Tobacco mosaic virus

Despite its name, tobacco mosaic virus can affect nearly 200 different plant species, including peppers, lilies, and lettuce. The virus causes yellow and brown spots to appear on the leaves. The spots look like a bit like mosaic. The virus doesn't usually kill the plant but it will affect the growth of the leaves, stunting them, or making the leaf shape distort as it grows.

Like any virus, tobacco mosaic virus takes over cells when it infects them, stopping the cell from getting on with its normal functions and processes such as photosynthesis. It uses the infected cell to make more copies of the virus which it will then release.

Plants get infected via wounds (a bit like a plant cut or graze). The virus can spread on the hands of gardeners and farmers, on their gardening tools and machinery, and if plants are grown very closely together (a crop field or glasshouse) by direct contact. As the virus can contaminate seeds it's important that growers are only sold disease-free seeds. As it can infect so many different host plants it can spread very quickly.

To prevent the spread of tobacco mosaic virus you should remove infected plants immediately, wash your hands and gardening equipment in between planting, keep plants spaced out, and you can grow tobacco mosaic virus resistance plants.

Despite being a problem for gardeners and farmers tobacco mosaic virus has been useful. It was the first virus discovered in 1898 by Martinus Beijerinck, and has been widely studied by scientists researching what viruses are and how they behave.

Infected Pepper plant | Image © Carlos Gonzalez, via Wikimedia Commons

Rose black spot (Diplocarpon rosae)

Rose black spot is caused by the fungus Diplocarpon rosae. This fungus can only infect rose plants, but it has created a huge problem in the UK as lots of plants have become infected. It causes black and purple spots on the leaves and stems, and infected leaves will drop of the plant prematurely. As the plant loses leaves this affects its ability to photosynthesise and therefore grow, so infected roses will show less vigour.

Like all fungi rose black spot produces spores, these will be in the black spots you see on the leaf, these spores are spread via water and will set up new infections. The fungus can lie dormant over the winter in the plant, and in infected leaves that have fallen. In the spring they start producing spores again.

The disease is very hard to control as spores can be blown in with the rain. There are some newer rose varieties that are more resistant but there are many genetic variations of the fungus, and resistance in new rose varieties is often short lived. Collecting up fallen leaves or covering them with mulch (a layer of material you put over the top of soil ie chipped bark, straw) helps as it stops the spores from the dropped leaves being splashed back up onto the plants with the rain. Removing infected branches and cutting the plant back in autumn (pruning). It's also suggested that you should burn any cut branches, and fallen leaves. You can also treat the plant with a chemical fungicide.

Some people think that cases of rose black spot have increased in urban areas as we reduce the levels of sulphur compounds in the air, as sulphur and its compounds are fungicides.

Rose black spot | Image © Wikimedia Commons

Crown gall disease (Agrobacterium tumafaciens)

Crown gall disease is caused by the bacteria Agrobacterium tumafaciens (scientists have recently renamed this species Rhizobium radiobacter). It can infect lots of different plant species (over 1,000) including: apples; cherries; courgettes; sweet peas; and hollyhocks. The bacteria causes lumps (galls) to grow on the stem or roots. On herbaceous plants (soft plants) the galls decay and the bacterium go into the soil, but on woody plants that can be hard. Plants can be infected for a long time as the root galls wouldn't be seen in the ground. The plants' growth and ability to produce fruit are affected, and the disease can kill the plant.

Agrobacterium tumafaciens lives in the soil, there are many different strains of the species and not all of them cause disease. Those that do get into the plant via wounds (cuts and grazes on a plant), the bacteria can detect the sugary compounds leaking from the plant's wound and it uses its flagellum (tail like structure) to move towards the wound. The bacteria can then insert a small loop of its DNA (plasmid) into the plant's DNA in the plant cell's nucleus. It makes the plant cell turn into a gall cell by making the infected cell produce huge amounts of growth hormone, the infected cell also start producing materials for the bacteria to feed on. This stops the cell getting on with with its normal processes, and as the gall develops if affects the plant's root and stem tissues, and plant's transport systems.

To prevent its spread you should remove and destroy any infected plants. You can grow species that are uninfected like grass or potatoes for a few years to reduce or eliminate the bacteria from the soil. There are no chemical treatments for this disease.

This pathogenic bacteria has proved to be useful though. Because the bacteria can transfer and incorporate its DNA into plant DNA, it's been used in the genetic modification of plants – although scientists genetically 'disarm' the bacteria first so as not to infect the host plant.

