Mini data sheet on *Neonectria neomacrospora*

Added to the EPPO Alert List in 2017 – Deleted in 2021

Reasons for deletion:
Neonectria neomacrospora has been included in EPPO Alert List for more than 3 years and during this period no particular international action was requested by the EPPO member countries. In 2021-06, the Working Party on Phytosanitary Regulations agreed that it could be deleted, considering that sufficient alert has been given.

Why: since 2008, a new and severe canker disease caused by *Neonectria neomacrospora* (anamorph *Cylindrocarpon cylindroides*) has been observed on firs (*Abies* spp.) in Norway. In 2011, the same disease was also found in Denmark causing damage on fir trees. The fungus was detected in Southern Sweden in 2014, in Belgium and France in 2017, in Finland and Germany in 2018. The Panel on Quarantine Pests for Forestry recommended that *N. neomacrospora* is added to the EPPO Alert List.

Where: the geographical distribution of *N. neomacrospora* remains to be clarified and it is not entirely clear whether this is a recently emerging fungus in Europe or a re-emerging one. According to the literature, cankers caused by this fungus have probably been observed in North America on *A. balsamea* as early as the 1930s. However, there is very little information about the current situation of this fungus in North America. In Europe, there are some old records of its presence. In Norway, when the herbarium specimen of the fungus recorded in 1951 under the name *Nectria cucurbitula* on *Abies alba, A. balsamea, A. concolor* and *A. nordmanniana* was re-examined in 1962, it was found to be identical to *Nectria cucurbitula* var. *macrospora* (= *N. neomacrospora*). The anamorph *Cylindrocarpon cylindroides* was first described from grafted *A. concolor* in a German nursery more than 100 years ago, but until recently there was no indication that a canker disease occurred in Germany. In this country, symptoms of a canker disease were observed in 2013 on *A. concolor* by scientists, but the presence of *N. neomacrospora* could only be confirmed in 2018. The fungus was also detected for the first time in Belgium on *Abies grandis* saplings (Luxembourg province) in 2017, and in Finland in 2018. In Asia, *N. neomacrospora* was first found in 2014 in the province of Hubei in China.**EPPO region**: Belgium, Denmark, Finland, France, Germany, Norway, Sweden, United Kingdom.
North America: Canada (British Columbia), USA (Oregon, Washington).
Asia: China (Hubei).

On which plants: *N. neomacrospora* has been reported on many *Abies* species, such as: *A. alba* (European silver fir), *A. amabilis* (Pacific silver fir), *A. balsamea* (balsam fir), *A. balsamea* var. *phanerolepis* (Canaan fir), *A. cephalonica* (Greek fir), *A. concolor* (white fir), *A. durangensi*s, *A. fargesi*i (Farges's fir), *A. fraseri (Fraser fir), A. grandis* (grand fir), *A. kawakamii* (Taiwan fir), *A. koreana* (Korean fir), *A. lasiocarpa* (subalpine fir), *A. magnifica* (Californian red fir), *A. nebrodensis* (Sicilian fir), *A. nordmanniana* (Nordmann fir), *A. nordmanniana* subsp. *equitrojani* (Turkish fir), *A. numidica* (Algerian fir), *A. pinsapo* (Spanish fir), *A. procera* (noble fir), *A. sibirica* (Siberian fir), *A. vejarii*. It has also occasionally been found on *Picea abies* (Norway spruce), *Pseudotsuga menziesii* (Douglas fir), and *Tsuga heterophila* (Western hemlock).

Damage: symptoms are characterized by dead shoots and branches, cankers, branch dieback and heavy resin flow. Under humid conditions, characteristic red perithecia with ascospores (sexual stage) develop on plant material that has been dead for some time (usually more than 1 year). These red fruiting bodies are usually observed in the lower part of the crown and close to the trunk. Conidia from the asexual state (*C. cylindroides*) can also form on

infected bark in humid conditions. In Denmark and Norway, tree mortality has been observed on *Abies* spp. in landscape plantings, Christmas tree production fields, and forest stands. Studies conducted in Denmark from 2011 to 2014 on 3 trial sites planted with different provenances of *A. lasiocarpa* have shown that damage has increased significantly. In surveyed sites, the proportion of damaged trees increased from 40% in 2011 to 80% in 2014, and approximately 60% of the trees were seriously damaged. In these studies, it is noted that damage caused by *N. neomacrospora* was so serious that all *A. lasiocarpa* provenances from Southern USA included in the trial were rated as unsuitable for Christmas tree production in Denmark.

Dissemination: ascospores are airborne and can spread over long distances. Conidia from the asexual state (*Cylindrocarpon cylindroides*) can be spread from tree to tree by rain splashes and physical contact between trees. *N. neomacrospora* is considered to be seed borne, and it has been hypothesized that the fungus has been introduced into Europe via infected seeds.

