

## Food, Farming and the Environment Green flowers are a pest!



Leafhoppers are pests of important agricultural crops. Like aphids, these insects also feed on the plant sap in the phloem, and can transmit viruses and bacteria that cause diseases in plants. For example, leafhoppers can infect a plant with phytoplasmas, a type of bacteria that kills plants.

Insects such as leafhoppers that infect plants with bacteria are called vectors. Phytoplasma vectors include planthoppers, leafhoppers, and psyllids.

Phytoplasmas cause disease in many agricultural crops, including: maize, grape, apple, pear, carrot, lime, peanut, and lettuce. They can also infect many ornamental crops, including delphiniums, asters, petunia, and poinsettias.

Phytoplasma diseases threaten millions of people across the world, by destroying crops and leaving people hungry. For example, coconuts are a major food crop and cash crop for many African farmers. Coconut palms are particularly threatened by phytoplasma diseases, which have already destroyed coconut plantations across the world. One particularly severe disease, Coconut Lethal Yellowing, causes the leaves to yellow, and the tree to die within a year, leaving just the 'telegraph poles' of dead tree trunks.

Once infected, plants cannot be cured of phytoplasma, and these bacteria eventually kill the plant. Current control strategies include the application of environmentally damaging pesticides to control the insect vector populations.



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Phytoplasmas cause a range of symptoms in infected plants, including stunting of growth and yellowing. One of the most striking symptoms produced by phytoplasmas is the growth of **green flowers from infected plants**. These flowers may be infertile or produce inferior fruit, which in crop plants means poor quality of seeds, grains, and fruit.

Phytoplasmas cause disease by producing proteins called effectors, which they release into the plant cells. The effectors interact with target molecules in the plant host cells and impair plant development and defence (immune) responses. In order to tackle this disease, scientists need to understand what phytoplasmas do to the plant and some scientists are trying to produce resistant plants.



Normal Arabidopsis flower



Infected Arabidopsis flower

## WHAT TO DO :

Take a look in your garden, a nearby park or school playing field. Can you see any green flowers? Green flowers are an indication that phytoplasmas may be infecting the plant.





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