Crown gall disease | Image © Bhai, via Wikimedia Commons

Chalara Ash Dieback (Hymenoscyphus fraxineus)

Ash dieback is a new but very serious disease that affects ash trees. It is caused by the fungus Hymenoscyphus fraxineus, and has been rapidly spreading over Europe since the 1990s, it was first seen in the UK in 2012. The disease is highly contagious, approximately two thirds of Denmark's trees are now infected, so the UK have put in place emergency measures to try to stop its spread through the UK. Ash is a very popular tree, it's grown in this country in gardens and parks, and makes up a substantial proportion of our woodland and hedgerows. It's grown for timber and wood products but it also plays a crucial role in ecosystems, with many animal species reliant of ash for shelter and food.

Infected leaves wilt, grow brown and die. Lesions (bit like a cut) appear in the bark of infected plants, and under these lesions the wood has turned dark brown as the tissues die. If the infection spreads across the branch, water can't be transported to the leaves, this is why they wilt and die. The whole tree will eventually die. The fungus is spread by spores that can be carried on the wind (they can travel 20-30 km), and via the importing of infected trees, or timber.

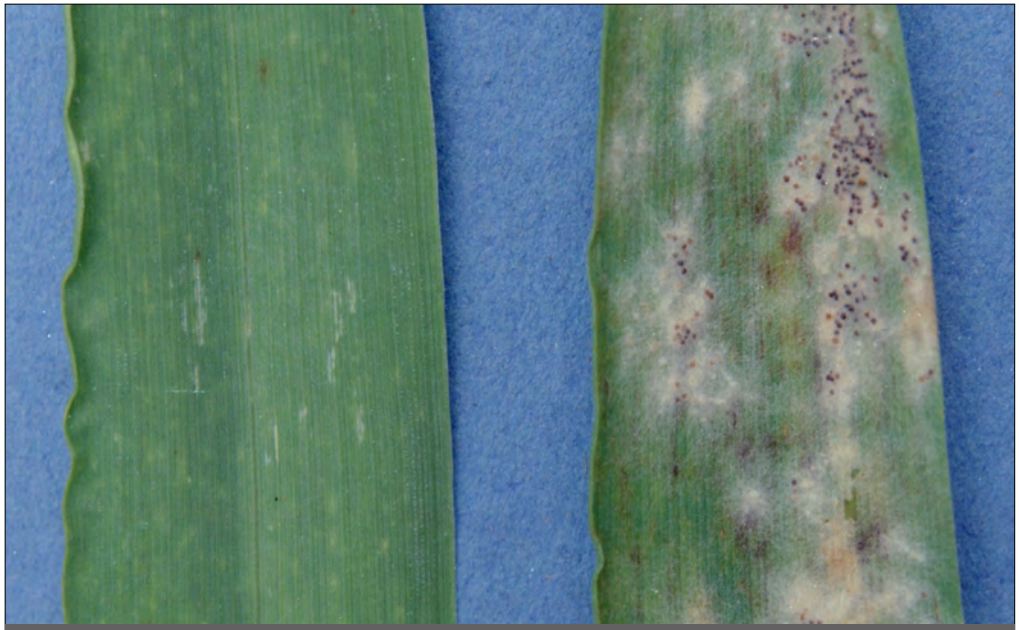
The disease is so serious that emergency quarantine regulations were imposed in 2012. Any sightings of infected plants must be reported to the Forestry Commission or the Animal and Plant Health Agency, they will then come and remove and destroy the infected plant and any leaves it might have dropped. New ash trees are carefully monitored for any signs of infection, and there are strict controls of the movement of ash plants and timber from ash trees both within the UK, and on imports into the UK.

Ash dieback | Image © FERA, via Wikimedia Commons

Barley powdery mildew (Erysiphe graminis)

Barley powdery mildew is caused by the fungus Erysiphe graminis. There are lots of different powdery mildews that infect lots of different plants but this specific pathogen only infects barley or barley grasses. Barley is grown as a cattle feed, to be used in brewing and in the production of malt. Fungal spores grow on the leaves creating the powdery white fluff. The leaf under the mildew becomes yellow as it feeds the growing fungus. The leaf will eventually die. The infection reduces the growth of the barley plant and its yield.

The infection is spread as spores are carried on the wind. You can grow varieties of barley that are resistant, and you can treat crops with fungicides to prevent the spread of the disease. You should also avoid planting a new crop into the stubble left from an infected crop that's been harvested.



Barley powdery mildew | Image © Clemson University, via Wikimedia Commons