting tree health

1. Physical factors: moisture, oxygen, mineral content, structure, and profile.
2. Indirect effects of physical factors: mycorrhizae, pathogen, soil microorganisms

## Mineral nutrition

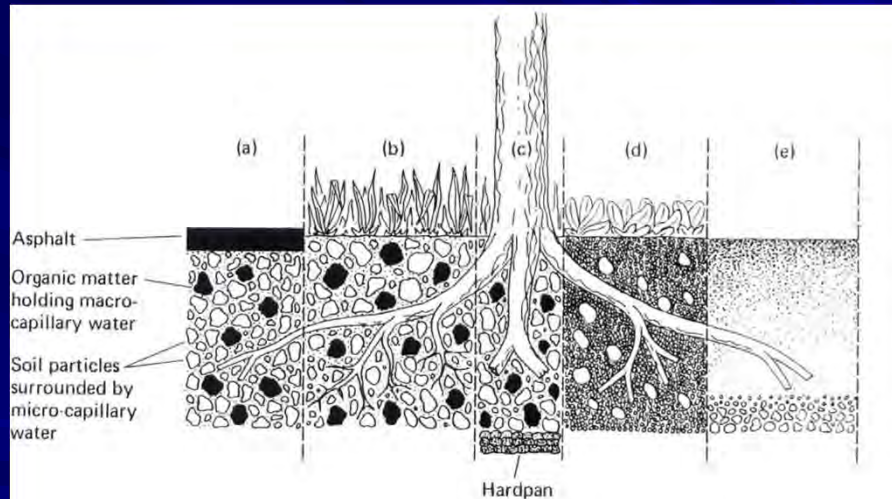
1. N, P, K, Ca, Mg, S, Fe, Mn, Zn, B, Cu, Mo
2. Exotic tree planted on sites not normally occupied by the species may show deficiencies.
3. Tree grown in urban environments or on highly disturbed sites will develop mineral-deficiency symptoms.

## Moisture

- Soil moisture:
  - 1) water held in the **macrocapillary** structure.
  - 2) water held in the **microcapillary** structure.
  - 3) water chemically bound.
- **Macrocapillary** water is utilized by tree roots and soil **microorganisms**.
- **Microcapillary** water is generally **not available** to plants, nor is chemically bound water.

**Humus** or **decomposing organic matter** is the major source of **macrocapillary water** holding capacity; therefore, the amount of organic matter in the soil is very important to tree health





Tree Disease Concepts ( Manion, 1981)

## Soil aeration

Oxygen: approximately 20%

Carbon dioxide( $\text{CO}_2$ ) < 1%

Decreased levels of  $\text{O}_2$  are more significant than increased levels of  $\text{CO}_2$  to the health of plant roots.

Heavy clay soils, soil compaction, asphalt, concrete, excessive rainfall, impeded drainage reduce the exchange of gases and thereby reduce O<sub>2</sub>

### In soil deficient in oxygen

1. root growth is retarded
2. amino acid leakage from roots to soil increase
3. mycorrhizal development is reduced
4. water and mineral absorption is reduced

