Netherlands Food and Consumer
Product Safety Authority
Ministry of Agriculture,
Nature and Food Quality

Quick scan for *Phytophthora pluvialis*

National Plant Protection Organization, the Netherlands

Quick scan number: MYC 2024-001

Quick scan date: 13 May 2024

No.	Question	Quick scan answer for ***Phytophthora pluvialis***
1.	What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? *Add picture of organism/damage if available and publication allowed*.	*Phytophthora pluvialis* Reeser, Sutton & Hansen No synonyms, no common name except 'red needle cast' in New Zealand. Kingdom Chromista Phyllum Oomycota Class Oomycetes Order Peronosporales Family Peronosporaceae Genus Phytophthora
2.	What prompted this quick scan? *Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.*	This Quick scan was prompted by the first report of a finding of *P. pluvialis* in the EU, in Belgium in 2024 (EPPO, 2024a). Additional information: - Following findings in the United Kingdom (UK) in 2021, the species was added to the EPPO alert list in 2022 (EPPO, 2022).

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		- A PRA is available for the UK (Webber, 2022) and where relevant information from this PRA is being used in this quick scan.
3.	Wat is the risk assessment area?	The risk assessment area is the territory of the European Union (EU 27)
4.	What is the current area of distribution?	Information from EPPO (2024b): **Europe:** Belgium, UK (present in England, Wales and Scotland where it is under official control). **North America**: United States of America (USA: California, Oregon, Washington). **Oceania:** New Zealand Additional information: - The species is probably native to North-Western USA (EPPO, 2022). - It was found for the first time in Europe in the UK in 2021 (EPPO, 2021a). - In southern Belgium, it was first detected in two water streams by baiting and later in needles of two symptomless trees in 2023; it was suggested that the species may be established in the region (EPPO, 2024a; Pirronitto et al., 2024). Uncertainty: - The distribution of *P. pluvialus* in the EU is highly uncertain. The findings in Belgium show that the pathogen can be present without any symptoms and can easily go undetected.
5.	What are the hostplants?	List of host plants (EPPO, 2024b): - *Larix kaempferi* - *Notholithocarpus densiflorus* - *Pinus patula* - *Pinus pinea* - *Pinus radiata* - *Pinus strobus* - *Pseudotsuga menziesii* - *Tsuga heterophylla* Experimental hosts: - *Larix decidua* - *Larix* x *eurolepis*
6.	Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism? *Yes/no + plant species on which damage has been reported + short description of symptoms.*	United Kingdom *Phytophthora pluvialis* causes needle cast, shoot dieback, and lesions on the stem, branches, and roots of *T. heterophylla* (western hemlock), *P. menziesii* (Douglas-fir) and *L. kaempferi* (Japanese larch) (EPPO, 2024c). *Phytophthora pluvialis* has most frequently been found on *T. heterophylla* (Webber, 2022). Stem cankers have also been observed leading to severe tree decline (EPPO, 2022). Some mortality (unquantified) has been

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	Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).	reported and the potential economic impact for the UK has been assessed 'large' but with low confidence (Webber, 2022). There was especially uncertainty about the host range and ability of trees to recover. *Phytophthora pluvialis* is under official control and areas have been demarcated around locations where the pathogen has been found. All demarcated areas except one are in the western part of the UK. One demarcated area is southeast from London. The climate in the western part of the UK is considered to be more favourable for the pathogen based on the number of rainy days and the temperature (Webber, 2022). <u>Belgium</u> In Belgium, infected trees (both *P. menziesii*) did not show symptoms (EPPO, 2024a; Pirronitto et al., 2024). <u>Oregon (USA)</u> In Oregon, *P. pluvialis* mainly causes needle loss in dense humid stands of *P. menziesii* but does not seem of significant economic importance (Reeser et al., 2015). <u>New Zealand</u> In New Zealand, *P. pluvialis* causes needle cast (browning and loss of needles) in stands of *P. radiata* and *P. menziesii* which can lead to growth decrease. Disease severity varies, however, strongly between areas and years. In one area in one year growth reduction was approximately 35% but over a 3-year period the average growth reduction was 16% with no loss in one of those years (Ganley et al., 2014). Tree mortality is not known.
7.	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses b. Outdoors c. Otherwise (e.g. storage facilities, human environment)	Greenhouses: host plants may be grown as bonsai plants and the pathogen may be introduced with infected plants. However, these plants are normally watered on the pot or from the bottom and the climatic conditions are unfavourable for spread (no rain and no fog, see also No. 6). Therefore, the pathogen is not expected to spread to other plants in the greenhouse and establishment is unlikely to happen. Outdoors: considering the findings of the pathogen in the UK and Belgium and the presence of host plants in the Netherlands, the conditions in the Netherlands are probably suitable for establishment of *P. pluvialis* (see No. 8 for more details on the conditions affecting establishment).
8.	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	<u>Host trees</u> Host trees are present in large parts of the EU. Infections in Europa have thus far been found on three conifer species (*L. kaempferi, P. menziesii* and *T. heterophylla*). These species are present in the EU but their abundance varies.

