

# Plant Health

## Diagnosis in Ornamental Plants - An Overview

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**Note:** This technical note gives an overview and is for guidance only. The note strives to make the information accurate, but no claims or guarantees are made about the accuracy, completeness, or adequacy of the contents. The user should not use it to take decisions and independent advice must be taken. The information relates to the United Kingdom only.

### Introduction

In commercial horticulture, plant pests and diseases (P&D) lead to losses in production and subsequent sales losses.

It is important for the grower to be able to detect and identify problems when they arise. A knowledge of the symptoms caused by pests and diseases is necessary for recognising and controlling these problems.

This technical note gives an introduction, for the grower, to some of the more common symptoms caused by pathogens and pests and those produced by physiological disorders. Advanced diagnosis techniques are indicated for the specific identification of pathogens.

### Terminology used in the Technical Note

- **Pest** – an animal that causes damage to plants e.g. insect, nematode
- **Pathogen** – an organism that causes disease in plants e.g. fungi, water-moulds, bacteria, viruses, mycoplasmas. Usually the Latin name of the organism is used.

- **Disease** – the collection of **symptoms** that are caused by a pathogen. The disease is normally given a common name that is descriptive of the disease.
- **Disorder** – a plant problem caused by a physiological disruption e.g. frost damage, nutrient deficiency, water stress.

### How do pests and diseases get to the plants?

- Dispersed by wind e.g. the fungal spores that cause ash die-back disease
- Dispersed by water, for instance in rain, or splashes of water droplets, or irrigation water e.g. the spores that cause late blight of potatoes; spores of Pythium causing damping-off disease of seedlings
- Infective particles in soil or growing media that the plants are put into, or in growing media that is brought into a site e.g. Fusarium wilt of lettuce
- Infected plant stock that is introduced will act as a source for the spread of the pest or disease.
- Animals can act as vectors for the spread of disease e.g. the transmission of viruses by aphids
- Infections can be introduced through wounds to the plant, including during pruning and grafting when spores can be transferred between plants on tools
- Pests and infective spores can be harboured in other places and it is particularly important to be aware of these for international imports e.g. wooden pallets, fruit.

### Diagnosis

A preliminary diagnosis can be made through going through a series of steps to examine symptoms.

#### **1. Has it appeared suddenly?**

If it is on only one plant check for physical damage and wounds perhaps caused by machinery e.g. wilt symptoms may be caused by a wound to the stem.

If it is on several plants and has occurred quickly e.g. overnight, check for chemical spray damage (often seen from the pattern of damage across the crop). Also check the weather conditions e.g. frost, sea-spray salt, heat – which may give scorch-like symptoms; or drought or waterlogging – giving wilt symptoms.

## 2. Is it on specific parts of the plant or does it affect the whole plant?

If the whole plant is affected, all at once, showing a wilt symptom or die-back, then there is likely to be either a root problem, e.g. *Phytophthora* root rot, or a blockage of the vascular system e.g. *Verticillium* wilt of *Chrysanthemum*.

Pests, pathogens and disorders can affect different parts of the plant e.g. leaves, stems, flowers, fruit. The part of the plant affected can be used in the diagnosis.

Some apparent problems are actually natural parts of the plant's development e.g. leaf senescence as plant resources are diverted to new growth – so learn to recognise how the plants normally develop so this is not confused with disease.

The disorders caused by nutrient deficiencies are sometimes most obvious on leaves. For example, characteristic leaf symptoms may be:  
Nitrogen deficiency– pale upper leaves, lower leaves yellow. Yellowing of leaves is called chlorosis.

Potassium deficiency – yellowing at the tips and edges of the leaves  
Phosphorus deficiency– leaves darker than usual  
Iron deficiency– yellow leaves with greener veins  
Diseases caused by viruses may also produce similar symptoms on leaves.

Pathogens can cause characteristic symptoms on parts of the plant. Fungal, and some bacterial diseases, may cause leaf spots or tip necrosis (necrosis is where the part of the plant is dead and brown) e.g. *Phytophthora ramorum* on Rhododendron, Anthracnose of oak (anthracnose is the symptom of necrotic lesions and may be caused by several, usually fungal, pathogens), *Diplocarpon rosae* causing Rose Black Spot disease, *Phytophthora infestans* late blight of tomato.

Other pathogens may be characteristic because you can see the organism e.g. Powdery mildew diseases – white on the upper leaf surface, Rust diseases – yellow/orange/white pustules often on the lower leaf surface or stem.

Insects can cause characteristic damage, for example to leaves, such as the tunnels of the Holly Leaf Miner fly larva; the leaf holes eaten in cabbage by the Large White Butterfly caterpillar; the skeletonisation of the alder leaf, leaving mainly the leaf veins, by the alder leaf beetle; the notched edges to Rhododendron leaves grazed by vine weevil; the blistered leaves of currant caused by the blister currant aphid.

So, when there are characteristic symptoms, the pest or pathogen may be sufficiently easy to identify to a general level e.g. rust, vine weevil for an effective control to be chosen.

With insect pests, search for the insect infestation – the insects are usually large enough to be found. They can then be identified by using an “identification key”. This guides the identifier through a series of steps looking at the characteristics of the insect so that the species can be determined.

### Further diagnosis

Sometimes the symptoms are not very specific e.g. root decay and die back, and there may even be more than one pathogen causing the symptoms.

It may then be necessary to use more advanced diagnostic techniques to identify the pathogen species exactly. It is most usual to contract a consultant to carry out this work.

For precise identification of the species of pathogen, microscopic examination is often used. Sometimes the pathogen needs to be grown out and isolated in a culture. Conventionally, to prove that a pathogen is the cause of the disease, Koch’s Postulates are used. In these, the organism is isolated, then a plant is inoculated with the culture to see if the same symptoms are shown, and then the pathogen is re-isolated.

The health of a crop, and the extent of disease, can be examined using methods including thermal sensors or image spectroscopy, often with mobile, hand-held devices. Where a particular pathogen is being sought, lateral flow immunoassay devices, where pathogens are detected by antibodies, can be used in the field

Increasingly, molecular techniques of identification are being developed and used, including “DNA fingerprinting”.