Express – PRA[1)] zu *Phytophthora chrysanthemi* – Occurrence –

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Initiation: Occurrence on Chrysanthemums in a horticultural enterprise in cultivation under glass in Hesse.

Express-risk analysis (PRA)	***Phytophthora chrysanthemi* Naher M, Watanabe, H., Chikuo, Y., & Kageyama K**		
Phytosanitary risk for Germany	**high** ☒	**medium** ☐	**low** ☐
Phytosanitary risk for EU-MS	**high** ☒	**medium** ☐	**low** ☐
Certainty of Assessment	**high** ☐	**medium** ☒	**low** ☐
Conclusion	The oomycete was described in Japan for the first time. It does not yet occur in Germany. To date, within the EU, it was only detected in Croatia. Up to now it is neither listed in the Annexes of Dir. 2000/29/EC nor at EPPO. *Phytophthora chrysanthemi* infests Chrysanthemums. It is assumed that *P. chrysanthemi* would be able to establish in glasshouses in Europe and in the case of suitable climatic conditions possibly also outdoors as demonstrated by the detection in Croatia. Due to its high damage potential for Chrysanthemums *P. chrysanthemi* poses a considerable phytosanitary risk for Germany and other EU-Member States. Based on this risk analysis, it can be assumed that the pest could establish in Germany or another Member State and would be able to cause severe damage on Chrysanthemums. Hence, measures for the prevention of further introduction of this potential quarantine pest should be met according to § 4a of the Plant Inspection Order. The infestation must be eradicated according to § 4a of the Plant Inspection Order.		
Taxonomy[2)]	Chromista, Pseudofungi, Oomycetes, Peronosporales, Peronosporaceae, *Phytophthora*		
Trivial name	--		
Synonyms	--		
Does a relevant earlier PRA exist?	No		
Biology	Was isolated in Japan from stem and root rot of Chrysanthemum. The species has non-papillary sporangiospores which are able to proliferate internally after having been discharged. *P. chrysanthemi* forms chlamydospores and oospores as permanent organs. The species is homothallic. *Phytophthora chrysanthemi* is thermopile with an optimal growth at 30°C on V8-juice-agar-medium. The oomycete even grows at 35°C (Naher et al., 2011) and thus belongs to a small cluster of *Phytophthora*-species in Clade 9 which are called „high temperature tolerant“(Yang et al., 2014). Chrysanthemum plants which were inoculated with the isolates in pathogenity tests developed lesions on the stem and		

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	the roots within 3 days. Finally, the identity of the pathogen was verified via the re-isolation of lesions of infested plants. Details on the German *P. chrysanthemi*-isolate: Götz et al. (2017)
Is the pest a vector?[3)]	No
Is a vector needed?[4)]	No
Host plants	Chrysanthemums
Symptoms[5)]	*Phytophthora chrysanthemi* causes stem and root rot of Chrysanthemums. The initial symptoms in Croatia were growth retardation and deterioration; the infested plants were significantly shorter than healthy plants (Tomic and Ivic, 2015). Severe damage by *P. chrysanthemi* was observed in some of the surveyed greenhouses and a high infectious potential of this oomycete can be considered as certain (Tomic and Ivic, 2015). Naher et al. (2011) observed stem and root rot as well on Chrysanthemums for cut flowers as on Chrysanthemums which were cultivated in hydroponics. Different extents of damage were reported for the Chrysanthemum varieties which were used for the testing of Koch-postulates: all were infested and showed symptoms but the spreading speed of the infection within the plant varied between the three tested varieties. Infested parts turned black and wilted, followed by the dying of the plants (Naher et al., 2011).
Presence of the host plants in Germany[6)]	Yes, Chrysanthemums are present in glass houses and in gardens and parks.
Presence of the host plants in the MS[7)]	Yes, Chrysanthemums are present in glass houses and in gardens and parks.
Known infested areas[8)]	Japan, prefectures Gifu and Toyama (Naher et al. 2011), Croatia (Tomic and Ivic, 2015), USA (NPAG-Report, 2016).
Pathways[9)]	The introduction can happen via any plant material of Chrysanthemums.
Natural spread[10)]	Natural spread via soil, water and plant material, presumably rarely via air.
Expected establishment and spread in Germany[11)]	This pathogen is tolerant to high temperatures. It was detected in the glass house production of cut flowers (Japan), in hydroponics (Japan; Naher et al., 2011) and in Chrysanthemums which were cultivated in soil in plastic covered production systems (Croatia; Tomic and Ivic, 2015). In Germany, an establishment can be expected mainly in glass houses, at suitable climatic conditions possibly also outdoors, as demonstrated by the detection in Croatia.
Expected establishment and spread in the MS[12)]	See Germany
Known damage in infested areas[13)]	*Phytophthora chrysanthemi* causes stem and root rot on Chrysanthemums and may lead to non marketable plants and also to the dying of the plants, with corresponding market deficit (Naher et al., 2011, Tomic und Ivic, 2015).

