Xanthomonas bacteria

What are they?

*Xanthomonas* are a group of around 27 bacterial species that cause disease in around 400 different plants. These include important food crops such as rice, soya-bean and tomato.

The species *Xanthomonas oryzae* causes the devastating disease rice bacterial blight (Image 2), which results in the loss of up to 50% of rice plants. These huge crop losses threaten the food supply for those who depend heavily on rice as a staple foodstuff.

Once inside the plant, the bacteria reproduce and move around using the plant’s water transportation system (xylem).

Most *Xanthomonas* species produce a sticky, glue-like substance called xanthan, which blocks water transportation causing plants to wilt and eventually collapse. *Xanthomonas* bacteria don’t enter living cells, but feed on nutrients released from plant cells as the become leaky and start to die.

What are the symptoms?

Symptoms vary according the *Xanthomonas* species, here are some examples:

- Citrus plants (e.g. oranges and lemons): *Xanthomonas axonopodis* causes areas of plant tissue to die and form cankers, leading to the loss of leaves and fruit and damage to overall plant health.

- Brassica plants (e.g. cabbage, broccoli, cauliflower and sprouts): *Xanthomonas campestris* causes black rot disease, where leaves become yellow and sickly, then wilt and die.

- Rice: *Xanthomonas oryzae* causes pale-green, water-soaked streaks to form on leaf tips and veins (Image 2). When lesions join together, the whole leaf can turn white and die. Eventually bacteria can spread to the whole plant, causing it to wilt and even die.

Which weather conditions?

*Xanthomonas* bacteria grow best at around 30°C. They cause huge problems in areas with a warm, wet climate.

How do they infect?

Bacteria enter plant leaves through breathing pores (stomata) and water releasing pores (hydathodes) in the leaf surface. Machinery and insects damage plants creating wound entry points for *Xanthomonas* bacteria.
• Onions: *Xanthomonas axonopodis* infection causes bacterial blight. Black spots form on leaves, reducing area available photosynthesis and so less sugar is produced. Plants become stunted and produce smaller onion bulbs.

Preventing *Xanthomonas* bacteria from entering a healthy area is the best way to control disease. This can be done by ensuring that seeds and machinery are uncontaminated and growing plant varieties that are resistant to *Xanthomonas* infection.

**Did you know?**

*Xanthomonas* bacteria are normally yellow in colour. The word *Xanthomonas* comes from the Greek *xanthos* meaning ‘yellow’ and *monas* meaning ‘entity’.

*Xanthomonas campestris* is used in the manufacturing of commercial products. *Xanthomonas campestris* produces xanthan gum, which is used as a thickener in some low-fat yoghurts and toothpastes.

**Where are the threats?**

In the UK, *Xanthomonas* bacteria are an important threat to several ornamental plants: e.g. lavender, geranium and ivy.

In Europe, *Xanthomonas* bacteria can cause problems on carrot and strawberry plants. They are also a major threat to banana production in Africa.

**How do they spread?**

Contaminated seeds or agricultural machinery can spread *Xanthomonas* bacteria to new areas. Rainwater or irrigation water can also carry bacteria from infected fields to adjacent healthy plots or from diseased trees to neighbouring plants. Similarly, hurricanes and storms can spread *Xanthomonas* over many miles in water droplets.

**What control is there?**

There is no effective way to control *Xanthomonas* species once an infection has hit. Chemical sprays may help to reduce or slow the spread of bacteria but do not cure already diseased plants.

Removal of contaminated plants, and surrounding plants, is essential to halt bacterial spread. Unfortunately removing plants can be very expensive for growers.

**Questions**

1. If you were a farmer, what measures would you put in place to protect your crops from *Xanthomonas* infection?
2. Can you think of any other microorganisms, which have commercial uses?
3. Can you think of any human pathogens that are also able to spread through water droplets?