

***Phytophthora ramorum* disease**

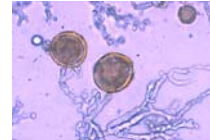
THE PATHOGEN

Phytophthora ramorum is a simple fungus-like pathogen. It forms three types of spores which are involved in its survival and dissemination

- **Sporangia and zoospores:** these develop from infected areas on foliage. The sporangia are small sac structures which release tiny swimming zoospores. This is the main way the pathogen gets disseminated from plant to plant.



- **Chlamydospores:** these are survival structures which form in plant tissue, leaves, wood etc and can also survive in the soil. They are important in the spread of the pathogen from one area to another on boots, machinery etc.



- **Oospores:** these only form when the two mating types of the pathogen come together. Currently the formation of oospores is very rare.

THE DISEASE

P. ramorum was first diagnosed in America where it was killing large numbers of the Pacific oaks in western California and was given the name 'Sudden Oak Death.' In Europe around the same time it was identified on rhododendron. Subsequently it has become clear that *P. ramorum* has a very wide host range infecting over 100 plant species ranging from woody shrubs in nurseries to mature trees including oak, beech and in the last couple of years Japanese larch.

THE SYMPTOMS

The symptoms observed of a *P. ramorum* infection vary enormously between hosts.

On rhododendron symptoms range from blackening of the leaves, to wilting stems with a typical shepherd's crook and shoot death.

On Japanese larch an infection with *P. ramorum* results in several different symptom:

Often the first indication of an infection is that trees shed their needles resulting in the thinning of the crown of individual trees, groups of trees or the entire Japanese larch woodland canopy.

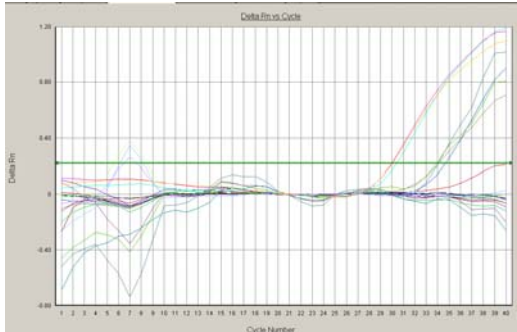
- Infected trees will form excessive numbers of cones
- There will be evidence of bleeding cankers on the main trunk of infected trees, although because these are often most prolific at the top of the trees, they are often difficult to see before the tree is felled.



- Needles which become infected turn brown and are often shed prematurely.



DIAGNOSIS



As the symptoms of *P. ramorum* on Japanese larch are diverse and variable and it is difficult to diagnose *P. ramorum* disease of larch on symptoms alone. There are a number of laboratory methods used including Lateral Flow Devices, isolation techniques and molecular - PCR (Polymerase Chain Reaction) technologies. Detection of *P. ramorum* in Japanese larch and diagnosis of the disease is more difficult compared with other host species, such as rhododendron.

CONTROL

P. ramorum is a non-indigenous pathogen and every effort must be made to prevent its establishment and further dissemination. There is therefore an extensive eradication programme to remove all infected trees and so significantly reduce any more inoculum development.



FURTHER INFORMATION

P. ramorum diseases have caused significant damage and loss to a wide spectrum of woody plants in many parts of the world. More information about the disease, its symptoms, its impact and importance, and disease management strategies can be found at the following web-sites:

Forestry Commission (Great Britain):
<http://www.forestry.gov.uk/pramorur>

Food, Environment Research Agency (FERA)
<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/pRamorum/>

European and Mediterranean Plant Protection Organisation (EPPO)
http://www.eppo.org/QUARANTINE/Alert_List/fungi/PHYTRA.htm

United States Department of Agriculture (USDA)
<http://www.invasivespeciesinfo.gov/microbes/suddenoak.shtml>