Express-PRA for *Xanthomonas albilineans* – Research and Breeding –

Prepared by: Julius Kühn-Institute, Institute for national and international Plant Health; by: Dr. René Glenz, Dr. Anne Wilstermann; on: 19-10-2020 (Translation by Elke Vogt-Arndt)

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

Express-PRA	***Xanthomonas albilineans* (Ashby 1929) Dowson 1943**		
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 *Xanthomonas albilineans* is endemic to the tropics and subtropics. It causes leaf scald to sugarcane and so far, it is not present in Germany and the EU. So far, the bacterium is not listed, neither in the Annexes of Regulation (EU) 2019/2072 nor by EPPO. *Xanthomonas albilineans* infects plants of the grass family and is a significant pest on sugarcane. Under certain conditions, relevant damage occurred sporadically on maize, too. Due to inappropriate climatic conditions, it is assumed that *X. albilineans* cannot establish in the open field in Germany. The establishment in southern European EU Member States is not expected. However, there is a lack of sufficient data to completely rule out the possibility of the establishment of the bacterium. Due to its presumably low damage potential to maize, *X. albilineans* poses a low phytosanitary risk for Germany and other EU-Member States. Thus, *Xanthomonas albilineans* is not classified as a quarantine pest and Article 29 of Regulation (EU) 2016/2031 does not apply. Nevertheless, it is a generally harmful pest and there are uncertainties in respect to its damage potential in Europe. Thus, measures for the prevention of the release should be recommended, including the application of Good Laboratory Practice like the inactivation of the pathogen after conclusion of the trials.		

Express-PRA	*Xanthomonas albilineans* (Ashby 1929) Dowson 1943
Preconditions for Express-PRA fulfilled?	It is known as a plant pest and is not listed. So far, it is not established in the area covered by the reporting plant protection service.
Taxonomy, common name, synonyms	Domain: Bacteria; Order: Xanthomonadales; Family: Xanthomonadaceae; Genus: *Xanthomonas*; Species: *Xanthomonas albilineans* (Ashby 1929) Dowson 1943
Does a relevant earlier PRA exist?	No.
Distribution and biology	The known distribution area is limited to areas appropriate for the cultivation of sugarcane, therefore, to tropical and subtropical areas. Based on genetic analyses, *Xanthomonas albilineans* as a monophyletic group has to be clearly distinguished from other species of the genus *Xanthomonas* and among these, it has the greatest similarities to the bacterium *Xylella fastidiosa*, which is also related to the Xanthomonads (RODRIGUEZ-R *et al.*, 2012; NAUSHAD & GUPTA, 2012). In this context, *X. albilineans* has a smaller, reduced genome than all other representatives of the genus *Xanthomonas.* Similar to *Xylella fastidiosa* and due to the resulting differences in pathogenicity-related gene clusters it is mainly limited to the occurrence and distribution in the xylem of the plant (PIERETTI *et al.*, 2009; PIERETTI *et al.*, 2015). Nevertheless, also the presence in non-vascular plant tissue (e.g. Parenchym) is possible (MENSI *et al.*, 2014). *Xanthomonas albilineans* is the trigger for the bacterial leaf scald of sugarcane (*Saccharum* spp., hybrid of *Saccharum officinarum*) and as such, it is present worldwide in most of the tropics and subtropics, in regions with an appropriate climate for the cultivation of sugarcane (EPPO, 2020). The bacterium spreads systemically in the xylem of the plant and the most distinct early symptoms are clearly limited white lines alongside of infected vascular bundles of the leaves, which with the further development of the leaf results in distinct chlorosis (BIRCH, 2001). Further symptoms include necrosis that spreads from the leaf margins alongside the infested vascular bundles and wilting of the complete plant, due to the blocking of the infested xylem. *Xanthomonas albilineans* produces the toxin Albicidin, which blocks the differentiation of chloroplasts and thus, it causes the typical symptoms in form of the leaf chlorosis. In addition to the

