Express – PRA[1)] zu *Puccinia psidii*

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Initiation: Occurrence in Baden-Württemberg

Express - PRA	***Puccinia psidii* (Winter, 1884)**		
Phytosanitary Risk for Germany	**high** ☐	**medium** ☐	**low** ☒
Phytosanitary Risk for EU-MS	**high** ☒	**medium** ☐	**low** ☐
Certainty of Assessment	**high** ☐	**medium** ☐	**low** ☒
Conclusion	The fungus *Puccinia psidii* did not occur in Germany and the European Union until now. The spores of the fungus can be spread widely by anemochory. Spread is also possible via adherent spores on vehicles, tools and persons. Presumably, its host range comprises the complete family of the Myrtaceae. From this family only myrtle (*Myrtus communis*) is endemic in the Mediterranean region. Up to now the pest is neither listed in the annexes of Directive 2000/29/EC nor on EPPO lists, but was on the EPPO Alert List from 1998 to 2003. In Germany plants of the genus of this family are of minor importance as potted plants. The expected damage in case of spread is limited to the dieback or a reduced marketing ability of ornamentals of the family Myrtaceae, f. e. myrtle, Callistemon (bottle brush), Eucalyptus. Eucalyptus is cultivated on the Iberian peninsula, in France, Morocco and Italy on app. 1.5 M. ha for the production of cellulose. The introduction into these countries could threaten its cultivation and considerable damage could be expected. This mainly concerns nurseries and plantations of young plants. Based on this risk analysis it has to be assumed that *Puccinia psidii* is able to establish in other Member States and cause considerable damage. Measures on the control and on the prevention of introduction of *P. psidii* should be met according to § 4a of the German Plant Inspection Order (PBVO), as f. e. the eradication of infested plants without the release of spores.		
Taxonomy[2)]	Fungi: Basidiomyceten: Uredinales (rust)		
Trivial names	Rust of Guava, rust of Eucalyptus		
Synonyms	Different names for asexual stages, f. e. *Uredo psidii, Uredo rangelii* (partly debated; Glen *et al*. 2007, Carnegie *et al*. 2010)		
Does a relevant earlier PRA exist?	Yes (EPPO, 2002; Clark, 2011).		
Biology	At first, the fungus was described on guava, later also on other species of the family Myrtaceae. Obligate parasite, forms very mobile spores which are spread by wind, rain and insects (bees). Different life cycles are assumed in which different spore forms are produced. The propagation		

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	mainly results from Uredospores, partly also Teliospores (survival form) are produced (Glen *et al.,* 2007). Optimal temperature for the mycelium growth is 15°C. First signs of the infection can be visually detected after 3 – 5 days. In the beginning brown-grey lesions appear, after 12 days the yellow pustules with Uredospores can be seen on the bottom side of the leaves. Under optimal conditions the fungus continuously produces Uredospores what might lead to a fast colonization of new areas (Ferreira, 1983, cited in Glen *et al.*, 2007). Optimal temperatures lie between 15 – 23°C. Temperature, leaf humidity, light intensity and photoperiod influence the infections (Ruiz *et al.*, 1989b, cited in Glen *et al.*, 2007). High air or leaf humidity and low light for at least 6 hours are generally considered as necessary for the germination (Ruiz *et al.,* 1989a und 1989c, cited in Glen *et al.*, 2007). Uredospores are able to stay viable up to 150 days dependent on temperature and relative air humidity. At lower temperatures and low air humidity the spores stay viable for a longer period. At temperatures of 30°C and an air humidity of 50% the life expectancy of the Uredospores is reduced to 18 days (Suzuki & Silveira, 2003). It is supposed that genetically different tribes exist. Though not much data are available up to now, the differing preferences for host plants as well as an inconsistent specificity and severity of symptoms in different areas support this thesis (Loope, 2010).
Is the pest a vector?[3)]	No
Is a vector needed?[4)]	No
Host plants	Plants of the family Myrtaceae, up to now 45 species are known. It is assumed that all species of the Myrtaceae are potential host plants (Carnegie & Lidbetter 2012, Clark 2011). However, at the moment a specialization of several mutants of the fungus is assumed, to which the different genera of the Myrtaceae react differently. (Coutinho *et al.*, 1998, Loope, 2010).
Symptoms[5)]	Lesions on young growing leaves, shoots, buds and fruits (Glen *et al.*, 2007). On Eucalyptus mainly stunted growth and increased ramification occur which hinder the marketing of the trees; in case of highly susceptible plants the infestation may lead to the dieback of the trees (Tommerup *et al.*, 2003). Also for other genera an infestation might lead to leaf deformation, defoliation of entire twigs, dying of shootings, stunted growth and possibly to the dieback of the plants (Global Invasive Species Database, 2012).
Presence of host plants in Germany[6)]	Only ornamentals (potted plants). In two locations in Germany old myrtles grow in show gardens (Hermannshof, Weinheim) and in a Botanical Garden (Wilhelma, Stuttgart).
Presence of host plants in the	The myrtle (*Myrtus communis*) is the only species of the family Myrtaceae which is common in Europe. It is endemic in the