## How to handle the oxygen problem?

1. Avoiding conditions that reduce O<sub>2</sub> in the soil.
2. Planting species the tolerate low O<sub>2</sub> levels

### Concentrations Capable of Causing injury and Typical Symptoms of Damage to Trees

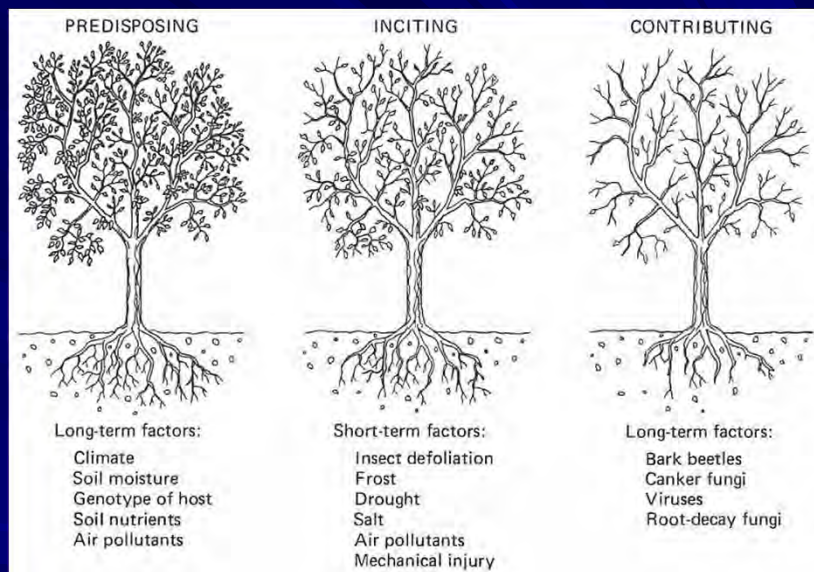
| Concentrations of<br>pollutants causing injury | Hardwoods                                | Conifers                 |
|--|--|--------------------------|
| SO <sub>2</sub> , 50pphm <sup>a</sup> 4hr      | Interveinal necrosis                     | Tip burning              |
| NO <sub>2</sub> , 200 pphm for 4 hr            | Marginal or interveinal<br>chlorosis     | ?                        |