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Limitation of the endangered area in Germany	Glass houses
Expected damage in the endangered area in Germany[14)]	Chrysanthemums are sold as cut flowers, pot plants and garden plants and are valuable ornamentals. Damaging of crops, impacts on the export.
Expected damage in the endangered area in the MS[15)]	See Germany
Control feasibilities and measures[6)]	Use of proofed healthy propagation and planting material, strict hygiene in the company; disinfection of contaminated irrigation and excess water, no re-use of contaminated substrate/soil, application of fungicides in consultation with the local Plant Health Service (development of resistance must strictly be avoided).
Detection and diagnosis[17)]	The symptoms can be visually recognized, as observed in Croatia and Japan. However, it can be distinguished between different *Phytophthora*-species or other pathogens that cause similar symptoms, as e.g. *Pythium* spp., *Fusarium* spp., or *Rhizoctonia* spp. (Tomic und Ivic, 2015). Clear detection is possible by means of micro-biological and molecular-biological methods in laboratory.
Remarks	---------
Literature	Erwin, D. C., and O. K. Ribeiro. 1996. Phytophthora Diseases Worldwide. APS Press, St. Paul, MN. 562 pp. Götz M, Ulrich R, Werres S, 2017. First detection of Phytophthora chrysanthemi on Chrysanthemum indicum in Germany. New Disease Reports 35, 6. http://www.ndrs.org.uk/article.php?id=035006 (Website accessed on 10 February, 2017.) Naher, M., K. Motohash, H. Watanabe, Y. Chikuo, M. Senda, H. Suga, C. Brasier, and K. Kageyama. 2011. *Phytophthora chrysanthemi* sp. nov., a new species causing root rot of chrysanthemum in Japan. Mycological Progress 10:21-31. NPAG Report. 2016. *Phytophthora chrysanthemi* Naher, Hi. Watan., Chikuo & Kageyama: Crown and root rot of chrysanthemum. New Pest Advisory Group. http://www.canr.org/newsletter/PhytophthorachrysanthemiNPAGReport20160401R.pdf (Website accessed on 5 January, 2016). Tomic, Z., and D. Ivic. 2015. *Phytophthora chrysanthemi* Naher, Motohash, Watanabe, Chikuo, Senda, Suga, Brasier & Kageyama - new cause of chrysanthemum disease in Croatia. Glasilo biljne zaštite 15(4):291-300. Yang, X., M. E. Gallegly, and C. X. Hong. 2014. A high-temperature tolerant species in clade 9 of the genus *Phytophthora*: *P. hydrogena* sp nov. Mycologia 106(1):57-65.

Explanation

[1)] Compilation of the most important and directly available information that renders possible a first preliminary evaluation of the phytosanitary risk. This short evaluation is necessary for the decision on a notification to EU and EPPO as well as the preparation of a complete risk analysis, to inform the countries and as the basis for the possible initiation of eradication measures. In the case of phytosanitary risk especially the possibility of the introduction and spread in Germany and in the Member States as well as possible damage are taken into account.

[2)] Taxonomic classification - also subspecies - as the case may be; in the case that the taxonomic classification is uncertain the JKI-scientist initiates the taxonomic classification as far as possible.

[3)] If so, which organism (organisms) is (are) transmitted and does it (do they) occur in Germany / the MS?

[4)] If so, which organism serves as a vector and does it occur in Germany/ the MS?

[5)] Description of the pattern of damage and the strength of the symptoms/damage on the different host plants

[6)] Appearance of the host plants in protected cultivation, open field, public gardens, forest,....; where, in which regions do the host plants appear and to which extent?
How important are the host plants (economic, ecological, ...)?

[7)] Appearance of the host plants in protected cultivation, open field, public gardens, forest,....; Where, in which regions do the host plants appear and to which extent?
How important are the host plants (economic, ecological, ...)?, possible origin

[8)] f. e. acc. to CABI, EPPO, PQR, EPPO Datasheets

[9)] Which ways of introduction and pathways are known for the pest and how important are they for the probability of introduction. Primarily the transport of the pest over long distances is meant, normally with infested traded plants, plants products or other contaminated articles. This does not comprise the natural spread resulting from introduction.

[10)] Which pathways are known for the pest and of which relevance are they in respect of the probability of the spread? In this case the natural spread resulting from introduction is meant.

[11)] under the given/prevalent environmental conditions

[12)] under the given /prevalent environmental conditions (domestic areas and areas of introduction)

[13)] Description of the economic, ecological /environmental relevant and social damage in the area of origin resp. areas of occurrence up to now

[14)] Description of the economic, ecological /environmental relevant and social damage to be expected in Germany, as far as possible and required, differentiated between regions

[15)] Description of economic, ecological/ environmental relevant and social damage to be expected in the EU / other Member States, as far as possible and required, differentiated between regions

[16)] Can the pest be controlled? Which possibilities of control are given? Are plant health measures conducted in respect to this pest (in the areas of its appearance at present resp. by third countries)?

[17)] Description of possibilities and methods of detection. Detection by visual inspections? Latency? Uneven distribution in the plant (sampling)?