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		Pseudotsuga menziesii is (fairly) widespread in Czech republic, Denmark, France, Germany, the Netherlands, Slovakia and the eastern part of Belgium. It is also present in parts of some other EU members states (Da Ronch et al., 2016). It is one of the most widespread exotic tree species in Europe. Its importance is expected to increase because it has a lower sensitivity to drought than *Pinus abies* (Nicolescu et al., 2023) which is the economically most important conifer tree species in Europe (OECD, 2006). *Larix kaempferi* and *T. heterophylla* are considered infrequent exotic species in forests in Europe but frequent exotic species in forests in the Netherlands (WUR, year?-a;year?-b) *Pinus radiata* is next to *P. menziesii* a primary host of *P. pluvialis* in New Zealand (Webber, 2022). *Pinus radiata* is native to North America (California and Mexico) and is cultivated in southwest Europe with large plantations in the Basque Region in Spain (EUFORGEN, 2024). Large plantations are also present in Galicia in Spain covering 7% (96.000 ha) of the forest area (Alonso-Rego et al., 2022). Thus far, no infections of *P. radiata* have been reported in Europe but this may be due that the absence or low incidence of this tree speecies in the infested areas in northwestern Europe. *Pinus radiata* is a less common species than *P. menziesii* and *T. heterophylla* in the UK (Webber, 2022). In NL, *P. menziesii* and *Larix kaempferi* cover both 5.3% of the forest area and are mainly present in central and eastern provinces (Schelhaas et al., 2022). <u>Climate</u> Frequent rainfall and high relative humidies are favourable for establishment and spread of the pathogen. In New Zealand, sporulation and infection take place in the coolest and wettest part of the year and especially in June-August when average air temperatures are approximately 7 - 8°C (Fraser et al., 2020; Webber, 2022). <u>Potential area of establishment</u> Areas with wet and mild winters seems to be most favourable which may especially be present in coastal regions, e.g. the western part of Brittany in France and Galicia in Spain. Coastal areas have been assessed to be favourable for establisment for *P. ramorum, P. kernoviae* and *P. lateralis*; pathogens which can also infect conifer trees and spread by fog and wind-driven rain (Sansford et al., 2009; EFSA-Panel-on-Plant-Health, 2011; EPPO, 2011;2021b). Southern and eastern parts of the EU may be unfavourable for establishment because of dry or cold conditions. A more detailed assessment is needed to assess the potential area of establishment in the EU which is not part of this Quick scan. The findings in Belgium (see No. 4) indicate that *P. pluvialis* can at least establish in part of the EU.

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9.	What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?	*Phytophthora pluvialis* can spread naturally via water courses over distances of at least 500 m (Webber, 2022). Aerial dispersal is possible by fog and wind-driven rain; there is uncertainty about the distances it can spread by air (Webber, 2022). *Phytophthora pluvialis* can spread over large distances by trade of plant for planting of its host plants. The likelihood of spread by movement of infected bark and wood has not been assessed in detail but "has shown to be low" according to (EPPO, 2024c). The UK has lifted movement restrictions on wood and isolated bark from demarcated areas since January 2023 (GOV.UK, 2023).
10.	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	<u>EU</u> Significant damage (i.e. tree growth reduction) may only be expected in areas that are (highly) favourable for establishment and spread of the pathogen as no symptoms were observed in Belgium and disease severity varies significantly between areas and years in New Zealand (see Question No. 6). Like for *P. ramorum*, humid coastal regions may especially be favourable (Sansford et al., 2009). A more detailed assessment is, however, needed to assess the areas in the EU that are (most) suitable for establishment of the pathogen and where significant damage can be expected. <u>The Netherlands (NL)</u> In NL, al least 10% of the forest area is covered by susceptible tree species and may be endangered. Wet conditions are, however, needed for aerial spread of the pathogen. Such conditions are also needed for aerial spread of *P. ramorum* and *P. lateralis*. In Europe, aerial spread of these two pathogens have been reported from the UK and the western part of Brittany (France) but is not known from NL (EFSA-Panel-on-Plant-Health, 2011; Green et al., 2013; Van der Gaag & Meffert, 2013; Schenck et al., 2018). Therefore, the climate in NL seems to be less favourable for establishment and spread of *P. pluvialis* than the UK climate. In addition, spread by water courses may be less important in NL due to the mainly flat landscape. Hence, less impact is expected than in the UK and it is uncertain whether introduction of *P. pluvialis* will lead to significant growth reduction of conifer trees in NL. However, climate change can lead to conditions that are more favourable for *P. pluvialis*. Winters are expected to become milder and wetter; the wind direction will be more often from the west which means that moist air from the North Atlantic Ocean will be supplied more often (KNMI, 2023). <u>Export</u> The potential impact for export of plants for planting, wood and bark of the host plants was not assessed.
11.	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)? *If "no", go to question 12*	No