| Fluorides <sup>b</sup>                         | Marginal chlorosis                       | Tip burning              |
| Ozone, 7pphm for 4 hr                          | Flecking on upper surface                | Flecking and tip burning |
| PAN, 1 pphm for 6 hr                           | Silvering or glazing of<br>lower surface | ?                        |

a pphm, parts per hundred million.

b Fluorides accumulate in the plant. When the level of 50-200 ppm is reached, symptoms appear.

Tree Disease Concepts ( Manion, 1981)

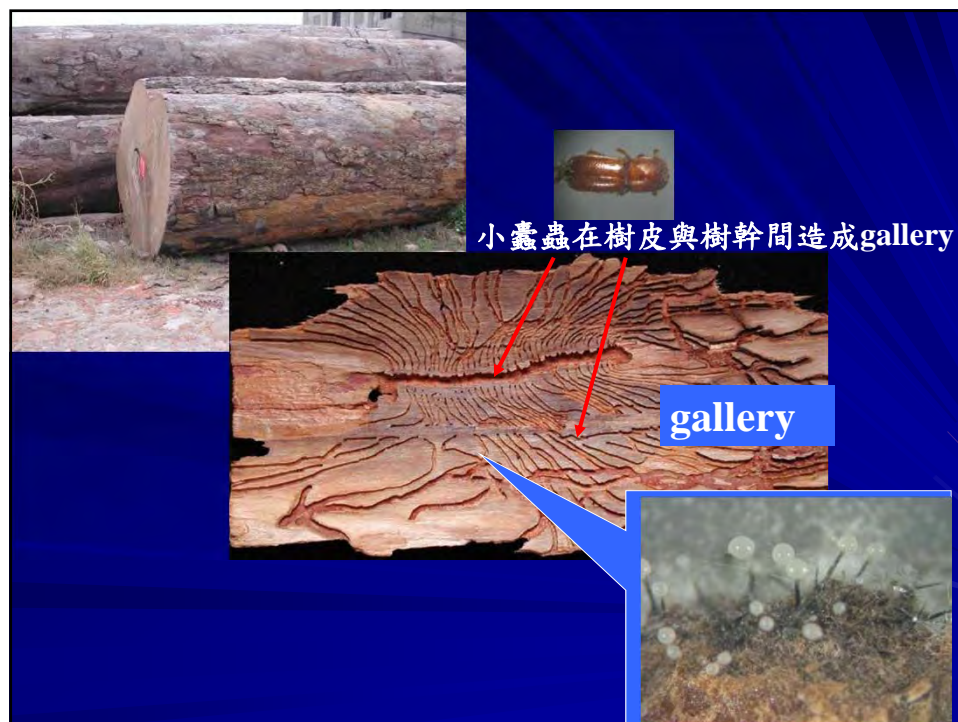
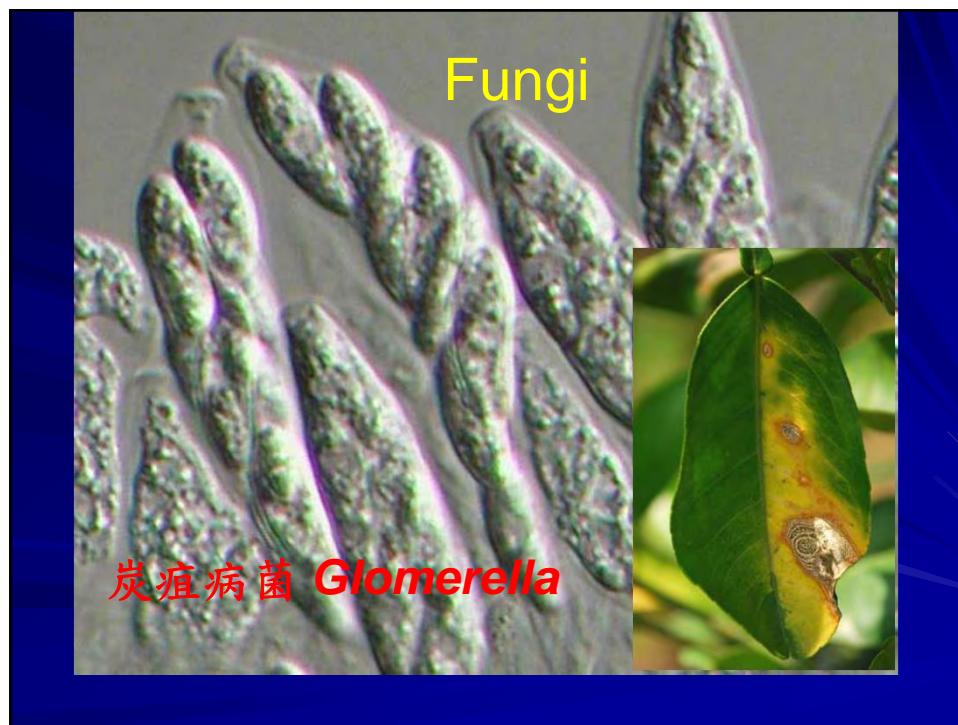