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MS[7)]	Mediterranean region and on the Canary Islands. In the east the geographic range reaches until Central Asia. Mainly in Portugal and Spain Eucalyptus is grown on a large scale and used for the production of cellulose. In 1996, Eucalyptus covered more than 230.000 ha (Welt online, 1996) in Galicia. In 2007, there were more than one Billion Eucalyptus trees in the Northwest of the Iberian Peninsula (GIT Forestry, 2007a). In total app. 1.5 Mio. ha of Eucalyptus are grown on the Iberian Peninsula, in France, Morocco and Italy. (GIT Forestry, 2007b).
Known infested areas[8)]	Endemic in Brasilia, presumably also in other South American states, widespread in Latin and South America; in some states of the USA (Florida, California, Hawaii) and recently in Japan and Australia (Clark, 2011).
Pathways[9)]	Nursery plants, including cuttings, scions, grafts (Clark 2011). Can be spread via adherent spores on vehicles, tools and persons (Anonym, 2009).
Natural spread[10)]	The fungus forms very mobile spores which are spread via wind, rain and insects. In general, spores of rust fungi are able to cover long distances by anemochory. (Clark, 2011).
Expected establishment and spread in Germany[11)]	As the use as potted plants of currently known host plants is limited, no permanent establishment has to be expected in Germany. Presumably, the climatic conditions are not suitable (Booth & Jovanovic 2012). Spread via nursery plants cannot be completely excluded.
Expected establishment and spread in the MS[12)]	In case of the introduction into the Eucalyptus production area in the Mediterranean region, the spread and, possibly, establishment of the fungus have to be expected. A pest risk assessment of EPPO (EPPO, 2002) in 2002 concluded that the risk of the establishment of the fungus in Europe is low – for this reason the fungus was not listed by the EPPO (EPPO, 2003). New scientific findings (establishment in Japan in the prefecture Chiba on the island of Honshu (Kawanishi *et al.* 2009) and in Australia in different locations on the coast (Booth & Jovanovic 2012 – in this case also controversial opinions) as well as occurrences in California and Florida (EPPO PQR)) indicate that an establishment might be possible.
Known damage in infested areas[13)]	Very variable and dependent on the infested species. In Hawaii severe damage was detected on the non-endemic species *Syzygium jambos* whilst light infections were detected only on 5% of the endemic *Metrosideros polymorpha* (Loope, 2010). In the Seventies, an infestation in Brazil led to the total loss of Eucalyptus plantations. At the moment, in Australia a change in biodiversity is expected in case that the fungus might spread. Especially nurseries and plantations with young plants are endangered. In agriculture mainly the scope of oil production could suffer from losses due to the increasing cultivation of *Backhousia* spp., *Leptospermum* spp. and *Melaleuca* spp. for oil production (Anonym, 2009).
Limitation of the endangered	Not possible because the host plants may be present in entire

