Plant healthcare Factsheet

Key facts

- A foliar fungal disease spread by airborne spores
- Needs a living host to develop
- Can produce up to five spore types, and may require two hosts in the life-cycle
- Leaf wetness needed for infection
- May have a long latent period
- Manipulating the microclimate will help prevent outbreaks
- Protectant and curative fungicides available for many crops
- Strategies required to prevent the development of fungicide resistance

Gladiolus rust

Introduction

The rusts are specialised pathogens, requiring a living host on which to grow. Like most diseases of this type, rusts have restricted host ranges. For example, the rust affecting pelargoniums will not attack fuchsias, and vice versa.

Control of leaf wetness is critical if damaging attacks of rust are to be avoided. In addition to those mentioned above, plants on which the disease is a problem include *Allium* spp., *Antirrhinum*, beans, *Bellis*, chrysanthemum, *Dianthus* spp., hollyhock, *Hypericum* (especially *H. calycinum*), rose and *Vinca major*. Tree rusts can also be damaging in certain situations, e.g. on willow and poplar grown as biomass crops.

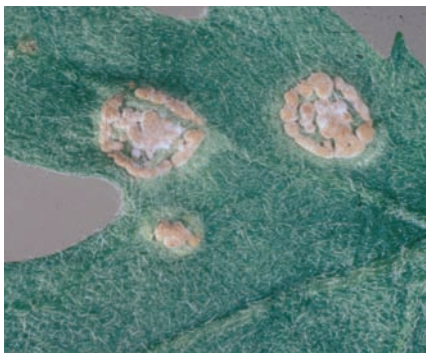
In most cases (although see below) rust infection will not kill a plant, but can soon lead to loss of yield or quality. Many rusts can have long latent periods, leading to their inadvertent spread through the trading of infected but symptomless plants.

Symptoms

The spores of some rust fungi are, as the name suggests, a rusty brown colour. However, this group of diseases actually has one of the largest variations of spore colour. The spores are produced in structures called pustules, and the colour of these varies according to both the species of rust and the stage it has reached in its life-cycle. Spores may be yellow, orange, brown, black or even white in colour.

Before the pustules burst through the plant tissue to release their spores, they take the form of small blisters. In most cases pustules are produced on the underside of the leaf, with a corresponding area of discolouration on the upper surface. Pustules may, however, sometimes be found on the upper leaf surface, as well as on other aerial parts such as stems, calyces and, more rarely, petals.

Heavy infection can cause the leaves to turn brown, shrivel and fall. In some cases (e.g. on *Antirrhinum* and *Bellis*) the attack can be so severe that the whole plant may wilt and die, particularly if it is also under stress due to other factors (e.g. drought).



Chrysanthemum white rust

Hypericum rust

Biology

The life-cycles of rust fungi vary from simple to complex. Some rusts (e.g. those on *Pelargonium* and *Antirrhinum*) produce just one or two types of spore, and spend their entire life on the single host plant. Others may produce up to five different types of spore, and require a second host plant (usually totally unrelated to the first) in order to complete their life-cycle. For example, the rust affecting *Fuchsia* (*Pucciniastrum epilobii*) spends part of its life on *Abies* species (firs).

Most rust spores are splash-dispersed, and can then be carried for long distances on air currents. When a spore lands on a susceptible plant, several hours of leaf wetness are required in order for it to germinate and penetrate the plant tissue. Once within the plant, the fungus produces specialised feeding structures called haustoria to divert nutrients from the plant cells for its own use.

All rusts have a 'latent period', which is the time between infection and the appearance of visible symptoms. This will vary according to the rust species and environmental conditions - if conditions for the rust are ideal the latent period may be as little as seven days. However, under less favourable conditions it may take several weeks for symptoms to appear. This has important implications for the commercial trade of plants, as there is the potential for infected but symptomless plants or cuttings to be moved from nursery to nursery (and even country to country).

In many crops (especially ornamentals grown under protection) rust may be present year-round, but where there is a break between crops rusts survive in a number of ways. Some produce a thick-walled spore that remains in dry plant debris or falls to the ground, germinating later to re-infect the new crop. Others may colonise closely related weed species. A rust with two hosts in its life-cycle will alternate between them - often only one of the host plants is an economically important crop.

Diagnosis

Rust diseases are often easy to detect, but laboratory analysis may be required to identify the species e.g. if the disease is on an unusual host, or is in the early stages of symptom expression and to determine the potential host range. Laboratory identification usually involves microscopic examination of the spores and their associated structures, but occasionally DNA-based testing may be required. There are a number quarantine listed rusts such as chrysanthemum white rust (*Puccinia horiana*), and poplar rust (*Melampsora medusae*) - further details from http://www.defra.gov.uk/planth/qic.htm.

Chemical control

There are a large number of fungicides available to growers with activity against rusts. These will vary according to the crop, and are too numerous to list in this factsheet. They range from protectant products, which need to be applied before the disease is present, to fungicides with eradicant activity (although these should still be applied as soon as possible if rust is found).

Because rusts produce huge numbers of spores, there is always the chance of mutations arising, some of which could lead to the development of resistance to previously effective fungicides. An anti-resistance strategy is therefore very important when formulating a fungicide programme. Detailed information is beyond the scope of this leaflet, but can be obtained from the Fungicide Resistance Action Group (FRAG) or downloaded from www.pesticides.gov.uk/rags_home.asp.

Preventative measures

- Inspect plants or cuttings arriving on the nursery for symptoms of rust. Continue to monitor apparently disease-free plants closely, as they may be carrying latent infections
- Quarantine plants if possible. If taking cuttings from your own stock plants, ensure that these are rust-free
- Avoid prolonged high humidity and, most importantly, long spells of leaf wetness. Ventilate crops grown under protection (with heat if required). Increase air movement by the use of fans, adequate spacing, open sites for outdoor crops, etc. Avoid overhead irrigation in the evening, as leaves will stay wet overnight
- Control weeds around the nursery, as these may act as an alternate host of a rust (e.g. willowherbs may be a source of fuchsia rust). A dense population of weeds in a crop will also result in prolonged leaf wetness
- Use rust-resistant varieties where available (but be aware that resistance can sometimes be overcome by mutation of the rust fungus)
- Avoid the excessive use of nitrogen, which causes 'soft' growth more prone to attack by rusts and other diseases
- Dispose of rust-affected plants carefully, bagging them first so that spores are not released
- Ensure that there is a thorough clean-up after a crop, removing all plant debris

Contact
diagnosis@csl.gov.uk
www.csldiagnostics.co.uk
+44 (0)1904 462 324