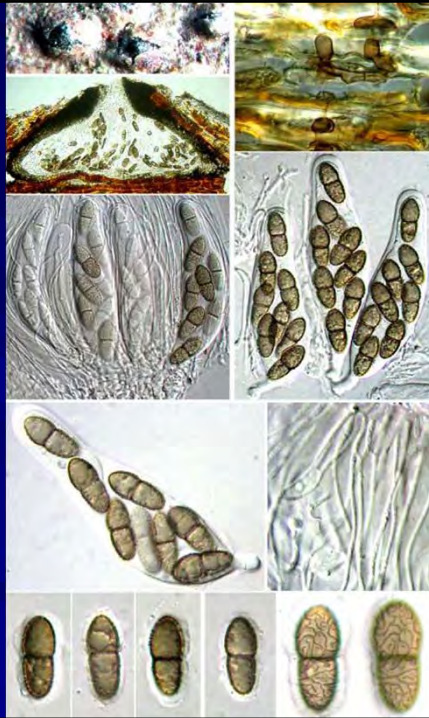
### Categories of factors influencing declines

Tree Disease Concepts ( Manion, 1981)

## Biotic agents of tree diseases



## 子囊菌

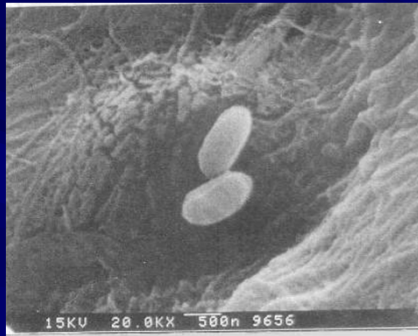


## 擔子菌類

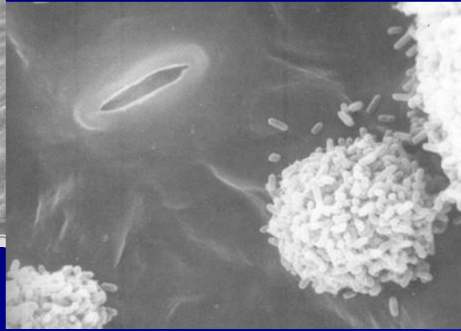




## 細菌於植物組織表面



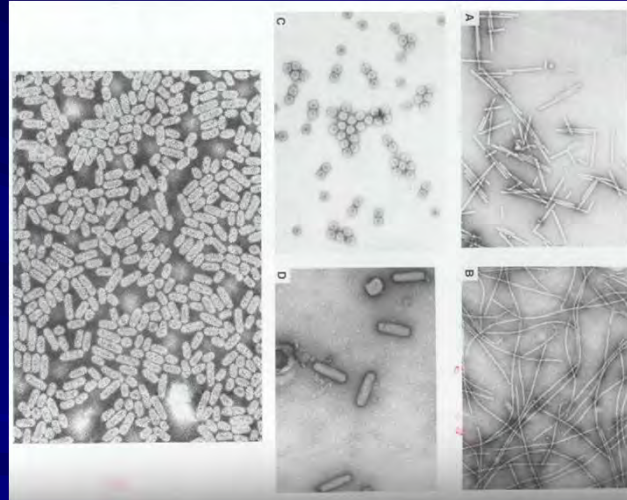
SEM, 20000x



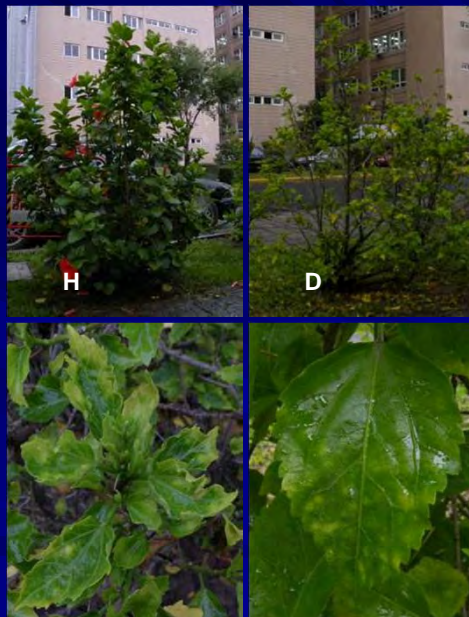
葉片氣孔周圍的細菌菌落 (1983, *Phytopathol. Z.* 108, 18-2)



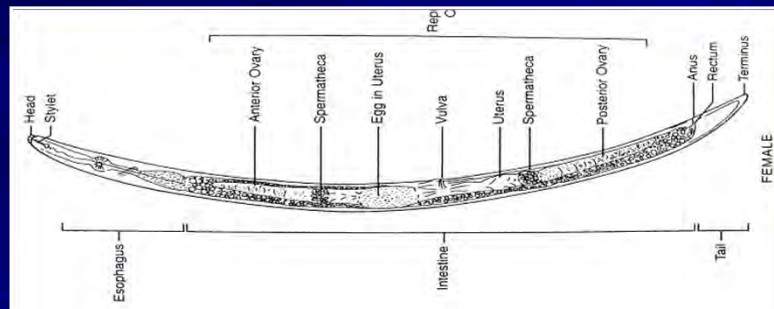
## 電子顯微鏡觀察引起植物病害的各式形狀病毒



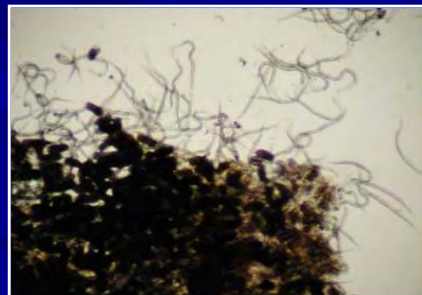
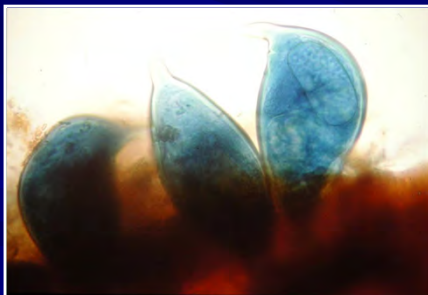
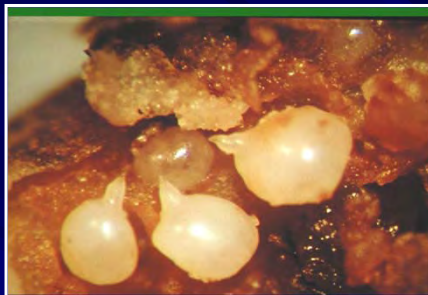
(>30000x, 1972, Virology 48, 30-40)



