



# General guide to the recognition of plant pests and diseases



## Aim of the presentation

- To provide an overview of the types of pest and disease that cause damage on plants and produce
- To demonstrate the types of symptoms that each type of pest or disease can cause
- To allow better recognition of symptoms of these pests and diseases and to improve detection.

# Contents



## Diseases

- Causes of disease
- Types of disease affecting different parts of the plant
  - Common symptoms

## Pests

- Groups of pests
- Symptoms caused





# PLANT DISEASES

# Causes of Plant Disease



## Fungi



Pictures: *Trametes versicolor*, *Rhizopus/Mucor*, coral spot, *Alternaria* spores, rhododendron bud blast, *Ganoderma* on hornbeam, peach leaf curl, acer tar spot.

# Fungi

- About 100,000 species, about 10,000 cause plant disease. The most common causes of disease in our temperate UK climate.
- Range in size from large mushrooms and brackets to tiny microscopic organisms.
- Fascinating fact – the biggest organism ever found is a fungus. This is a honey fungus in USA, whose network of mycelium covers the area of over 1200 football pitches, and over 2000 years old.



# Causes of Plant Disease



## Fungus-like organisms



Pictures: foliar blight, tuber blight, Phytophthora root rot on box, Phytophthora bleeding canker on sycamore, *Phytophthora* sporangium, clubroot, pea downy mildew, nicotiana downy mildew.

# Fungus-like organisms

- Some of these are now known to be more closely related to algae, but many look very like fungi and the diseases they cause are still known by many people as 'fungal' diseases.
- This group of organisms include some very important diseases, like *Phytophthora*, downy mildews, and clubroot.
- Fascinating fact – this group includes one of the diseases with the biggest impact on history – potato blight (*Phytophthora infestans*)
- This was the cause of the Irish potato famine in 19<sup>th</sup> century. Starvation caused by repeated crop failures resulted in over a million dead, and a million more forced to emigrate, mainly to USA. Population of Ireland fell by one quarter.



# Causes of Plant Disease



## Bacteria



Pictures – fireblight, *Pseudomonas syringae* on magnolia, horse chestnut bleeding canker, *Pseudomonas syringae* on hibiscus, potato soft rot.

# Bacteria

- Bacterial diseases are fewer in number than fungal diseases in UK's temperate climate, although much more common in the tropics.
- Still some damaging diseases in the UK though, including fireblight, bacterial canker of prunus, bleeding canker of horse chestnut.
- There are many bacteria that are regulated in both EU and UK legislation
- Fascinating fact – bacteria are extremely adaptable. Species of bacteria can live in ice, boiling hot thermal springs, and even radioactive waste!



