Express PRA for *Brenneria goodwinii* – Research and Breeding –

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Initiation: Application for an Express-PRA by the Federal State Lower Saxony, due to the application on a special authorisation for the movement and use of the organism for research and breeding purposes.

Express Pest Risk analysis	***Brenneria goodwinii***		
Phytosanitary risk for Germany	**high** ☒	**medium** ☐	**low** ☐
Phytosanitary risk for EU Member States	**high** ☒	**medium** ☐	**low** ☐
Certainty of the assessment	**high** ☐	**medium** ☒	**low** ☐
Conclusion	The bacterium *Brenneria goodwinii* is co-responsible for the complex disease ‚Acute oak decline' (AOD) in Great Britain. It is not clear whether the bacterium is endemic in Europe or whether it was introduced. In 2018, the bacterium was found on oaks in Switzerland that were imported from Germany in 2017, and infected trees were found in Latvia, too. Although symptoms of the infection were documented in Germany and in Central Europe (Austria, Belgium, France, Italy, the Netherlands, Poland, Spain), the pathogen was not detected until today. So far, *B. goodwinii* is listed neither in the Annexes of Directive 2000/29/EC nor by EPPO. *Brenneria goodwinii* infects oaks (*Quercus* sp) and can cause severe damage on trees of different ages and may lead to their dieback. Due to appropriate climate conditions, it is assumed that *Brenneria goodwinii* is able to establish outdoors in Germany. The establishment in South European EU Member States is possible, too. Due to its high damage potential for oaks, *B. goodwinii* poses a significant phytosanitary risk for Germany and other EU Member States. Based on this risk analysis, it is assumed that the pest is able to establish in Germany or other Member States and cause significant damage. As long as there is no evidence for a wide distribution of the bacterium in Germany and Europe, measures according to § 4a of the Plant Inspection Order should be met to prevent the release of this potential quarantine pest, inclusive the use of good laboratory practices		

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	like the inactivation of the pathogen after the completion of the trials. A targeted monitoring could show the distribution of this bacterium in Germany. All symptomatic trees should be examined to detect infections with *B. goodwinii*.
Preconditions for Express-PRA fulfilled?	Could be a pest, is not listed, so far, it has not been detected in the area covered by the reporting plant protection service.
Taxonomy, common name, synonyms	Kingdom: bacteria; Class: Gammaproteobacteria; Order: Enterobacteriales: Family: Enterobacteriaceae; Species: *Brenneria goodwinii* Denman, Brady, Kirk, Cleenwerck, Venter, Coutinho & de Vos 2012 Common name: Acute Oak Decline (AOD)
Does a relevant earlier PRA exist?	An Express-PRA from Great Britain is available. The pathogen is already widely distributed there and distributes further. Despite the high damage potential, the bacterium is not regarded as a potential quarantine pest in Great Britain (DENMAN & WEBBER, 2014).
Distribution and biology	Often, dieback of oaks was observed as a consequence of complex abiotic and biotic factors in Europe. Presumably, the first outbreak of AOD in Great Britain was already in the 1920s. Since 2009, the complex disease was discussed more and more, in science and public (DENMAN & WEBBER, 2009). The distribution of the involved bacterium *B. goodwinii* is not yet clear. Although there is evidence for AOD through symptom descriptions and photos from many European countries (Austria, Belgium, France, Germany, Italy, the Netherlands, Poland, Spain, Great Britain), so far, there is no evidence for the presence of the bacterium in most countries (DENMAN & WEBBER, 2014). So far, the occurrence is assured in Great Britain where the infection is widely distributed, and there are single outbreaks in Switzerland (the concerned trees were imported from Germany in 2017) and in Latvia (EPPO, 2018a and b). AOD is a complex diesease on oaks. That means that the disease is not triggered by one pathogen only but needs several factors to its formation. *Brenneria goodwinii* and *Gibbsiella quercinecans* are constantly detectable in lesions of infected trees. In case of infection of healthy oaks with both bacteria and the presence of eggs of *Agrilus biguttatus,* the typical symptoms of AOD could be triggered. The bacteria are very rarely detectable in healthy trees (DENMAN *et al.* 2018).

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	The lesions develop on the trunk of the affected trees in the inner bark layer. Typical symptoms are a strong dark slime flux from longitudinal cracks that form between the bark plates. Under the bark, necrotic spots develop that enlarge to fluid-filled holes. In spring, the fluid flows down the trunk from 5-10cm longitudinal cracks. The fluid can dry and build sparkling drops in the cracks. Later, a hard black crust forms on the slime flux. Often, the cracks are distributed around the complete trunk. Normally, infected trees die 3-5 years after the occurrence of the first symptoms (DENMAN & WEBBER, 2009). The bacteria infection and the infestation with A. *biguttatus* lead to an interruption of the vascular system of the plant (BROWN *et al.*, 2018). Mostly, trees are infected that are older than 50 years, but in the meanwhile also (younger) infected trees with a trunk diameter of 10-12cm were found (FOREST RESEARCH, 2019). Despite a very strong mutual occurrence of the infection and the infestation with the beetle *A. biguttatus,* the role of the beetle in the development of the infection is unclear, so far (BROWN *et al*., 2017).
Are host plants present in the PRA-area? If so, which?	The bacterium infects oaks (*Quercus* sp.). So far, *B. goodwinii* was found on *Q. robur*, *Q. petrea* (EPPO, 2018a; EPPO 2018b) and *Q. cerris* (BRADY *et al.* 2017). *Q. robur* and *Q. petrea* are present from South Scandinavia to Northern Spain, Italy and Portugal (EATON *et al.*, 2016).
Is a vector/further plant needed for host alternation? Which? Distribution?	The complex disease is linked to the occurrence of the two-spotted oak buprestid *Agrilus biguttatus* that is endemic in Europe. Nevertheless, so far there is no evidence that the beetle actually has a vector function for the bacterium (DENMAN & WEBBER, 2014; BROWN et al, 2017).
Climate in the distribution area comparable to PRA-area?	*B. goodwinii* was detected in Latvia, Switzerland and Great Britain. The climate in Germany and in great parts of North and Central Europe are comparable.
If no, are host plants present in protected cultivation?	No
Damage to be expected in the PRA-area?	In Great Britain, infected trees normally die 3-5 years after the occurrence of the first symptoms (DENMAN & WEBBER, 2009). *Q. robur* and *Q. petrea* are endemic and widely distributed in Europe. The oaks have a very high economic and ecologic value. Furthermore, oaks are an important component of the European cultural history (EATON et al., 2016).

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	The condition of the oak stands in Germany und Europe is already very critical. In 2018, 42% of the registered oaks in Germany showed a distinct opening-up of the crowns and hence, distinct damage symptoms (BMEL, 2019). In the weakened oak stands severe damage had to be expected similar to those in Great Britain.
Remarks	Firstly, *B. goodwinii* was described in 2012 (DENMAN *et al.*, 2012). So far, the distribution of the bacterium in Europe is not well known. As long as there is no evidence for a wide distribution of the organism, the phytosanitary risk through the pathogen is estimated as high. In 2018, the infected trees were felled in Switzerland and infected plant material was destroyed. Furthermore, a monitoring was initiated (EPPO, 2018a). In case of movement and use of the organism the prevention of the release must be secured.
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