## 植物病原線蟲



( Adapted from Taylor, 1971 )



(Courtesy from TsayTT, *et al.*)





## Dwarf mistletoes (矮槲寄生)

- *Arceuthobium*  
*Arceuthobium* spp.
- 僅存在於美洲，並寄生在針葉樹上
- 葉子退化為鱗片狀
- 造成樹木矮化、變形、甚至死亡
- 種子具黏性
- 吸收水、光合作用產物及礦物營養



# Urban Tree Problems

- Urban trees are much more likely to be affected by noninfectious diseases.
- One must understand the **common needs of trees**.
- A **balance** must be maintained between **water lost by transpiration** and **water uptake by the roots**.

- **Soil conditions** should allow for growth and activity of the feeder root system to maintain a proper root-shoot balance.
- **Sufficient foliage** must exist and be photosynthetically active to produce food for growth of the tree

- **Good tree vigor** will prevent infection by weak pathogens.

(當我們脆弱時，朋友變成敵人)

(當我們堅強時，敵人變成朋友)

- Saprogen → Saprophyte + Pathogen
- *Trichoderma, Penicillium, Aspergillus, Phellinus, Ganoderma*

- Noninfectious disease attack most or all species of trees, while infectious diseases are usually limited to one or a few species.
- Urban trees normally live for over 100 years, but exist in a rapidly changing environment.
- These changes constitute the primary causal factors of the abiotic diseases so common in urban trees.

- Many varieties of ornamental trees which are incorporated into landscape plants are selected because they are resistant to the infectious diseases common in the area.
- The most diseases of urban trees are caused by abiotic causal factors, usually related to activities of people.

## Abiotic causal factors

Moisture stress, soil stress, animal injury, temperature stress, construction injury, Injury from electricity, Artificial light, air pollution injury, and injury from underground gas.

## Drought stress

- **Paving**(鋪路) ; **soil compaction**(土壤壓實) : urban trees were restricted root zone
- Leaves show **marginal** and **interveinal necrosis**.
- **Die back** of the crown (drought conditions for a number of years)
- Foliage desiccation (air temperature becomes warm when the ground is frozen in the winter.

- Summer drought can be alleviated by watering trees, and by placing a thick mulch.
- Watering once every 2 weeks is usually sufficient.
- Excessive watering will result in low soil oxygen levels and death of roots, particularly feeder roots.

## Soil stress

- pH, Nutrient deficiencies, Toxicities, Poor physical condition
- Most trees grow best at pH 5.5 to 6.5
- Overliming; Adding sulfur for decreasing pH value.
- Iron deficiency → interveinal chlorosis
- Foliar spray of chelated miner elements



- High nitrogen fertilizers:

- 1) causes a lot of crown growth of trees and results in an imbalance of root - crown areas.
- 2) increases sensitivity to drought and dieback.

A fertilizer high in phosphorus and low in nitrogen:  
leads to a proper root-crown ratio

- Soil compaction will result in a reduced root system and eventually crown dieback.

- Jogging, bike and vehicular paths should be kept at least 10 feet away from trunks of urban trees.

- Construction activity may result in damming(水閘化) or ponding(池化) of water in the root zone of existing trees.

## Self girdling by roots

- Tree affected will lack the normal butt swelling at the ground line and will eventually have crown dieback.
- Control measure:
  - 1) Cutting out dead limbs(大枝條) and thinning the crown.
  - 2) Planting genetically smaller trees in areas with restricted root zones.

- Animal injury: clawing or chewing on the bark; urine damage.
- Sunscald injury:
  - 1) Summer sunscald normally occurs when open areas are cut in stands for buildings.
  - 2) Temperature rapid change results in bark injury, usually on the southwest side of the trees.
- Extremely low temperatures: the freeze caused bark cracks.
- Construction activities (equipment)
- Electrical shorts(電波), lightning, street light.