Pathway: plants for plantings, seeds, Christmas trees, cut branches? of *Abies* species and other conifer hosts from countries where the fungus occurs.

Possible risks: *Abies* species are widely grown in the EPPO region for forestry and ornamental purposes, including the production of Christmas trees (e.g. *A. nordmanniana* and *A. lasiocarpa*). *N. neomacrospora* has recently caused severe outbreaks in Denmark and Norway on *Abies* spp. trees, leading to reduced tree quality and in some cases to tree mortality. *N. neomacrospora* can attack a very large number of *Abies* species and subspecies. In nurseries of Christmas tree plantations, some control measures have been recommended (destruction of diseased plants, chemical treatments) but these cannot be applied in forest stands. Studies have been initiated in Denmark to identify resistant or tolerant *Abies* species and subspecies, but the moment no positive results have been obtained. The epidemic levels which have been observed in Denmark and Norway, as well as the high number of *Abies* species susceptible to this fungus, indicate that attention should be paid to *N. neomacrospora* in the cultivation of *Abies* species.

Sources

Booth C, Samuels GJ (1981) *Nectria neomacrospora* nom. nov., a new name for *Nectria macrospora* (Wollenweber) Ouellette. *Transactions of the British Mycological Society* 77, 645-645.

Brodal G, Rosøk HB, Høst E, Talgø V (2015) Seed-borne fungi on Christmas trees. Abstract of a paper presented at the 12th International Christmas Tree Research and Extension Conference (Honne, NO, 2015-09-06/11), p 37. http://www.bioforsk.no/ikbViewer/Content/122898/NIBIO_BOOK_1(1)_2ed.pdf

Brurberg MB, Stensvand A, Talgø V (2015) Development and application of a PCR-based test for the identification of *Neonectria neomacrospora* damaging *Abies* species. Abstract of a paper presented at the 12th International Christmas Tree Research and Extension Conference (Honne, NO, 2015-09-06/11), p 34. http://www.bioforsk.no/ikbViewer/Content/122898/NIBIO_BOOK_1(1)_2ed.pdf

Chastagner G, Talgø V, Riley K (2014) Neonectria canker on true fir in western USA. *The International Forestry Review* **16**(5), p 345.

Chaverri P, Salgado C, Hirooka Y, Rossman AY, Samuels GF (2011) Delimitation of *Neonectria* and *Cylindrocarpon* (Nectriaceae, Hypocreales, Ascomycota) and related genera with *Cylindrocarpon*-like anamorphs. *Studies in Mycology* **68**, 57-78.

Heydeck P, Merkel R, Dahms C, Hielscher K (2018) [New damages on *Abies concolor* in the northeastern German lowlands]. *Julius-Kühn-Archiv* **461**, 115-116 (in German).INTERNET

Forest Research.

- *Neonectria* canker of *Abies*. https://www.forestry.gov.uk/fr/neonectria
- *Neonectria* canker of *Abies*. Pathology Advisory Note 16. https://www.forestry.gov.uk/pdf/Path_Note_16_Neonectria.pdf/$file/Path_Note_16_Neonectria.pdf
- UK Disease Threats by Ana Perez-Sierra. Presentation made at the Wales Tree Health Seminars 2016. https://naturalresources.wales/media/680039/ukdisease-threats-presentation-

2016.pdfPettersson M, Frampton J, Rönnberg J, Talgø V (2016) Neonectria canker found on spruce and fir in Swedish Christmas tree plantations. *Plant Health Progress*. doi:10.1094/PHP-BR-16-0017

Nielsen KN, Thomsen IM, Hansen OK (2019) Direct quantitative real-time PCR assay for detection of the emerging pathogen *Neonectria neomacrospora*. *Forest Pathology*, e12509. https://doi.org/10.1111/efp.12509

NPPO of Finland (2018-06).

NPPO of France (2018-05).

NPPO of Germany (2018-11).

Rietman LM, van der Kamp BJ, Shamoun SF (2005) Assessment of *Neonectria neomacrospora* (anamorph *Cylindrocarpon cylindroides*) as an inundative biocontrol agent against hemlock dwarf mistletoe. *Canadian Journal of Plant Pathology* **27**(4), 603-609.

Schmitz S, Charlier A, Chandelier A (2017) First report of *Neonectria neomacrospora* on *Abies grandis* in Belgium. *New Disease Reports* **36**(17). http://dx.doi.org/10.5197/j.2044-0588.2017.036.017

Skulason B, Hansen OK, Thomsen IM, Talgø V, Nielsen UB (2016) Damage by *Neonectria neomacrospora* and *Adelges piceae* in provenance trials of subalpine fir (*Abies lasiocarpa*) in Denmark. *Forest Pathology*. DOI: 10.1111/efp.12326

Talgø V, Brurberg MB, Stensvand A (2009) *Neonectria* canker on true fir and spruce in Norway. *Proceedings of the 9th International Christmas Tree Research and Extension Conference* (Corvallis, Puyallup, US, 2009-09-13/18), 58-62.