# Causes of Plant Disease



## Viruses / Viroids / Phytoplasmas



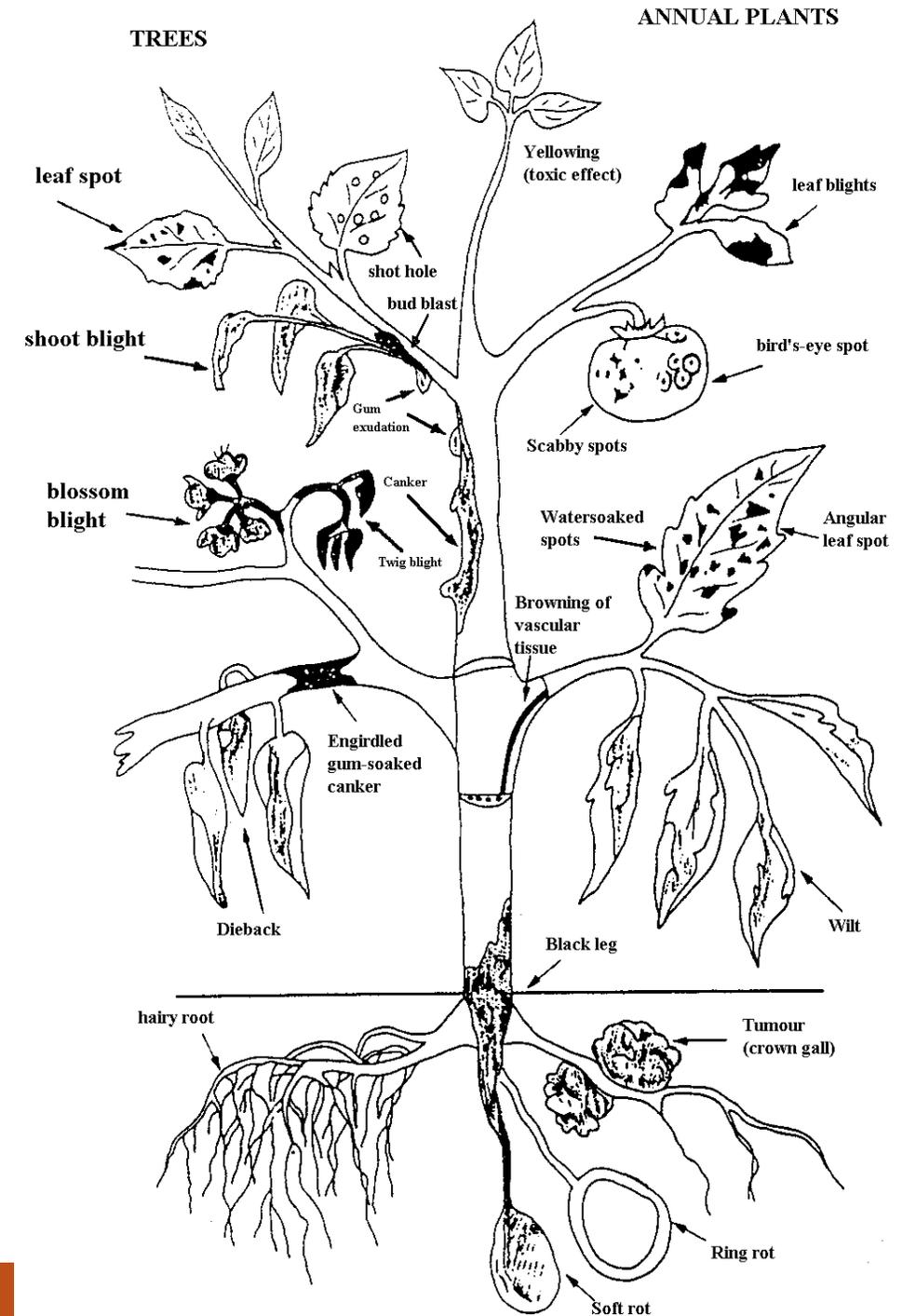
Pictures: Cucumber mosaic virus, spraing (tobacco rattle virus), elm yellows phytoplasma, bean common mosaic virus, Chilli vein mottle virus on chilli, Tomato spotted wilt virus on dahlia, potato tuber spindle viroid, columnea latent viroid.

# Viruses / Viroids / Phytoplasmas

- Viruses are very small and can only be seen with powerful electron microscopes. Viroids are even smaller, and are just naked pieces of genetic material. Phytoplasmas are more closely related to bacteria than viruses, but often cause virus-like symptoms.
- Viruses have no means of movement and rely on 'vectors' to move them from plant to plant. Common vectors include insects such as aphids, thrips, whiteflies.
- People can move some 'mechanically-transmitted' viruses by transferring sap from a virus-affected to a healthy plant (via tools, or simply by touching the plants).
- Fascinating fact: some plant viruses are extremely contagious. Plant sap containing tobacco mosaic virus can be diluted a million times and still be infectious.

# Symptoms of plant disease

- Vary enormously.
- These are just the symptoms caused by bacteria!