## 衰弱症的病因

誘因：樹木的遺傳基因、環境的氣候變化、土壤濕度、土壤營養與空氣污染等因子長期干擾影響的效應。

引因：霜害、乾旱、鹽害、空氣污染、人為不當修剪、機械與建築傷害及昆蟲危害造成落葉等短期傷害的效應。

助因：樹皮甲蟲類、潰瘍性真菌、病毒及根腐菌等侵入植體為害的結果。

## Recognition of Biotic, Abiotic and Decline diseases

1. Symptoms
2. Signs
3. Host specificity
4. Spatial distribution

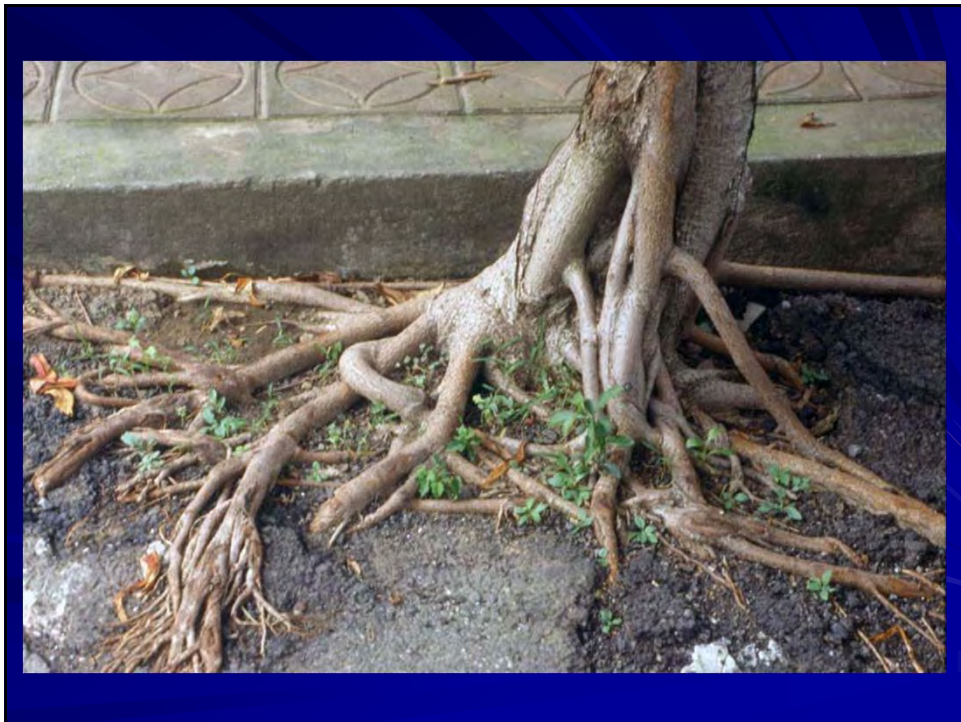
## 衰弱症的病徵

- 樹木生育減緩，枝條的長度變短與樹幹的周徑變小。
- 枝條的間距較短，樹梢叢生枝葉。
- 在晚夏或初秋時，樹葉變淡黃(或轉色)，提前落葉。
- 樹冠變得較稀疏，葉片變小，葉色轉淡，頗似微量元素缺乏的症狀。

- 地上部未出現病徵之前，地下部的根系發育退化，支根與取食根的數目與菌根菌量顯著減少。
- 根部蓄積的養分量明顯下降。
- 在冬季時，樹梢枝條大量枯死，並有兼行寄生性菌類入侵為害。
- 樹冠枝梢大量枯死後，樹冠出現不歸則或不對稱的外貌。
- 根腐病菌如根朽菌、褐根病菌與靈芝菌類侵入根部，加速樹勢衰弱，並在樹幹基部產生菌類的子實體。

















## 衰弱症的防治要領

- 慎選樹木的品種，適地適種。
- 適時與適度修剪枝條。
- 供應樹木生長所需之養分與水分，尤其在定植行道樹前，植穴應適度補充腐植質或發酵完全之有機質，提高根系需求之養分與水分。





- 避免在根系周圍鋪蓋柏油或水泥，防止土壤產生壓實或硬磐的現象。
- 避免人為活動傷害樹木的正常發育。
- 清除枯枝或病原菌子實體後，以殺菌劑、瀝青或癒合劑塗抹傷口。











# PG SUSPENSION

**Forestry Fungicide**  
for the biological  
control of Fomes root  
and butt rot of Pines

Contains the fungus *Peniophora gigantea*

A product of Ecological Laboratories Ltd  
and the Forestry Commission

Batch No

Expiry Date

**The Control of Substances Hazardous  
to Health Regulations (COSHH) may  
apply to the use of this product at work**













