

Express PRA for *Raffaelea canadensis* - Research and Breeding -

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Initiation: Application for an Express-PRA by the Federal State Lower Saxony resulting from a request for a special authorisation for the movement and use of the organism for research and breeding purposes.

Express PRA	<i>Raffaelea canadensis</i> L. R. Batra		
Phytosanitary risk for Germany	high <input type="checkbox"/>	medium <input type="checkbox"/>	low <input checked="" type="checkbox"/>
Phytosanitary risk for EU Member States	high <input type="checkbox"/>	medium <input type="checkbox"/>	low <input checked="" type="checkbox"/>
Certainty of the assessment	high <input type="checkbox"/>	medium <input checked="" type="checkbox"/>	low <input type="checkbox"/>
Conclusion	<p>The Ambrosia fungus <i>Raffaelea canadensis</i> presumably is endemic to North America and according to current knowledge, it does not occur in Germany. The only known occurrence in Europe is in Portugal. So far, it is listed neither in the Annexes of the Regulation (EU) 2019/2072 nor by EPPO.</p> <p>So far, <i>R. canadensis</i> was detected in conifers, avocado plants and cork oaks. There was an indication on potential damage by the fungus once on an avocado tree in California and in cork oaks in Portugal. It is currently still unclear whether the fungus should actually be regarded as the causative agent of a plant disease.</p> <p>Due to appropriate climatic conditions, it is assumed that <i>R. canadensis</i> can establish outdoors in Germany. The establishment in southern European Member States is possible and at least in Portugal, did already happen.</p> <p>According to the current state of knowledge, the damage potential of <i>R. canadensis</i> is low and it poses no phytosanitary risk for Germany and other EU-Member States.</p> <p>Based on this risk analysis, it is assumed that <i>R. canadensis</i> can establish in Germany or another Member State. No significant damage is to be expected.</p> <p>Thus, <i>R. canadensis</i> is not classified as a quarantine pest and accordingly, Article 29 of the Regulation (EU) 2016/2031 does not apply. Currently, the damage potential of the fungus is not completely clarified and thus, measures on the prevention of the release should be recommended, including the application of good laboratory practices like the inactivation of the pathogen after the completion of the trials.</p>		
Pre-conditions for PRA fulfilled?	Could be a pest, is not listed; so far, it is not established in the area covered by the reporting plant protection service.		

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Taxonomy, common name, synonyms	Kingdom: Fungi; Phylum: Ascomycota; Order: Ophiostomatales; Family: Ophiostomataceae; Species: <i>Raffaelea canadensis</i> L.R. Batra 1967; Synonyms: <i>Tuberculariella ambrosiae</i> A. Funk 1965; <i>Ambrosiella sulcati</i> A. Funk 1970
Does a relevant earlier PRA exist?	No
Distribution and biology	<p>The genus <i>Raffaelea</i> comprises mainly species that are associated with Ambrosia beetles and develop in dead bark or wood (saprophytes). Additionally, the genus contains plant pests (GONTHIER & NICOLOTTI, 2013). Currently, no teleomorphs (fruiting body form) are known for the species of the genus (DE BEER et al., 2013). Ambrosia beetles breed species-specific fungi in their boreholes that decompose the dead wood. The adult beetles carry the fungus spores in special glandular skin sacs (mycetangia). The beetles maintain the fungi by influencing the air humidity and removal of inappropriate fungi. The larvae of the beetles feed the fungi. The bore galleries of beetles and larvae reach into the core-wood (SCHNEIDER, 1991). The host plant range and the distribution of the fungi are linked to the host plant range of the associated beetles. The beetles do not necessarily have to be associated with the same fungi in their complete distribution area.</p> <p><i>R. canadensis</i> was described in Canada (British Columbia) for the first time. There, the fungus lives in a symbiosis with the Ambrosia beetle <i>Treptoplatypus wilsoni</i> (family Platypodidae, pinhole borer) that occurs on Coniferales like <i>Pseudotsuga menziesii</i> (BATRA, 1967), <i>Abies</i> sp., <i>Picea</i> sp., <i>Pinus</i> sp. and <i>Tsuga</i> sp. The beetle is endemic to Canada and the USA (ATKINSON, 2019). So far, damage to healthy conifers by the beetle or the fungus is not known..</p> <p>The Ambrosia beetle <i>Gnathotrichus sulcatus</i> (family Scolytidae) lives in symbiosis with <i>R. canadensis</i>, too, and is endemic to the USA, Canada and Central America. The beetle is seen as a severe pest on raw wood, sawn wood and dunnage. It infests wood of the families Pinaceae, Cupressaceae and Taxodiaceae. The estimated yearly losses through the beetle amount to 95-189 million Canadian Dollar. The beetle is regulated in Regulation (EU) 2019/2072 as a non-European Scolytidae (CABI, 2018). Normally, this beetle does not infest living trees.</p> <p>The oak pinhole borer <i>Platypus cylindrus</i> is endemic to Europe and a vector for <i>R. canadensis</i>. The distribution of the beetle ranges over Eurasia including the Mediterranean region to the African continent (SOUSA & INÁCIO, 2005). Host plants for <i>P. cylindrus</i> mainly are oaks (<i>Quercus</i> sp.), but it was also found on walnut, beech, ash, elm and wild cherry.</p>