Express-PRA	*Xanthomonas albilineans* (Ashby 1929) Dowson 1943
	phytotoxic characteristics, through obstruction of the prokaryotic DNA-replication, Albicidin possesses also anti-bacterial activity against Gram-positive and Gram-negative bacteria in nanomolar concentration (PIERETTI *et al.*, 2015). The distribution of *X. albilineans* happens mechanically through the use of contaminated harvesting equipment or planting of infected symptomless cuttings although airborne spread into water has also been detected (DAUGROIS *et al.*, 2003). Besides the main host plant sugarcane, the bacterium also was detected in other plants from the family of grasses (Poaceae; e.g. maize). Some of these were artificial inoculation trials or plants that were grown near sugarcane crops.
Are host plants present in the PRA-area? If so, which?	*Xanthomonas albilineans* infects grasses (Poaceae). The main host plants are sugarcane (*Saccharum officinarum*; *S. spontaneum*), sorghum (*Sorghum halepense*), bamboo (*Bambusa vulgaris*), *Coix lacryma-jobi* and lemon grass (*Cymbopogon citratus*). Mainly maize is of economic significance in Germany and Europe and is widely cultivated.
Is a vector/further plant needed for host alternation? If so. which? Distribution?	No, the main pathway of *X. albilineans* are cuttings from sugarcane. Locally, the bacterium might be distributed via the cutting tools, the air and water drops.
Climate in distribution area comparable to PRA-area?	No, the bacterium has only been detected in the subtropics and tropics.
If no, are host plants present in protected cultivation?	Not relevant.
Damage to be expected in the PRA area?	There were isolated indications on relevant damage to maize caused by the bacterium; mainly, when maize and sugarcane are cultivated in crop rotation. It cannot be totally ruled out that under the climatic conditions in Europe isolated damage in maize is possible, also without cultivated sugarcane. Due to the inappropriate conditions for the growth of the bacterium in Germany and Europe, the risk is estimated as low.
Remarks	A confident assessment on the risk caused by *X. albilineans* under the prevailing climate conditions for the cultivation of maize currently is not possible. Thus, the release of the bacterium should be prevented.

Express-PRA	*Xanthomonas albilineans* (Ashby 1929) Dowson 1943
Literature	BIRCH, R. G., 2001: *Xanthomonas albilineans* and the antipathogenesis approach to disease control. Mol. Plant Pathol. 2(1), 1-11. DAUGROIS, J. H., V. DUMONT, P. CHAMPOISEAU, L. COSTET, R. BOISNE-NOC, P. ROTT, 2003: Aerial contamination of sugarcane in Guadeloupe by two strains of *Xanthomonas albilineans*. Eur. J. Plant Pathol. 109, 445-458. EPPO, 2020: EPPO Global Database (available online). https://gd.eppo.int MENSI, I., M. S. VERNEREY, D. GARGANI, M. NICOLE, P. ROTT, 2014: Breaking dogmas: the plant vascular pathogen *Xanthomonas albilineans* is able to invade non-vascular tissues despite its reduced genome. Open Biol. 4, 130116 NAUSHAD, H. S., R. S. GUPTA, 2013: Phylogenomics and Molecular Signatures for Species from the Plant Pathogen-Containing Order Xanthomonadales. Plos One 8(2), e55216. PIERETTI, I., A. PESIC, D. PETRAS, M. ROYER, R. D. SÜSSMUTH, S. COCIANCICH, 2015: What makes *Xanthomonas albilineans* unique amongst xanthomonads? Front. Plant Sci. 6, 289. PIERETTI, I., M. ROYER, V. BARBE, S. CARRERE, R. KOEBNIK, S. COCIANCICH, A. COULOUX, A. DARRASSE, J. GOUZY, M. A. JACQUES, E. LAUBER, C. MANCEAU, S. MANGENOT, S. POUSSIER, B. SEGURENS, B. SZUREK, V. VERDIER, M. ARLAT, P. ROTT, 2009: The complete genome sequence of *Xanthomonas albilineans* provides new insights into the reductive genome evolution of the xylem-limited *Xanthomonadaceae*. BMC Genomics 10, 616. RODRIGUEZ-R, L. M., A. GRAJALES, M. L. ARRIETA-ORTIZ, C. SALAZAR, S. RESTREPO, A. BERNAL, 2012: Genomes-based phylogeny of the genus *Xanthomonas*. BMC Microbiol. 12, 43.