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12.	If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)? *Only to be answered in case of an interception or a find.*	Not relevant
13.	Additional remarks	
14.	References	Alonso-Rego C, Fernandes P, Álvarez-González JG, Arellano-Pérez S & Ruiz-González AD, 2022. Individual-Tree and Stand-Level Models for Estimating Ladder Fuel Biomass Fractions in Unpruned Pinus radiata Plantations. Forests, 13 (10), 1697. Da Ronch F, Caudullo G & de Rigo D, 2016. Pseudotsuga menziesii in Europe: distribution, habitat, usage and threats In: San-Miguel-Ayanz J, de Rigo, D, Caudullo, G, Houston Durrant, T, & Mauri AE (eds.), European Atlas of Forest Tree Species. Publ. Off. EU, Luxembourg, pp. e01a4f5+. EFSA-Panel-on-Plant-Health, 2011. Scientific Opinion on the Pest Risk Analysis on Phytophthora ramorum prepared by the FP6 project RAPRA. EFSA Journal, 9 (6), 2186-n/a. Available online: https://doi.org/10.2903/j.efsa.2011.2186 EPPO, 2011. Report of a Pest Risk Analysis for Phytophthora kernoviae. European and Mediterranean Plant Protection Organization. Available online: https://pra.eppo.int/pra/e4cfd484-0566-438d-864f-06137c815e7d EPPO, 2021a. First report of Phytophthora pluvialis in the United Kingdom. EPPO Reporting Service, 2021/227. EPPO, 2021b. Pest Risk Analysis for Phytophthora lateralis rev 1. European and Mediterranean Plant Protection Organization. Available online: https://pra.eppo.int/pra/9b4385bc-8c0e-4d35-af0f-030fc78426bf EPPO, 2022. Phytophthora pluvialis: addition to the EPPO Alert List. EPPO Reporting Service, 2022/061. EPPO, 2024a. First report of Phytophthora pluvialis in Belgium. EPPO Reporting Service, 2024/039. EPPO, 2024b. EPPO Global Database: Phytophthora pluvialis [Web page]. Available online: https://gd.eppo.int/taxon/PHYTUV [Accessed: 29-03-2024]. EPPO, 2024c. Update on the situation of Phytophthora pluvialis in the United Kingdom, and first record on Larix trees. EPPO Reporting Service, 2024/040. EUFORGEN, 2024. Pinus radiata [Web page]. European Forest Institute. Available online: https://www.euforgen.org/species/pinus-radiata/ [Accessed: 03-04-2024]. Fraser S, Gomez-Gallego M, Gardner J, Bulman LS, Denman S & Williams NM, 2020. Impact of weather variables and season on sporulation of Phytophthora pluvialis and Phytophthora kernoviae. Forest Pathology, 50 (2), e12588. Available online: https://doi.org/https://doi.org/10.1111/efp.12588 Ganley R, Williams N, Rolando C, Hood I, Dungey H, Beets P & Bulman L, 2014. Management of red needle cast caused by Phytophthora pluvialis a new disease of radiata pine in New Zealand. New Zealand Plant Protection, 67, 48-53.