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	<p>So far, the transmission of <i>R. canadensis</i> to cork oaks (<i>Quercus suber</i>) by the beetle is known only from Portugal. Under laboratory conditions, after artificial inoculation with <i>R. canadensis</i>, one-year-old cork oaks developed wilting symptoms in the course of 3-5 days but did not die during the trial. The connection between <i>R. canadensis</i> and the dieback of cork oaks in Portugal is not yet clear (INACIO et al., 2012). <i>Platypus cylindrus</i> mainly infests diseased or dead / felled trees. Since several years, an increased aggressiveness of <i>P. cylindrus</i> is observed on cork oaks. Also trees that are obviously healthy, get infested and may die within 1-3 years (INACIO et al., 2011). It has to be considered that cork oaks may be weakened through the removal of the cork layer for usage (SOUSA & INACIO, 2005). Furthermore, the dieback of cork oaks in Portugal that is observed since the 1980s is seen as an impact of the combination of abiotic stress, mismanagement and a resulting infestation with a manifold of pests (TIBERI et al., 2016).</p> <p>In 2010, an avocado tree (<i>Persea americana</i>) infested with <i>R. canadensis</i> was found in California (USA). It showed typical symptoms of the laurel wilt. So far, only the fungus <i>Raffaelea lauricola</i> was known as the cause for the laurel wilt. Presumably, the vector is the beetle <i>Xyleborus glabratus</i> that was introduced to the USA from Asia (ESKALEN & McDONALD, 2011).</p> <p>In South Africa, the fungus was found in association with the beetle <i>Platypus externedentatus</i> (HARRINGTON et al., 2010).</p>
<p>Are host plants present in the PRA area? If so, which?</p>	<p>The establishment of the fungus would be possible in dead conifers in Germany and Europe.</p> <p>In Portugal and Spain, cork oaks are used commercially for the production of cork and are an important component of natural habitats.</p> <p>In total, app. 12,000 hectares of avocados are cultivated in the EU. In 2017, in Spain 11812 ha, in Greece 309 ha, in France 242 ha and in Cyprus 86 ha were cultivated (FAOSTAT, 2019).</p> <p>The host plant range of the fungus is linked to its vectors. Presumably, further potential host plants are widely distributed in the EU.</p>
<p>Is a vector/further plant needed for host alternation? If so, which? Distribution?</p>	<p>Beetles of the families Platypodidae and Scolytidae transmit and maintain the fungus.</p>
<p>Climate in distribution area comparable to PRA-area?</p>	<p>The known distribution area indicates a very high climatic tolerance of <i>R. canadensis</i>. It is assumed that the climatic conditions in great parts of Germany and the EU are appropriate for the establishment.</p>

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If no, are host plants present in protected cultivation?	Occasionally, avocado trees are maintained in tropical greenhouses and private households.
Damage to be expected in the PRA area?	<p>No significant damage caused by <i>R. canadensis</i> has to be expected in Germany. Although a corresponding vector would be available with <i>Platypus cylindrus</i>, the endemic population of this beetle does not show any significant aggressiveness towards living trees. Thus, the transmission of the fungus to healthy trees seems unlikely. So far, there is no information on damage to conifers caused by <i>R. canadensis</i>.</p> <p>In Central Europe, cork oaks are not winter-hardy. The fungus did already establish in Portugal. Currently, the dramatic dieback of cork oaks in Portugal is ascribed to a complex of abiotic and biotic factors. <i>R. canadensis</i> is not the only trigger of the complex disease but could be a favourable factor.</p> <p>The cultivation of avocados is of low economic importance in the EU.</p>
Remarks	<p>In case of the introduction of aggressive vectors, damage on living plants cannot totally be ruled out.</p> <p>There are no comprehensive investigations on the actual distribution of the fungus.</p>
Literature	<p>ATKINSON, T. H., 2019: Bark and Ambrosia Beetles of North and Central America. – <i>Treptoplatypus wilsoni</i>. https://www.barkbeetles.info/regional_chklist_target_species.php?lookUp=383 (Last revision 21-06-2019, accessed on: 02-07-2019)</p> <p>BATRA, L. R., 1967: Ambrosia Fungi: A Taxonomic Revision, and Nutritional Studies of Some Species. <i>Mycologia</i>, 59(6), 976–1017. doi:10.1080/00275514.1967.12018485</p> <p>CABI, 2018: Datasheet <i>Gnathostrichus sulcatus</i> (western hemlock wood stainer). CABI Crop Protection Compendium. https://www.cabi.org/cpc/datasheet/25504 (Last revision 14-06-2018; accessed on: 04-07-2019)</p> <p>DE BEER, Z. W., K. A. SEIFERT, M. J. WINGFIELD, 2013: A nomenclator for ophiostomatoid genera and species in the <i>Ophiostomatales</i> and <i>Microascales</i>. <i>Biodiversity Series</i> 12, 245-322.</p> <p>ESKALEN, A., V. McDONALD, 2011: First Report of <i>Raffaelea canadensis</i> causing Laurel Wilt Disease Symptoms on Avocado in California. <i>Plant Dis.</i> 95(9). doi: 10.1094/PDIS-03-11-0203</p> <p>FAOSTAT, 2019: Crops. Food and Agriculture Organization of the United Nations. http://www.fao.org/faostat/en/#data/QC (accessed on: 02-07-19)</p>

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