

# PLANT DISEASES AND PESTS WITH PROFESSOR XIANGMING XU AND DR MICHELLE FOUNTAIN

## TALKING POINTS

1. How has an understanding of plant and pathogen genetics helped efforts to improve plant health?
2. What are biocontrol agents, and why are researchers interested in them?
3. How can scientists exploit pests' own communication techniques to reduce infestations?
4. How have technology and mathematics helped combat plant pests and pathogens?
5. What are the advantages and disadvantages of pesticides, compared to the alternative methods of pest control explored in this article?

## ACTIVITIES YOU CAN DO AT HOME OR IN THE CLASSROOM

### UNDERSTANDING MICROBIOMES TO IMPROVE PLANT HEALTH

Microbiomes are found everywhere. There are plenty of microbes that are known to be beneficial to plants, and others that harm them. Use the internet to fill out this table:

Type of microbe	Good/bad for crops?	Why?
Rhizomes		
Potato late blight		
Mycorrhizal fungi		
Strawberry grey mould		
European apple canker		
Cherry bacterial canker		

Can you find other examples?

### USING PESTS' NATURAL ENEMIES AS BIOCONTROL AGENTS

If you are fortunate to have a garden or access to a wild area, you can collect your own pests and their natural enemies, or you may be able to persuade an adult to buy them on the internet (making sure they are a native species, of course). Try keeping ladybirds – this link describes how to look after them: <https://www.wikihow.com/Take-Care-of-a-Ladybug>.

See if you can distinguish between species, e.g. the invasive harlequin ladybird compared to the native seven-spot ladybird: <https://www.coleoptera.org.uk/coccinellidae/how-recognise-harlequin-ladybird>

Aphids are a common prey item of ladybirds and are also a pest of fruit trees. Collect some and design an experiment to investigate ladybirds' role as a natural enemy of aphids. You can vary factors like:

- Number of aphids
- Number of ladybirds
- Access to aphids (is there a lot of space? Are there places for aphids to hide?)
- Access to other food sources
- Temperature

Record how many aphids the ladybirds eat, and how quickly. If possible, your class can have a number of ladybird tanks, each with different conditions. This will allow you to compare how different factors affect predation. Make sure to return the ladybirds to the wild once the experiment is over!

### USING SEMIOCHEMICALS TO TRICK PESTS

Insects use a wide range of chemical signals to communicate with each other. They are also able to detect particular chemicals given off by plants, or even other insect species. What sort of signals do you think insects can transmit or detect? Use the examples in the article to get started. Think about:

- Feeding
- Reproduction
- Shelter
- Predator avoidance

Insects are far more reliant on chemical signals than many other animals, including us. Why do you think this is? Once you have finished, use the internet to check your answers, and find out anything extra.

### CREATING THE FUTURE WITH PRECISION TECHNOLOGY

Mathematical modelling, engineering and advanced technology are enabling agricultural management to become a lot more precise. Using your knowledge of modern technology, give some examples of how this might be done. Some technologies to consider:

- Drones
- Satellite imagery
- Sensors for temperature, humidity, or disease prevalence (how do you think this could be measured?)
- Artificial intelligence
- The internet of things (this is where devices communicate with each other through the internet.)

Look online for any interesting examples. If you can't find anything online for one of your ideas, maybe you have thought of something that no-one else has!