Talgø V, Fløistad IS (2015) Management of diseases in Norwegian Christmas tree fields. Abstract of a paper presented at the 12th International Christmas Tree Research and Extension Conference (Honne, NO, 2015-09-06/11), p 44. http://www.bioforsk.no/ikbViewer/Content/122898/NIBIO_BOOK_1(1)_2ed.pdf

Talgø V, Thomsen IM, Nielsen UB, Brurberg MB, Stensvand A (2011) *Neonectria* canker on subalpine fir (*Abies lasiocarpa*) in Denmark. *Proceedings of the 10thInternational Christmas Tree Research and Extension Conference* (Eichgraben, AT, 2011-08-21/27), 92-96.

Talgø V, Thomsen IM, Nielsen UB, Brurberg MB, Stensvand A (2011) Neonectria canker on subalpine fir (*Abies lasiocarpa*) in Denmark. Poster available from Bioforsk (NO) website: http://www.bioforsk.no/ikbViewer/Content/100752/Neonectria_VT_v1.1_A3.pdf

Talgø V, Thomsen IM, Nielsen UB, Brurberg MB, Stensvand A (2011) *Neonectria* canker on subalpine fir (*Abies lasiocarpa*) in Denmark. *Proceedings of the 10th International Christmas Tree Research and Extension Conference* (Eichgraben, AT, 2011-08-21/27), 92-96.

Talgø V, Thomsen IM, Nielsen UB, Brurberg MB, Stensvand A, Cech T (2011) [New species of *Neonectria* as a cause of cankers on true firs (*Abies* spp.) in Scandinavia]. *Forstschutz Aktuell* **54**, 33-37 (in German). http://bfw.ac.at/400/pdf/fsaktuell_54_8.pdf

Talgø V, Thomsen IM, Ravn HP (2013) [*Neonectria* canker II. Host plants and interaction with insects]. Københavns Universitet. Skov ; Landskab. Videnblade Pyntegrønt 5.6-26 (in Danish). http://www.skovdyrkerne.dk/uploads/media/Neonectria_2.pdf

Talgø V, Thomsen IM, Stensvand A (2013) A *Neonectria* canker has become a serious problem on true fir in Norway and Denmark. IUFRO Work Unit 2.02.09 *Christmas Tree Newsletter* **5**(1), 7-9.

Thomsen IM, Strømeng GM, Talgø V (2013) [*Neonectria* canker I. Biology and epidemiology]. Københavns Universitet. Skov ; Landskab. Videnblade Pyntegrønt 5.6-25 (in Danish). http://www.skovdyrkerne.dk/uploads/media/Neonectria_1.pdf

Thomsen IM, Talgø V (2013) [*Neonectria* canker III. Symptoms and control]. Københavns Universitet. Skov ; Landskab. Videnblade Pyntegrønt 5.6-27 (in Danish). http://www.skovdyrkerne.dk/uploads/media/Neonectria_3.pdf

Thomsen IM, Talgø V (2015) *Neonectria neomacrospora* has caused severe damage on true fir (Abies spp.) in Denmark. Abstract of a paper presented at the 12th International Christmas Tree Research and Extension Conference (Honne, NO, 2015-09-06/11), p 33. http://www.bioforsk.no/ikbViewer/Content/122898/NIBIO_BOOK_1(1)_2ed.pdf

Thomsen IM, Xu J, Talgø V (2015) Inoculation experiments with *Neonectria neomacrospora* on *Abies nordmanniana*. Abstract of a paper presented at the 12th International Christmas Tree Research and Extension Conference (Honne, NO, 2015-09-06/11), p 35. http://www.bioforsk.no/ikbViewer/Content/122898/NIBIO_BOOK_1(1)_2ed.pdf

Xu J, Nielsen UB, Talgø V, Thomsen IM, Hansen OK (2015) Effects of different factors on *Neonectria neomacrospora* infection on cut *Abies nordmanniana* branches. Abstract of a poster presented at the 5th International Workshop on the genetics of tree-parasite interactions (Orléans, FR, 2015-08-23/28). https://belinra.inra.fr/doc_num.php?explnum_id=1029

Zeng ZQ, Zhuang WY (2016) Three new Chinese records of Nectriaceae. *Mycosystema* 35(11), 1399-1405.

EPPO RS 2013/234, 2017/120, 2017/139, 2018/016, 2018/121, 2018/146, 2019/058, 2019/092