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		GOV.UK, 2023. Phytophthora pluvialis [Web page]. Forestry Commission, United Kingdom. Available online: https://www.gov.uk/guidance/phytophthora-pluvialis [Accessed: 02-04-2024]. Green S, Brasier CM, Schlenzig A, McCracken A, MacAskill GA, Wilson M & Webber JF, 2013. The destructive invasive pathogen Phytophthora lateralis found on Chamaecyparis lawsoniana across the UK. Forest Pathology, 43 (1), 19-28. KNMI, 2023. KNMI'23-klimaatscenario's voor Nederland, KNMI, De Bilt, KNMI-Publicatie 23-03. Nicolescu V-N, Mason WL, Bastien J-C, Vor T, Petkova K, Podrázský V, Đodan M, Perić S, La Porta N & Brus R, 2023. Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) in Europe: an overview of management practices. Journal of Forestry Research, 34 (4), 871-888. OECD, 2006. Section 3 - Norway Spruce (Picea abies (L.) Karst). In, Safety Assessment of Transgenic Organisms, Volume 2: OECD Consensus Documents. OECD Publishing, Paris. Pirronitto S, Paquet F, Gaucet V & Chandelier A, 2024. First report of Phytophthora pluvialis in Douglas fir plantations in Belgium. New Disease Reports, 49 (1), e12244. Available online: https://doi.org/https://doi.org/10.1002/ndr2.12244 Reeser P, Sutton W, Ganley R, Williams N & Hansen E, 2015. Phytophthora pluvialis. Forest Phytophthoras, 5 (1). Sansford C, Inman A, Baker R, Brasier C, Frankel S, De Gruyter J, Husson C, Kehlenbeck H, Kessel G, Morajelo E, Steeghs M, Webber J & Werres S, 2009. Report on the risk of entry, establishment, spread and socio-economic loss and environmental impact and the appropriate level of management for Phytophthora ramorum for the EU. Deliverable Report 28. EU Sixth Framework Project RAPRA. Available online: http://rapra.csl.gov.uk/ Schelhaas M-J, Teeuwen S, Oldenburger J, Beerkens G, Velema G, Kremers J, Lerink B, Paulo M, Schoonderwoerd H & Daamen W, 2022. Zevende Nederlandse Bosinventarisatie: methoden en resultaten. 2352-2739. Wettelijke Onderzoekstaken Natuur & Milieu. Schenck N, Saurat C, Guinet C, Fourrier-Jeandel C, Roche L, Bouvet A, Husson C, Saintonge FX, Contal C & Ioos R, 2018. First report of Phytophthora ramorum causing Japanese larch dieback in France. Plant Disease, 102 (10). Available online: https://doi.org/dx.doi.org/10.1094/pdis-02-18-0288-pdn Van der Gaag D & Meffert J, 2013. Pest Risk Assessment for Phytophthora lateralis. Netherlands Food and Consumer Product Safety Authority. Available online: https://english.nvwa.nl/documents/plant/plant-health/pest-risk-analysis/documents/pest-risk-analysis-phytophthora-lateralis Webber J, 2022. Rapid Pest Risk Analysis (PRA) for: Phytophthora pluvialis. Department for Environment Food & Rural Affairs.

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		WUR, year?-a. Tree factsheet Larix kaempferi (Lambert) Carriére Wageningen University. Available online: https://www.wur.nl/upload_mm/5/3/e/e44a45e0-21bc-4a54-9860-98b8713cc7d6_larkaef.pdf WUR, year?-b. Tree factsheet Tsuga heterophylla (Rafinesque) Sargent Wageningen University. Available online: https://www.wur.nl/upload_mm/b/8/5/09e324b4-44b9-4393-9397-bd5989f479a4_tsuhetf.pdf
15.	**Summary and conclusions**	• This Quick scan was prompted by the first report of *Phytophthora pluvialis* in the EU (in Belgium) in 2024. • The species is probably native to North-Western USA and has been introduced into New Zealand, the United Kindom (UK) and Belgium. In the UK, *P. pluvialis* was reported for the first time in 2021. • Known host plants are *Larix kaempferi, Notholithocarpus densiflorus, Pinus patula, Pinus pinea, Pinus radiata, Pinus strobus, Pseudotsuga menziesii* and *Tsuga heterophylla.* • *Phytophthora pluvialis* can likely establish in parts of the EU including the Netherlands. *Phytophthora pluvialis* has probably already established in parts of Belgium and may have a wider distribution in Europe than currently known. • Frequent rainfall and high relative humidies are favourable for establishment and spread of the pathogen. Coastal areas that have been assessed to be favourable for the development of other tree affecting *Phytophthora* species that can spread by fog and wind-driven rain (*P. ramorum, P. kernoviae* and *P. lateralis*) may also be favourable for *P. pluvialis.* A more detailed assessment is needed to assess the potential area of distribution in the EU and the endangered area. • *Phytophthora pluvialis* can cause various symptoms of which needle cast is most common. Infection can lead to growth reduction of the tree. • In NL, at least 10% of the forest area is covered by susceptible conifer species. The potential impact of *P. pluvialis* is, however, uncertain. It is assessed to be lower than for the UK because of less favourable climatic conditions and the absence of symptoms in the two trees found infected in Belgium (neighbouring country). However, winters are expected to become milder and more humid due to climate change making the conditions more favourable for *P. pluvialis.* The potential impact of *P. pluvialis* may, therefore, increase in the future.
16.	**Follow-up measures**	None, in view of the occurrence of *P. pluvialis* in Belgium, the uncertainty on its potential impact and lack of feasible measures to eradicate or contain the organism once it is present in forests or nature reserves.