SPORE COUNTS COULD PREDICT BLIGHT SPREAD

Every year growers watch weather forecasts for the conditions which favour blight but Dr GARETH GRIFFITH believes there is a better way of assessing local risks. He points out that even when the weather is right for disease development blight spores may not actually be present in the air passing over potato fields

Sampling and automated counting of airborne spores could be used to track the movement of blight and might even help growers to cut fungicide use, according to a team of researchers working at the University of Wales in Aberystwyth. MAFF-funded experiments have been carried out at the Institute of Biological Sciences (IBS) and field trials are now underway to evaluate a new technique which can recognise blight sporangia. The system involves the connection of a piece of equipment known as a flow cytometer to a high-volume air sampler operating at 600 litres per minute.

Field monitoring

Pathologist Dr Gareth Griffith explains that the technique can be used to identify blight spores against a background of pollen, inert particles and other fungal spores which are present in the air. Particles collected by the sampler are trapped in a small volume of Calcofluor stain solution and can be analysed using a flow cytometer equipped with three lasers. Sample transfer and analysis of the data are carried out automatically, allowing the device to operate unmanned for a period of several days. The system has been 'trained' to recognise blight sporangia from other airborne particles using a mathematical technique which employs evolutionary algorithms to devise a set of rules to allow accurate identification with low levels (less than 2%) of false readings. The data sets used to define these rules have been generated from lab tests and are based on a number of characteristics, including forward and sideways scatter of light from the lasers (largely a function of particle size and shape – blight sporangia are bigger than other fungal spores) and the amount of UV light reflected off the stained particles (pollen grains, for example, do not take up the stain so well and have different fluorescence characteristics).

Sampling could warn researchers when blight spores are present in air currents.

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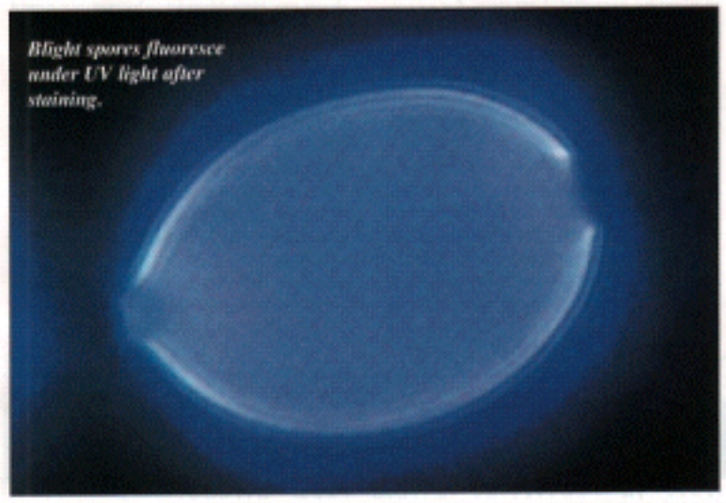
Dr Gareth Griffith of the Institute of Biological Sciences with the air sampler.

Field trials began in earnest this summer and the research team (Dr Griffith, Dr Jenny Day and flow cytometry expert Prof Douglas Kell) hope to determine realistic spores levels at which warnings can be issued without overstating the disease risk. Detection of 5–10 spores/m3 should be possible.

'Climatic forecasting can tell us whether conditions are suitable for the spread of the pathogen but this will only occur if sporangia are present in the air spora,' says Dr Griffith. 'The ability to detect low numbers of spores in the air during the early part of the growing season will greatly enhance our ability to forecast the disease. Successful validation of this new approach will mean that potato growers could avoid unnecessary spraying of fungicides early in the growing season.'

The technique could be used to track the dispersal of other fungal spores as well as pollens which cause allergies.



Blight spores fluoresce under UV light after staining.

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