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area in Germany	Germany as potted plants.
Expected damage in the endangered area in Germany[14)]	Only minimal because of the limited occurrence of the host plants as potted plants in Germany. Nevertheless, economic damage caused by quality reduction or dieback of the potted plants in nurseries and garden centres cannot be excluded.
Expected damage in the endangered area in MS[15)]	In large areas with cultivation of Eucalyptus trees for the cellulose production, considerable economic damage is possible.
Control feasibility and measures[16)]	In case of introduction into a limited area, the eradication of infested plants seems to be successful, though caution is needed not to spread the spores. In case that plants in a large area are already infested, the use of fungicides in combination with defoliation or removal of the host plants is recommended for Australia, maybe combined with the removal of the host plants in a security zone. In case that the fungus did already establish in a large area, the eradication possibility is presumed as low. A containment of the fungus seems to be impossible (Anonym, 2009). In Australia research is done on the resistance breeding of different Eucalyptus species (Anonym, 2009).
Detection and diagnosis[17)]	A specific nested-PCR Method was described (Langrell *et al.*, 2008). Australia Plant Health issued a Contingency Plan which contains precise diagnostic requirements (Anonym, 2009).
Remarks	An estimation of expected damage in case of introduction and spread of *Puccinia psidii* is difficult because many factors are not known. It is assumed that different tribes with diverse infectivity for different host plants exist. That is why the severity of an infestation might depend on the introduced tribe. However, tribes introduced into the EU via Eucalyptus must be presumed to be highly infective on Eucalyptus. It is uncertain whether the fungus is able to establish in Europe (i. e. the Mediterranean region) – the certainty of the assessment is evaluated as „low“.
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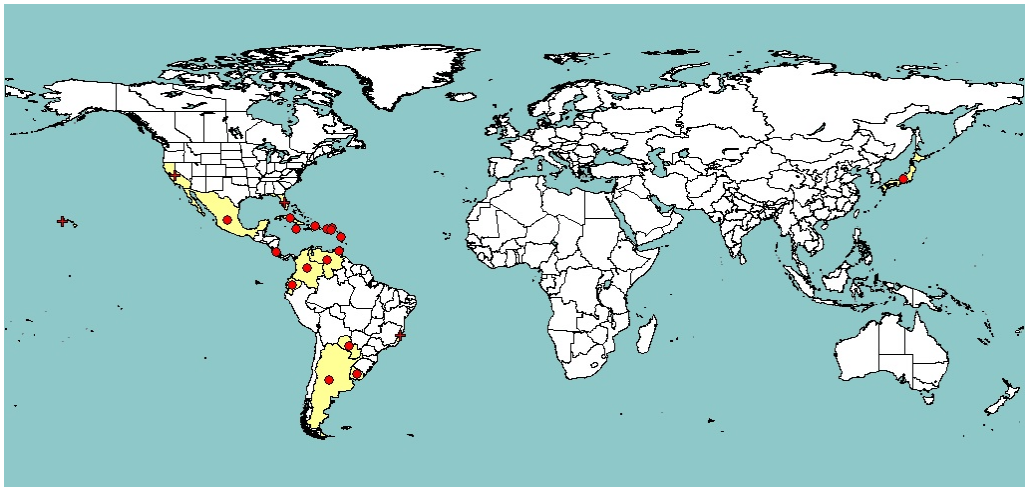

Fig. 1: Distribution map of *Puccinia psidii* [EPPO PQR]

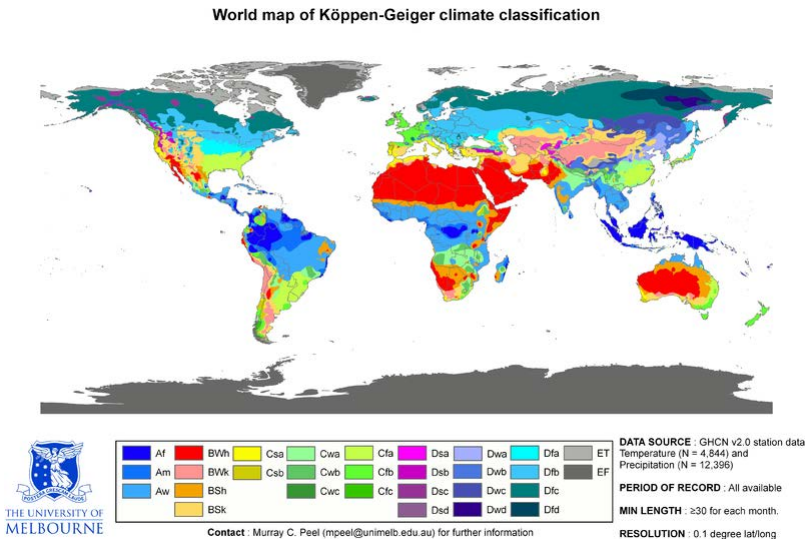

Fig. 2: Classification of the climatic zones according to Köppen-Geiger

Fig. 3: Rust spores on the underside of Eucalyptus leaves

Fig. 4: Symptoms of an infestation with *Puccinia psidii* on the upper side of the leaves

Fig. 5: Severe infestation with *Puccinia psidii* on Eucalyptus

Fig. 6: Infestation with *Puccinia psidii* on *Syzygium jambos*

Explanations

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

2) Taxonomic classification – also subspecies; in case that the taxonomical classification is uncertain the JKI-scientist initiates the taxonomic classification, as far as possible.

3) If so, which organism (which 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 severity of the symptoms/damage on the different host plants

6) Presence of the host plants in protected cultivation, open field, amenity plantings, forest.
Where, in which regions are the host plants present and to which extent?
How important are the host plants (economical, ecological,..)? Possible origin

7) Presence of the host plants in protected cultivation, open field, amenity plantings, forest, ...;
Where, in which regions are the host plants present and to which extent?
How important are the host plants (economical, ecological,..)? Possible origin

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

9) Which pathways are known for the pest and how important are they for the possibility of introduction? Primarily the transport of the pest over long distances is meant, normally with infested traded plants, plant 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 possibility of 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 (native 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 the 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 current distribution resp. by third countries)?

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