

JKI Data Sheets

Plant Diseases and Diagnosis

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Phytophthora on *Chamaecyparis lawsoniana* Murr. (Lawson cypress or Port-Orford-Cedar)



Imprint

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Importance of *Chamaecyparis lawsoniana*

Aside from a few forestry plantations, in Europe *C. lawsoniana* is planted in amenity situations and parks and used in hedgerows, windbreaks (<http://www.discoverlife.org>).

It is one of the most important conifers in the European ornamental nursery plant trade. A total amount of 75 (1999), 130 (2002) and 50 (2001 and 2003) tonnes of ornamental nursery stock were imported from North America to the EU (Global ornamental trade data, AIPH, International Statistics on Flowers and Plants).

Phytophthora species

From *C. lawsoniana* trees with characteristic disease symptoms the following *Phytophthora* species have been isolated directly from the tissue or from the soil:

<i>Phytophthora</i> species	Disease symptoms	Reference
<i>lateralis</i>	nursery stock mortality bleeding canker branch infection leaf infections	Tucker & Milbrath, 1942 Roth <i>et al.</i> , 1957 Robin <i>et al.</i> , 2011 Trione & Roth, 1957
<i>eruiigena</i>	stem and collar root	Clancy & Kavanagh, 1977
<i>hibernalis</i>	canker, foliage infection	Brasier & Strouts, 1978
<i>cinnamomi</i>	root rot	Torgesson, 1954
<i>citricola</i>		Bakonyi <i>et al.</i> , 2006

Disease symptoms (see figures)

The most frequent symptoms of disease caused by *P. lateralis* are root and collar lesions. Fine roots are the first target of zoospores, and then hyphae develop in larger roots and in collar where they kill the inner bark (Oh & Hansen, 2007). After the removal of outer bark, a sharp margin is visible between necrotic phloem, discoloured in cinnamon-brown, and healthy cortical tissues. The whole canopy of infected trees turns to pale green, yellow and then light-brown, when the tree is dying.

Another type of symptoms caused by *P. lateralis* was observed. Dead branches with necrotic lesions (same colour as in collar) were observed in the middle or low part of the canopy and seemed to be progressive, spreading from the needles towards the trunk. Foliar infections by *P. lateralis* have been reported in Oregon (USA, Trione & Roth, 1957), in France, in the Netherlands, in UK and in Ireland (EPPO Reporting Service 2011/026, 2011/027, 2011/029, 2011/221, Green *et al.*, 2012).

Possibility of Symptom Confusion

The collar and root lesions presented in the figures are quite specific for *Phytophthora* infection. General dieback could be caused by other stresses when not associated with root infections. Foliar and aerial infections can be caused by other pathogenic fungi.

Disease development

The root system infection and invasion lead to the quick mortality of the trees (a few years). Disease in the USA is still spreading but slowly thanks to preventive methods (Hansen *et al.*, 2000).

Diagnosis

It is not possible to identify a *Phytophthora* infection only by disease symptoms. Different diagnostic techniques like direct isolation, molecular and serological methods help to identify *Phytophthora* as the cause of the tree disease and to specify the *Phytophthora* species. Information on *Phytophthora* diagnosis on trees or in general are given for example in <http://forestphytophthoras.org/key-to-species>, <http://www.phytophthoradb.org>, <http://phytophthora-id.org/> and in Martin *et al.* (2012). For *Phytophthora lateralis* information on diagnosis are for example in: <http://www.jki.bund.de/plant-diseases.html>.

Please contact your national authorities (see next chapter) for help with diagnosis.

What to do in case trees are suspected to be infected?

Contact your responsible national authorities, for example:

Austria:

- Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft (BWF)
Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BWF)
Seckendorff-Gudent-Weg 8, 1131 Vienna, Austria; <http://www.bfw.ac.at/>
- Österreichische Agentur für Gesundheit und Ernährungssicherheit
Austrian Agency for Health and Food Safety, Institute for Sustainable Plant Production
Spargelfeldstraße 191, 1220 Vienna; <http://www.ages.at>

Belgium:

- Département Sciences du Vivant, Centre Wallon de Recherches Agronomiques
Life Sciences Department, Walloon Agricultural Research Centre
Rue de Liroux 4, B-5030 Gembloux;
Anne CHANDELIER | a.chandelier@cra.wallonie.be
- Instituut voor Landbouw- en Visserijonderzoek (ILVO), Eenheid Plant - Gewasbescherming
Institute for Agricultural and Fisheries Research, Plant Sciences Unit – Crop Protection - Gewasbescherming
Burg. van Gansberghelaan 96 bus 2, 9820 Merelbeke
Kurt HEUNGENS | kurt.heungens@ilvo.vlaanderen.be

Bulgaria:

- Българска Агенция по безопасност на храните:
Централна лаборатория по карантина на растенията
plant protection regional services: <http://www.babh.government.bg/en/labs.html>
- Агробиоинститут, Селскостопанска Академия
бул 8, Драган Цанков № 8, София 1164
Biotic Stress Group, AgroBioInstitute, Agricultural Academy
8 Dragan Tsankov Blvd., 1164 Sofia
Славчо Славов, sbslavov@abi.bg
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The Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Publ. Res. Institute

Květnové náměstí 391, Průhonice, 252 67, Praha západ

Matěj PANEK | panek@vukoz.cz

Denmark:

- NaturErhvervstyrelsen, Ministeriet for Fødevarer, Landbrug og Fiskeri
The Danish Agrifish Agency, <http://www.naturerhverv.fvm.dk>
- Skov & Landskab, Det Biovidenskabelige Fakultet, Københavns Universitet
Forest and Landscape, Faculty of Science, University of Copenhagen
<http://www.sl.life.ku.dk>

Finland:

- Elintarviketurvallisuusvirasto Evira, Kasvinterveysyksikkö
Finnish Food Safety Authority Evira, Plant Health
Mustialankatu 3, FI-00790 Helsinki
http://www.evira.fi/portal/fi/kasvit/viljely_ja_tuotanto/metsanviljely/valvonta/
- Metsäntutkimuslaitos
Finnish Forest Research Institute
P.O. Box 18, FI-01301 Vantaa
Anna RYTKÖNEN | anna.rytkonen@metla.fi
- Maa- ja elintarviketalouden tutkimuskeskus MTT
Agrifood Research, MTT
FI-31600 Jokioinen
Päivi PARIKKA | paivi.parikka@mtt.fi

France:

- Services Régionaux de l'Alimentation (SRAL) des Directions Régionales de l'Alimentation, de l'Agriculture et de la Forêt (DRAAF)
Regional Plant Protection services
<http://agriculture.gouv.fr/suivi-de-la-sante-des-forets>
<http://agriculture.gouv.fr/services-deconcentres>
- Laboratoire de Santé végétale, unite de Mycologie, ANSES
French Agency for Food, Environmental and Occupational Health & Safety (ANSES)- Plant Health Laboratory, unit of mycology
Domaine de Pixérécourt Bat E., 54220 Malzéville, France; <http://www.anses.fr/PNTC01.htm>;
Nathalie SCHENCK | Nathalie.schenck@anses.fr
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- Pôle interrégionaux du Département de la santé des forêts:
Regional forest health survey organisation:
<http://agriculture.gouv.fr/departement-de-la-sante-des-forets>

Germany:

- Pflanzenschutzdienststellen der Bundesländer, Adressenliste siehe: regional plant protection services, address list see: <http://www.jki.bund.de/de/startseite/unsere-service/linksammlung.html>
- Julius Kühn Institut – Bundesforschungsanstalt für Kulturpflanzen (JKI), Institut für Pflanzenschutz in Gartenbau und Forst (JKI-GF)
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Forest Research Institute, 570 06 Vassilika, Thessaloniki, Greece
<http://www.fri.gr>, info@fri.gr
- Ινστιτούτο Μεσογειακών Δασικών Οικοσυστημάτων & Τεχνολογίας Δασικών Προϊόντων, Τέρμα Αλκμάνος, 115 28 Ιλίσια, Αθήνα, Ελλάς
Institute of Mediterranean Forest Ecosystems & Forest Products Technology, Terma Alkmanos, 115 28 Ilisia, Athens, Greece
<http://fria.gr>, tsop@fria.gr

Hungary:

- Megyei Kormányhivatalok Növény- és Talajvédelmi Igazgatóságai
Regional offices of NFKCSO, Directorate of Plant Protection and Soil Conservation
<http://www.nebih.gov.hu/elerhetosegek>
- MTA ATK Növényvédelmi Intézet
Plant Protection Institute, Centre for Agricultural Research, Hungarian Academy of Sciences
Herman Ottó u. 15, H-1022 Budapest, Hungary;
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Backweston Agri-Campus, Celbridge, Co. Kildare, Ireland
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Italy:

- COSVIR XI - Servizio fitosanitario centrale
Italian Phytosanitary Service
cosvir11@pec.politicheagricole.gov.it, <http://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/2341>
- Dipartimento per la Innovazione nei sistemi Biologici, Agroalimentari e Forestali, Università degli Studi della Toscana
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Latvia:

Valsts augu aizsardzības dienests
State Plant Protection Service <http://www.vaad.gov.lv/english/contacts/departments.aspx>

Netherlands:

Nationaal Referentie Centrum,
Nederlandse Voedsel- en Warenautoriteit (NVWA)
National Reference Centre, NPPO
Netherlands Food and Consumer Product Safety Authority
Ministry of Economic Affairs, Agriculture and Innovation
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Portugal:

- Instituto de Conservação da Natureza e das Florestas – ICNF
Institute for Nature Conservation and Forestry - INCF
<http://www.icnf.pt/florestas>
- Direção de Serviços de Fitossanidade e de Materiais de Multiplicação de Plantas
Directorate of Plant Health and Materials Multiplication of Plants
Tapada da Ajuda, 1349-018 Lisboa
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Forest Research and Management Institute
Statiunea Brasov; Closca 13, 500040, Brasov, Romania,
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Serbia:

- Институт за шумарство, Одељење за заштиту шума
Institute of Forestry, Department of Forest Protection
Kneza Višeslava 1
11030 Belgrade, Serbia
www.forest.org.rs
- Institut za nizijsko šumarstvo i životnu sredinu, Zaštita šuma
Institute of Lowland Forestry and Environment, Forest Protection
Antona Čehova 13, 21000 Novi Sad, Serbia
www.ilfe.org

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Agricultural Institute of Slovenia
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Switzerland:

Eidg. Forschungsanstalt für Wald, Schnee und Landschaft (WSL)
Competence Center of Forest Protection (WSL)
http://www.wsl.ch/dienstleistungen/waldschutz/index_EN

Turkey:

- Çankırı Karatekin Üniversitesi, Fen Fakültesi, Biyoloji Bölümü, Çankırı, Türkiye
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- Tree Health Diagnostic & Advisory Service, Forest Research, Northern Research Station, Roslin, Midlothian EH25 9SY; ddas.nrs@forestry.gsi.gov.uk
- Tree Health Diagnostic & Advisory Service, Forest Research, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH; ddas.ah@forestry.gsi.gov.uk

Management and control

Management and control of the disease in the United States have been reviewed by Hansen *et al.* (2000).

Several cedar trees that have survived to natural epidemics or in artificially infested raised beds proved to have significant genetic resistance to *P. lateralis* using different inoculation procedures (Hansen *et al.*, 1989).

A breeding program was initiated by USDA Forest Service (USFS) in cooperation with Oregon State University to use these resistant trees in seed orchards aiming at providing resistant progenies for forest regeneration (<http://www.fs.fed.us/r6/dorena/poc/>). Some of these trees or their progenies are currently studied to confirm their resistance to European isolates.

In Europe, infected trees detected in new disease foci should be eradicated.

EPPO quarantine recommendation

P. lateralis was added to the European and Mediterranean Plant Protection Organisation (EPPO) A1 List in 2009 but was transferred to the A2 List in 2011 (EPPO Reporting Service 2011/187, <http://www.eppo.int/QUARANTINE/listA2.htm>).

Literature used

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Links to further information

http://agriculture.gouv.fr/IMG/pdf/Phytophthora_lateralis.pdf

<http://www.forestry.gov.uk/forestry/INFD-8BPLHD>

Phytophthora in the Forests: <http://forestphytophthoras.org/>

Phytophthora determination keys: <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-08-11-0636>

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Disease symptoms of *Phytophthora* on *Chamaecyparis lawsoniana* (Lawson cypress or Port-Orford-Cedar)



Symptoms on the upper plant parts

Left: Tree dyback and mortality

Right: Aerial canker and branch mortality



Cambium necrosis

Left: cortical lesions spreading from one branch to the stem

Central: at the collar

Right: spreading from roots