Express PRA[1] for Turnip crinkle virus – Occurrence –

Prepared by: Julius Kühn-Institute, Institute for national and international Plant Health, Dr. Heiko Ziebell, Dr. Anne Wilstermann; on: 20-02-2019. (translated by Elke Vogt-Arndt)

Initiation: Occurrence in a private garden in the Federal State Lower Saxony

Express PRA	**Turnip crinkle virus**		
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 *Turnip crinkle virus* (TCV) is already known from Great Britain (England, Scotland) since the 1950's. Furthermore, the virus was described in Yugoslavia. Currently, no data are available on the distribution in Germany and the rest of the EU. So far, the virus is listed neither in the Annexes of the Regulation (EU) 2019/2072 nor by EPPO. TCV infests plants from the cruciferous plant family (Brassicaceae), and under experimental conditions chenopods (*Chenopodium* sp.) and thorn apple (*Datura stramonium),* too. No information on relevant damage in the known distribution areas is available. Due to appropriate climatic conditions, it is assumed that TCV can establish outdoors in Germany. An establishment in EU-Member States is also to be expected. Due to its low damage potential for cultivated plants, TCV does not pose any phytosanitary risk for Germany and other EU-Member States. Thus, TCV is not classified as a potential quarantine pest and Article 29 of the Regulation (EU) 2016/2031 does not apply.		
Taxonomy[2)]	Viruses; order: not assigned; family: *Tombusviridae* ; genus: *Carmovirus*; species: *Turnip crinkle virus*		
Common name	German: Englische Kräuselkrankheit der Mairübe		
Synonyms	---------		
Does a relevant earlier PRA exist?	No		
Biology	The main vectors of TCV are both the larvae and the adults of flea beetles (Tribus: Alticini; flea beetles *Phyllotreta* sp.,		

Express PRA	Turnip crinkle virus
	Psylloides sp.). The virus can be transmitted to host plants mechanically. Currently, no further vectors are known. Transmission via seed or transmission through false flax are known. For propagation, TCV is reliant on host plants. Carmoviruses normally cause only minor symptoms and infest a limited host range (QU & MORRIS, 2001).
Is the pest a vector?[3)]	No
Is a vector needed?[4)]	TCV is transmitted by flea beetles (*Psylloides* sp., *Phyllotreta* sp.). Currently, other vectors are unknown. The virus can be transmitted mechanically.
Host plants	TCV infests turnip (*Brassica rapa*), pak choi (*B. chinensis*), black mustard (*B. juncea*) and rape (*B. napus*) and under experimental conditions goosefoot species (*Chenopodium* sp.) and thorn apple (*Datura stratomonium*) (HOLLINGS & STONE, 1972; KHARBANDA, 2001). The natural infection of garlic mustard (*Alliaria petiolata*) was described recently (GAAFAR *et al.*, manuscript submitted in 2019).
Symptoms[5)]	Mosaic and marbling symptoms of the leaves, dwarfed plants; leaf yellowing and deformation (BLAKE *et al.*, 2007; HOLLINGS & STONE, 1972; ZIEBELL, personnel comment). In a field experiment with infested and non-infested plants, no significant crop losses for swede turnips and table beets were detected despite of partly strong leaf mutation (LISTER, 1958).
Presence of the host plants in Germany[6)]	Garlic mustard (*Alliaria petiolata*) is a prevalent weed in Germany. In 2017, approx. 1.3 million ha rape were cultivated in Germany. In 2017, the cultivation area for cabbage and other cruciferous plants added to approx. 14,000 ha (FAOSTAT, 2019).
Presence of the host plants in the Member States[7)]	Throughout the EU, approx. 6.7 million ha rape as well as 165 thousand ha of other cruciferous plants are cultivated (FAOSTAT, 2019). Garlic mustard is distributed throughout the EU.
Known infested areas[8)]	First records from Great Britain in the 1950s. New finding in a private garden in Lower Saxony where garlic mustard occurred as a weed. Only a few plants showed TCV symptoms, other cabbage species were asymptomatic (red cabbage, green cabbage).
Pathways[9)]	Infested plants or vectors.

