Factsheet 11/01

Tomato

Project No. PC 181

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New results on pepino mosaic of tomato

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Pepino mosaic has been found affecting a small number of tomato crops in the UK each year since 1999. Disease symptoms are illustrated in HDC factsheet 12/00, together with guidance on prevention and action to take if the disease is suspected or confirmed. This factsheet summarises new information obtained in the UK and elsewhere since July 2000.

Legislative control

Is the disease still notifiable?
Yes, a suspected outbreak should be reported to the Plant Health and Seeds Inspectorate (PHSI). Contact your local office (see under Environment, Food and Rural Affairs/ Department of) or contact PHSI Headquarters at York, Tel: 01904 455174, Fax: 01904 455197. An inspector will examine the crop and samples will be tested free of charge by the Central Science Laboratory (CSL). There have been five outbreaks in the UK in the 2001 crop so far.

What is being done at a European level?
Pepino mosaic has been confirmed in many EU countries (Austria, Belgium, France, Italy, The Netherlands, Portugal, Spain, UK) and also in other countries (Canada, Morocco, Ukraine, and the USA). Under an EC Decision (2001/536), member states are authorised to take action to prevent its introduction and spread within the Community. This authority is valid until 31 December 2002 and extends to tomato plants and seed. Additionally, the PHSI will take action when they find obviously infected fruit.

How can I test for Pepino mosaic?
A rapid testing kit for use on-site is obtainable from CSL (Tel: 01904 462600) email: pocketdiagnostics@csl.gov.uk. This is a useful test to check suspect symptoms. If a positive result is obtained, PHSI should be contacted and confirmatory tests will be done.

Note the altered leaf shape and sharply pointed tips (cv Espero)

What if Pepino mosaic is confirmed?
PHSI will give advice appropriate to the situation. At an early stage of infection this may be the removal of all affected plants and those of a surrounding area, but it may be possible to continue growing the crop and to market unaffected fruit, subject to following PHSI instructions.

Virus spread

How is the virus spread?
Handling plants is the most usual means. But it is also spread on tools and clothes of operators. Patterns of infected plants within a crop can sometimes be related to movement of crop workers. Experiments have shown that leaf to leaf contact, for example when a crate of young plants is rocked, is sufficient to allow spread. Spread by bees is possible but is not considered to be important. Insect pests are not vectors of this virus.

How rapidly does it spread?
If the disease is not recognised at an early stage, and appropriate action taken, it can spread throughout a glasshouse to affect most plants within a few weeks. Groups of around 10 adjacent plants may show symptoms in areas where the disease started. Individual plants or small groups of plants with symptoms may occur elsewhere (secondary foci of infection). Once all affected plants are removed and a surrounding *cordon sanitaire* established, strict implementation of precautionary measures, including hand washing, the use of footbaths and protective clothing (see HDC factsheet 12/00 for full details) may limit the rate of spread both through a house and into other glasshouse blocks on a site.

Bright yellow leaf spotting, an occasional symptom

Can it be carried on seed?
Yes, it has now been shown that the virus can be carried on the outside of tomato seed. It has not been found in the embryo or endosperm. Infection has been detected only at very low levels (0.03 to 0.06%) and prior to acid-extraction and seed cleaning. The risk of infection on acid extracted seed is very low. Nevertheless, all seeds including those of rootstocks, should be treated by heat (70°C for 4 days) or chemicals (soaked in 10% trisodium phosphate for 3 hours) as a precautionary measure. Such treatment is usually done by seed companies or specialist propagators. Heat treatment of seed is also offered as a service by HRI Business Development Department, Wellesbourne (Tel: 01789 470382). In the absence of experimental evidence, it cannot be guaranteed that such seed treatments will be effective.

Disease management

Are there any resistant varieties?
All tomato varieties inoculated with the virus have developed symptoms. Natural infections have occurred in cultivars Aranca, Candella, Eloise, Espero, Golden Harvest, Nectar, Rosafino, Santa, Solairo and Sweet Lady. There is no known resistance at present.