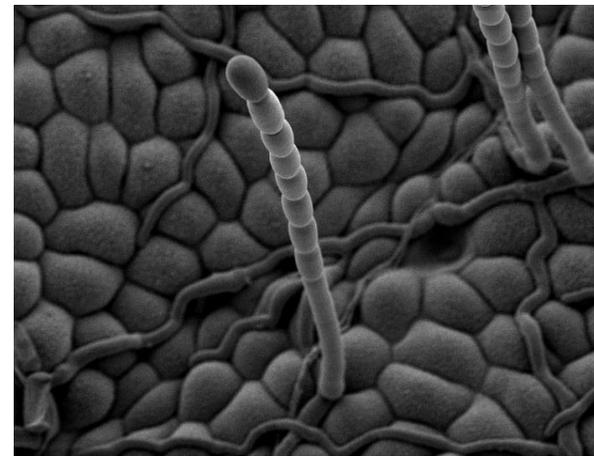
## Leaf diseases

- Powdery mildews
- Downy mildews
- Rusts
- Leaf spots



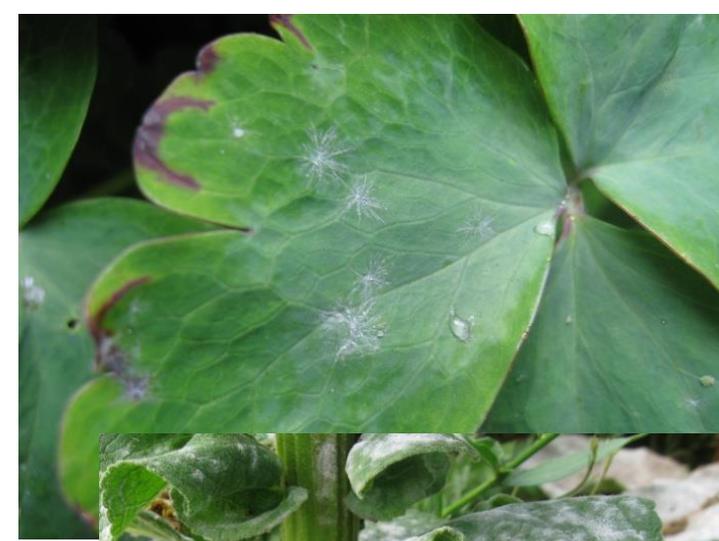
# Powdery mildews

- Fungus - lots of different species
- Typically whitish, powdery growth
- Can affect leaves and other aerial parts
- White growth on top or both sides?  
Powdery mildew
- White growth on bottom surface? Could be powdery or downy
- A few powdery mildews aren't so 'classic'
- Host-specific, so each plant or group of related plants are affected by a different powdery mildew species.



# Powdery mildew symptoms

- Start off as small colonies from infections by individual spores. Top photo - Aquilegia
- Colonies get bigger and merge together. Middle photo – Verbascum (mullein)
- Young soft growth is often attacked preferentially. Bottom photo – young gooseberry shoot



# Downy mildews

- Fungus-like organism: lots of different species
- Often (not always) confined to leaves
- Discolouration of top surface
- 'Fungal' growth below; white, purple or brown
- May cause leaf distortion or shedding
- Host-specific, so each plant or group of related plants are affected by a different downy mildew species.
- Growth on leaf underside consists of spore stalks and spores.



- Top L&R: Downy mildew of oriental poppy. Discolouration of upper leaf surface. Growth of organism is also visible on corresponding underside. Often white, may be purplish or brownish depending on downy mildew species. Also depending on species, host plant or even variety, the growth may be thick or sparse.



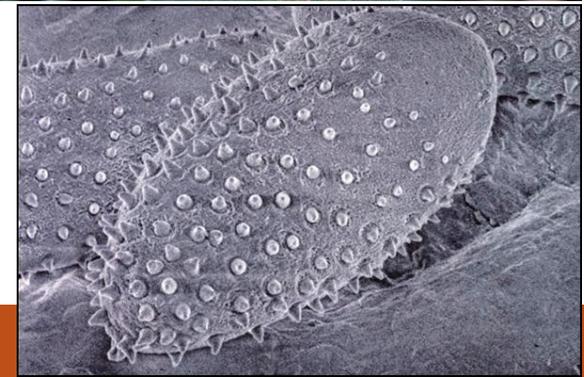
- Bottom left: Downy mildew of Nicotiana (tobacco 'blue mould'). Prominent yellow patches on upper surface. Can see growth of the mildew at bottom right where leaves have twisted to show the underside – white, turning blue-purple with age.



- Bottom right: Impatiens downy mildew. Note leaf distortion and yellowing. Affected leaves are quickly shed.