Express PRA	Turnip crinkle virus
Natural spread[10)]	TCV is transmitted by flea beetles (*Psylloides* sp., *Phyllotreta* sp.), currently, no other vectors are known.
Establishment and spread to be expected in Germany[11)]	Rape is grown on approx. 1.3 million hectares in Germany. There are no known climatic restrictions across the entire country.
Establishment and spread to be expected in the Member States[12)]	Throughout the EU, rape is cultivated on approx. 6.7 million ha, and further cruciferous plants are cultivated on 165 thousand ha (FAOSTAT, 2019). Although the virus was already described in Great Britain in the 1950s, there are few sources in literature on the distribution of this virus. The establishment and distribution is only possible if the vector is present.
Known damage in infested areas[13)]	A virus infection usually is unremarkable with mild symptoms. Tested cultivars were not very susceptible (LI & SIMON, 1989). No data is available on relevant damage in the known distribution areas. In the present case in Germany, only a few individual plants were affected, and neighbouring crop plants showed no symptoms
Delimitation of the endangered area in Germany	Cultivation areas of cruciferous plants (Brassicaceae).
Damage to be expected in endangered area in Germany[14)]	No significant damage on crops has to be expected.
Damage to be expected in endangered area in MS[15)]	No significant damage on crops has to be expected.
Control measures[16)]	Control of the vectors, destruction of infested plants.
Detection and diagnosis[17)]	Suspicious plants may be checked on spherical virus particles by means of electron microscopy. TCV-specific antibodies allow the detection by means of immuno-Electron microscopy or ELISA.
Remarks	For the first time, the virus was described as present in Germany in 2019. Thus, available information is limited. The risk analysis will be revised when new relevant information is available.
Literature	BLAKE. J. A., K. W. LEE, T. J. MORRIS, T. E. ELTHON, 2007: Effects of turnip crinkle virus infection on the structure and function of mitochondria and expression of stress proteins in turnips. Physiologia Plantarum 129 (4): 698–706. doi 10.1111/j.1399-3054.2006.00852.x

https://onlinelibrary.wiley.com/doi/full/10.1111/j.1399-3054.2006.00852.x (accessed on: 06-02-2019)

FAOSTAT, 2019: Crops. Food and Agriculture Organization of the United Nations. http://www.fao.org/faostat/en/#data/QC (accessed on: 06-02-2019)

GAAFAR, Y., A. SIEG-MÜLLER, P. LÜDDECKE, K. HERZ, J. HATRICK, C. MAAß, S. SCHUHMANN, K. R. RICHERT-PÖGGELER, H. ZIEBELL, (Manuskript eingereicht) 2019: First report of *Turnip crinkle virus* infecting garlic mustard (*Alliaria petiolata*) in Germany. New Disease Reports.

HEINZE, K., 1959: Phytopathogene Viren und ihre Überträger. Phytopathogenic viruses and their Vectors. Duncker & Humblot Berlin, 290 S.

HOLLINGS, M., O. M. STONE, 1972: Turnip crinkle virus – Description of plant viruses. http://www.dpvweb.net/dpv/showdpv.php?dpvno=109

KING, A. M. Q., M. J. ADAMS, E. B. CARSTENS, E. J. LEFKOWITZ (Hrsg.), 2012: virus taxonomy. Ninth Report of the International Committee on Taxonomy of viruses. Elsevier Academic Press.

P. D. KHARBANDA, B. D. L. FITT, R. M. LANGE, J. S. WEST, A. H. LAMEY, D. V. PHILLIPS, 2001: Diseases of Rapeseed = Canola (*B. napus* L. and *Brassica rapa* L. (=*B. campestris* L.)). The American Phytopatholigical Society. http://www.apsnet.org/publications/commonnames/Pages/Rapeseed.aspx (accessed on: 06-02-2019)

LI, X. H., A. E. SIMON, 1990: Symptom intensification on cruciferous hosts by the virulent satellite RNA of turnip crinkle virus. Phytopathology 80(**3**): 238-242.

LISTER, R. M., 1958: Some turnip viruses in Scotland and their effect on yield. Plant Pathology 7, 144-146.

QU, F., T. J. MORRIS, 2008: Carmoviruses. In: MAHY, B. W. J., M. H. V. H. V. VAN REGENMORTEL (HRSG.), 2008: Encyclopedia of Virology (Third Edition), 453-457.

Explanation

[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)] E.g. 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)?