Do some varieties tolerate the disease?
Possibly. The severity of symptoms appears to differ between cultivars, but it is also influenced by the age of the plant when it is infected and the growing environment. DEFRA has funded work to investigate these interactions. Grower observations indicate that a crop affected early in the season (January/February) may suffer less overall yield penalty than the same variety infected in mid-season.

Fruit may fail to colour up evenly; often only as a vertical red band (cv Espero)

Carry-over of virus between crops

Is carry-over between crops a possibility?
Initially it was reported that a high proportion of nurseries affected one season were also affected the following season. In the UK, where strict hygiene procedures have been implemented, this has not been the case. Although there is a risk that pepino mosaic can persist between successive crops, a good end-of-crop hygiene programme will prevent disease carry-over.

What are the critical points to prevent disease carry-over?
Ensure that the glasshouse and surrounding area is cleared of fallen crop debris (fruit, dried leaf and stem pieces) and that picking crates, trolleys and waste containers are thoroughly cleaned of squashed fruit and its remains. It is more difficult to disinfect the virus in fruit sap than in leaf sap.

Where does the virus occur in affected glasshouses?
Almost everywhere. Where pepino mosaic had been established in a crop for several weeks, the virus was found on concrete pathways, plastic floor covering, support wires, drip nozzles, wooden stakes at row ends, on glass, aluminium stanchions, carbon dioxide tubing, on heating pipe supports, waste bins, picking crates and containers and in run-off solution. The only places tested where it was not found were matting soaked in disinfectant (TSOP) and on heating pipes.

How long does the virus survive on glasshouse structures and equipment?
In sap expressed from leaves, we found the virus usually survived only a few days. The greatest survival period we recorded was 14 days, when the sap was maintained at 15°C. Survival was less (2-4 days) at high temperatures (20-25°C).

Does pepino mosaic survive in soil?
The risk of transmission from infected roots appears to be low, though it cannot be excluded. When infected plants of a soil-grown crop were cut-off at soil level, fine roots contained transmissible levels of pepino mosaic when sampled 31 days later, but not at 8 weeks after crop removal. When tomato plants were grown in compost containing infected root pieces, none had become infected after 8 weeks. As a precaution, large roots should be removed and the soil cultivated to aid rapid breakdown of fine roots.

Are there any weed or other crop plant hosts?
A wide range of common weeds have been inoculated with the virus and only two became infected, black nightshade (*Solanum nigrum*) and bittersweet or woody nightshade (*Solanum dulcamara*). Cucumber leaves became infected on inoculation but the virus did not spread systemically and it is considered that cucumber crops are not at risk. The only known alternative host crops in the UK are potato and aubergine. Many potato cultivars developed severe symptoms when artificially infected with pepino mosaic.

Fruit rejected because of irregular, blotchy ripening

Disinfection

Which disinfectants are effective against pepino mosaic?
The following products were tested on various surfaces (aluminium, concrete, glass, polythene, plastic) contaminated with pepino mosaic in leaf sap, and shown to be effective when used at their recommended rates. In a test with Hortcide at the recommended rate, pepino mosaic virus was more difficult to decontaminate in fruit sap than in leaf sap. Horticide was not effective in the removal of pepino mosaic virus from rigid plastic trays contaminated by squashed tomato fruit. Robust cleaning and disinfection procedures need to be sought for this purpose.

Product	Rate tested	Supplier
Benglucid	2%	Marketed by HCI Disinfection, Denmark
GluCid	2%	Marketed by Brinkmans, Holland (no longer available in the UK)
Horticide	1:25	CMW Horticulture Ltd 01430 422222
Jet 5	1:125	Hortichem Ltd 014980 676500
Menno-Florades	4%	Brinkmans UK Ltd 01482 842123
Panacide M	0.5%	Coalite Chemicals 01246 826816
Sodium hypochlorite	0.5%	Various horticultural suppliers
Trisodium phosphate (TSOP) horticultural grade	10%	Fargo Ltd 01903 721591
Virkon S	1%	Antec International Ltd 01787 377305

Where can I find further information?

- A full report on the work summarised here is available to HDC members from the HDC office. Quote Project PC 181.
- Information is also available from the Department of Environment, Food and Rural Affairs website at: www.defra.gov.uk/Plant & Seeds/ Pests and diseases.

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