Bean Rust Fungus

What is it?

Rust fungi produce a brown powder on plants. This dust is made up of thousands of fungal spores, which enable the fungus to spread to new plants. The bean rust fungus is one of the most common fungal diseases of broad beans in the UK.

Symptoms

1. Leaves wither and die: as the fungus grows through the leaf, it reduces the area that can be used to make sugar (through photosynthesis). Without enough sugar, the leaf dies, and the plant will produce fewer, smaller beans.

2. Brown dusty spots on leaves and stems: these spots are called pustules and they release microscopic airborn spores, which carry the fungus to new plants.

3. Yellow halos around the pustules: this is where the plant has blocked the fungus from spreading to healthy cells by killing diseased plant cells.

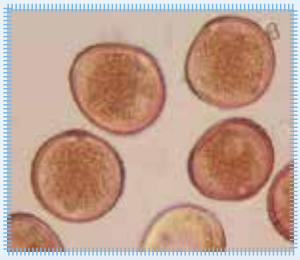
How does it infect?

The rusty brown spores are airborne. When they land on a bean plant they germinate by growing a long tube (hypha). This tube is able to sense the shape and smell of the leaf to find the plant's breathing holes (stomata) through which it enters the plant.

Once inside the plant, the fungus grows and develops in the leaf. Early on, the fungus grows between cells and causes little damage. It steals food from the plant using specialised feeding structures (haustoria). The fungus matures after 10 -12 days and forms pustules, which burst back through the breathing holes and release more rusty coloured spores into the environment. This lifecycle is repeated many times throughout the summer.

Colourful spores

The fungus produces five different types of spore throughout its life. Over the summer the fungus grows many pustules on the plant, which each release 2,000 rusty brown spores per day for 2 - 3 weeks. These rusty brown spores (urediniospores) are carried by the wind to new bean plants.



Over winter the fungus produces thick walled black spores (teliospores), which are resistant to harsh weather and stick to the underside of leaves. This allows the fungus to survive over winter and into the next growing season.

Weather

The fungus grows best in July and August, as it requires warm and prolonged wet conditions to infect bean plants.

Why is it a problem?

Bean rust can reduce the amount of crop (yield) by up to 30% on its own and when combined with the chocolate spot fungal disease, yields can drop by 50%.
If the fungus infects a young plant, it can seriously stunt bean growth, leading to severe yield loss. A badly infected bean field looks like it has been scorched.

Control

There are several ways to prevent bean rust. These include growing different crops each year and removing left over bean plants to prevent fungal spores building up. Also planting bean varieties that are resistant to bean rust and spraying fungicides to kill the fungus.

Did you know?

Rust fungi evolved a very long time ago... Fossils from around 5 million years ago have been found in India and North America, showing the rust fungus growing inside plant leaves. In fact early rust fungi are thought to date back to the Carboniferous period 360 million years ago!

Images

1. Broad bean Image by Richard W.M. Jones, Wikipedia
2. Image of *Uromyces viciae-fabae* infection pustules by Michael Shaw, University of Reading
3. Image of *Uromyces viciae-fabae* infection symptoms by Michael Shaw, University of Reading
4. Image of *Uromyces appendiculatus* from: H., Hoch, R., C., Staples, B., Whitehead, J., Comeau, E., D., Wolf. Growth Orientation and Cell Differentiation by Surface Topography in Uromyces. *Science, New Series,* Vol. 235, No. 4796 (Mar. 27, 1987), pp. 1659-1662 (Full Permission from AAAS)
5. Image of *Uromyces viciae-fabae Uridniospore* by © Copyright Malcolm Storey 2011-21126.
6. Image of *Uromyces viciae-fabae* Teliospore by Michael Shaw, University of Reading
7. Image of bean crop field by: Diane Earl, National Education Network Gallery

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