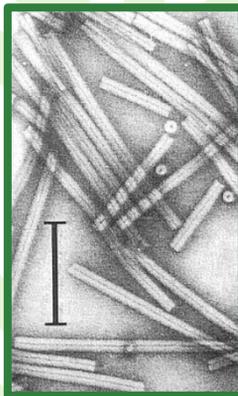
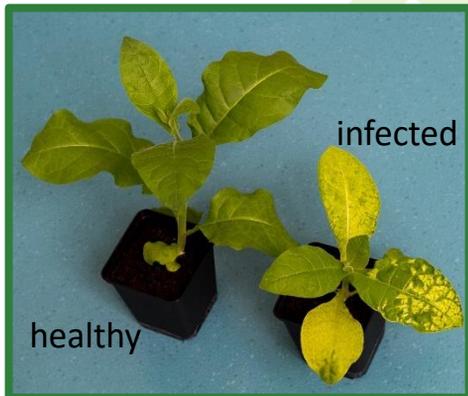


Tobacco Mosaic Virus (TMV)

The virus, TMV, causes the disease Tobacco Mosaic which affects tobacco, tomato, other Solanaceous plants and upwards of 200 plant species



Pathogen Description

TMV is a viral plant pathogen and a member of a large group of viruses within the genus Tobamovirus. Its particles are rigid rods only 300 nanometres long and 18nm wide, consisting of coat protein molecules stacked helically around a single strand of RNA, which is its genome (see electron micrograph middle picture above, scale bar = 100nm).

Mode of Infection

TMV enters plants through wounds. Damage to the plant cell membrane permits entry of infectious particles into the cytoplasm. TMV 'hijacks' the hosts protein synthesis machinery to make viral proteins and TMV makes many copies of its RNA. TMV spreads into neighbouring cells using its movement protein which modifies tiny channels, called plasmodesmata, which connect nearly all plant cells. The virus spreads from an initial infection site to all parts of the plant via the phloem, the plant's nutrient transport network.

Symptoms

Symptoms include mosaic patterns on leaves, mottling, necrosis, stunting and leaf curling (see plant images above).

Disease spread

TMV is transmitted very easily making control difficult. For example, infected leaves rubbing against healthy plants, or contaminated tools or workers hands (which can become contaminated with virus from cigarettes) can all spread TMV. Unlike most plant viruses, TMV is not transmitted by insects.

Control

Measures include strict glasshouse management – watering hoses/cans should not be allowed to make contact with plants. Dead plants/old leaves are bagged and removed carefully. Contaminated soil discarded. Tools should be treated with soap or 10% bleach. Try to avoid 'wounding' healthy plants. A cross-protection technique was used to protect tomato crops - inoculating young plants with a mild strain of TMV gave protection against subsequent infection by severe strains. Today, most modern tomato varieties are resistant to TMV.

Detection

Most viral symptoms are easily confused with environmental effects or other plant pathogens, so correct diagnosis is important and relies upon detection assays that use antibodies or PCR-based assays.

Interesting Facts

TMV was the 1st virus to be discovered, 1st to be purified, 1st to be characterised by x-ray crystallography and the 1st plant virus to be sequenced. It was the 1st to be combatted by plant genetic engineering and it is now leading the way as a tool for scientists seeking to develop pharmaceuticals and nanomaterials in plants.

Further reading

<http://www.apsnet.org/edcenter/intropp/lessons/viruses/Pages/TobaccoMosaic.aspx>