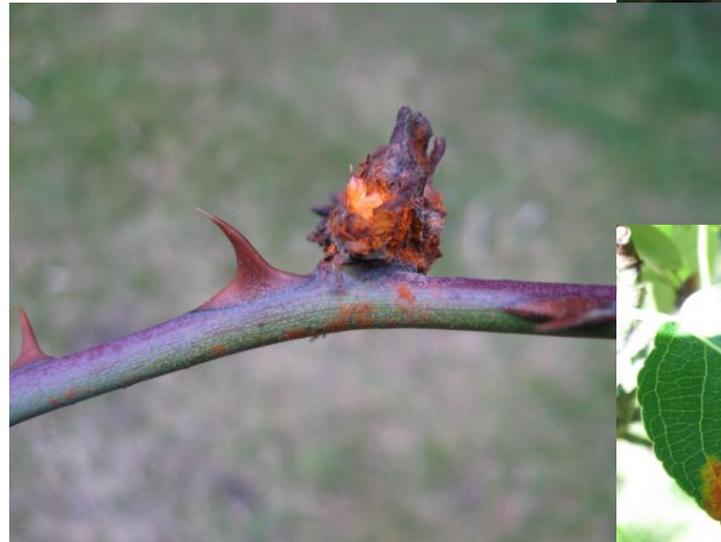
# Rusts

- Fungus - lots of different species
- Host-specific, so each plant or group of related plants are affected by a different rust species
- Often (not always) confined to leaves
- Discolouration of top surface
- Pustules underneath – various colours
- Up to five spore types and may need two host plants. These host plants in two-host life-cycles are often completely unrelated.
- Colour of pustules will depend on rust species & type of spore being produced.



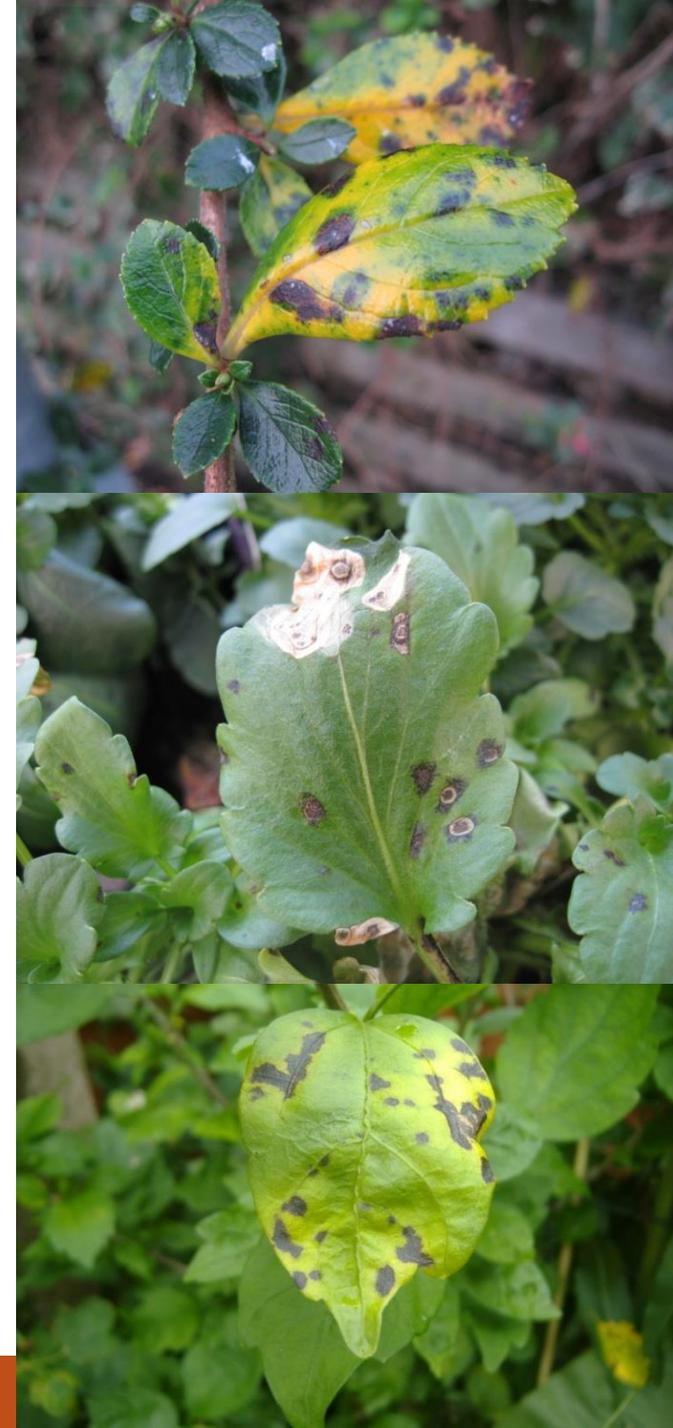
From the top:

- Chrysanthemum white rust showing discolouration of upper surface and buff/white pustules on lower surface.
- Blackberry rust (orange summer pustules, but note a few black overwintering ones beginning to develop).
- Rose rust, showing infection of emerging shoot.
- Pear rust



# Leaf spots

- Can be caused by fungi, bacteria or viruses
- Huge number of different species
- Fungal fruiting bodies sometimes visible
- Effects on plant very variable
- Some may also cause diebacks
- Most plant species will suffer from at least one leaf spot, often several.
- Some leaf spot diseases have very little effect on the plant, others can be much more damaging, causing defoliation and dieback.



- Top R: *Phoma* on brassica: Leaf spots showing fungal fruiting bodies
- *Septoria* leaf spot of Escallonia – a relatively new and very damaging fungal leaf spot
- *Cylindrocladium* blight of box – fungus causing leaf loss and dieback, as well as spotting.
- *Xanthomonas arboricola* pv *pruni* on Prunus – a bacterial leaf spot
- *Pseudomonas syringae* on hibiscus – a bacterial leaf spot



# Cankers and diebacks

Top left - bleeding canker of horse chestnut (*P. syringae* *pv.* *aesculi*)

Bottom left – apple canker (*Neonectria ditissima*)

Right – ash dieback (*Hymenoscyphus fraxineus*)



# Cankers and diebacks

- Canker = infection causing lesion on stem or branch
- May be flat, raised or sunken
- Some have associated bleeding of sap
- Can be fungal or bacterial
- May be other symptoms present (e.g. leaf spots)



# Examples of fungal and bacterial cankers and dieback.

Top left: apple canker

Top right: dieback of cotoneaster due to fireblight

Bottom: horse chestnut bleeding canker (note dried sap on bark)



# Phytophthora diseases

Top left – *Phytophthora*  
root rot of box



Top right – bleeding  
canker of sycamore



Bottom left – *P.*  
*ramorum* on  
rhododendron



Bottom right – *P.*  
*ramorum* on camellia



## *Phytophthora* diseases

- Fungus-like organisms
- Many different species
- Some cause root and stem base decay
- Some affect aerial parts
- Some can do both



Photos: potato blight, sporangium, red core of strawberry

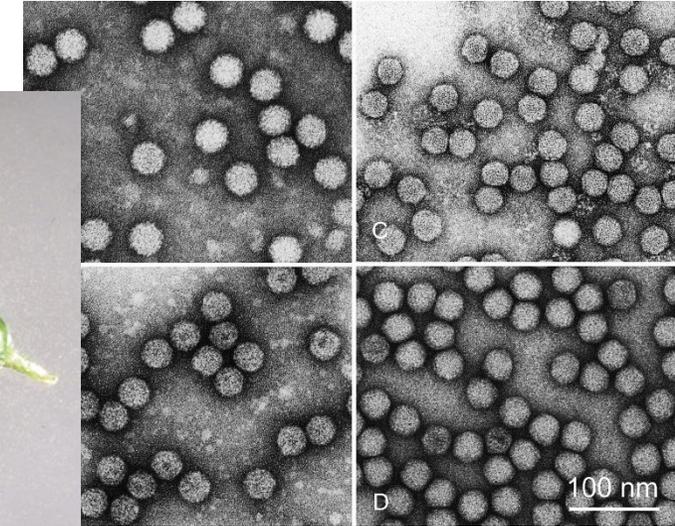
# Viruses, viroids & phytoplasmas



Photos: Top: paeony ringspot virus, Middle: hellebore black death (hellebore net necrosis virus), Bottom left: potato spindle tuber viroid, Bottom right: aster yellows phytoplasma on delphinium

# Viruses, viroids & phytoplasmas

- Huge range of symptoms
- Mottles, mosaics, stripes, spots, rings, patterns
- Symptoms can affect leaves, flowers and fruit
- Insects are common vectors, but there are many others
- Some are mechanically transmitted



Photos: Cucumber mosaic virus, tomato spotted wilt virus on dahlia

# Examples of virus symptoms

From Top:

- Mosaic symptom on leaves and fruit caused by cucumber mosaic virus
- Rings and patterns caused by Paeony ringspot virus
- Uneven fruit ripening and leaf distortion caused by Pepino mosaic virus.
- Chlorotic spots and rings on Prunus leaves and fruit caused by Plum pox virus

