Express PRA[1] for *Tetranychus ludeni* – Occurrence –

Prepared by: Julius Kühn-Institute, Institute for national and international Plant Health; Dr. Gritta Schrader; on: 02-07-2021. (translated by: Elke Vogt-Arndt)

Initiation: Occurrence in a glasshouse in the Federal State Hesse

Express PRA	***Tetranychus ludeni* Zacher**		
Phytosanitary risk	Categorisation is not applicable; the requirements for a quarantine pest are not fulfilled. However, since *T. ludeni* can cause significant damage and is not yet overall widespread, measures should be met for the limitation of the infestation.		
Certainty of the assessment	**high** ☐	**medium** ☐	**low** ☒
Conclusion	The spider mite *Tetranychus ludeni* does already occur in Germany and the EU. In 1913, the first description was made by Zacher on specimens that were collected in greenhouses in Germany and in hotbeds in France, but it is assumed that the species has its origin in the tropics. So far, the mite is not listed in the Annexes of Regulation (EU) 2019/2072 or by EPPO. *Tetranychus ludeni* is very polyphagous and infests more than 60 plant families, amongst others Cucurbitaceae, Fabaceae, Malvaceae, Rosaceae and Solanaceae. Due to unsuitable climate conditions, it is assumed that *T. ludeni* cannot establish in Germany in the open field. Nevertheless, a (further) establishment in southern EU-Member States and in glasshouses is possible. *Tetranychus ludeni* shows a great resemblance with the RNQP (regulated non-quarantine pest) species *T. urticae*. Thus, measures should be comparable. Due to the risk of confusion between the two species, it is assumed that the spider mite is already more widespread than officially known. For this reason, *Tetranychus ludeni* is not classified as a quarantine pest and Article 29 of the Regulation (EU) 2016/2031 does not apply. Currently, listing as RNQP is not pursued, but plant material should be “practically free“ from this spider mite.		
Taxonomy[2], common name, synonyms	Arachnida, Acari, Tetranychidae, *Tetranychus, Tetranychus ludeni* Zacher, German:Salbeispinnmilbe *Epitetranychus ludeni, Septanychus deviatarsus, Tetranychus deviatarsus*		

Express PRA	*Tetranychus ludeni* Zacher
EPPO Code	TETRLU
Does a relevant earlier PRA exist?	No.
Biology	In India, *T. ludeni* occurs in the first week in April. In June, the population reaches its peak and in July, the population density is declining sharply (Reddy, 2001). The mite often occurs together with *T. urticae* (Ragusa et al. 2019). The optimal temperatures for the survival and the development of *T. ludeni* are 22-28 °C and the worst are 29-35 °C. In laboratory tests, mites emerged from almost 100 % of the eggs at 15-21°C and 22-28 °C while it was only 70% at 29-35 °C. At 22-28 °C, approx. 75% of the emerged mites developed to adults, compared to approx. 60 % at 15-21°C and 10 % at 29-35 °C (Ristyadi et al. 2019, Leite et al. 2021). In laboratory, Gotoh et al. (2015) detected a high propagation rate of *T. ludeni* and concluded that the spider mite could become a serious pest in case that chemical control agents are reduced or become insufficiently effective.
Is the pest a vector?[3]	No.
Is a vector needed?[4]	No.
Host plants	*Tetranychus ludeni* is very polyphagous. Migeon and Dorkeld (2021) list 347 host plants from 63 families, among them economically important families like Cucurbitaceae, Fabaceae, Malvaceae, Rosaceae and Solanaceae. ChannaBasavanna (1980) mentions especially *Phaseolus vulgaris* (common bean) and *Abelmoschus esculentus* (Okra; not relevant for EU) as particularly suitable host plants. The first finding in Sicily was also on common bean and on *Ricinus communis*, and in the subsequent years on tomatoes (*Solanum lycopersicum*), eggplants (*Solanum melongena*), *Ipomea violacea* and *Datura stramonium* (Ragusa et al. 2019).
Symptoms[5]	Comparable to *T. urticae,* bright spots can be found on the infested leaves. If the infestation becomes more severe, the leaves turn brownish or silvery, brittle and fall off prematurely. The mites can cover the complete surface of the infested plants with cobwebs.
Presence of the host plants in Germany[6]	Host plants are widespread resp. are cultivated in greenhouses.

Express PRA	*Tetranychus ludeni* Zacher
Presence of the host plants in Member States[7]	Host plants are widespread resp. are cultivated in greenhouses
Known infested areas[8]	Spread worldwide (Migeon and Dorkeld, 2021). First finding in 1913, in Germany in a greenhouse and in France in Paris in a hotbed on sage (*Salvia splendens*), eggplant (*Solanum melongena*) and *Cucurbita* sp. (Zacher, 1913), but the spider mite is very likely of tropical origin (Marić et al. 2021). In Europe: France, Greece, Italy, Portugal, Serbia, Spain (Marić et al. 2021, Migeon and Dorkeld, 2021, Ragusa et al. 2019, CABI, 2020). However, it is assumed that the species is more widespread in the EU than is actually known, due to the great similarity in all stages with the widespread species *T. urticae* (Ragusa et al. 2019).
Pathways[9]	Via infested plants, plant parts.
Natural spread[10]	Natural spread is the same as for *T. urticae*, primarily via anemochory.
Establishment and spread to be expected in Germany[11]	The spider mite was found in a greenhouse in the Federal State Hesse. The occurrence in other greenhouses cannot be ruled out, particularly as there were first findings in 1911 and 1912 in greenhouses in Berlin-Dahlem (Zacher, 1913). It is very unlikely that the mite finds optimal climatic conditions for the establishment outdoors in Germany.
Establishment and spread to be expected in the Member States[12]	Since the spider mite is already established outdoors in several southern EU Member States (CABI, 2020), further establishment can be expected. Establishment in greenhouses in cooler Member States is possible.
Known damage in infested areas[13]	In case of severe infestation with mites plants may die.
Limitation of the endangered area in Germany	Greenhouses. Since the mite occurs in association with *T. urticae* it is assumed that where *T. urticae* occurs, *T. ludeni* may occur, too, unless temperatures are too low.
Damage to be expected in endangered area in Germany[14]	Since temperature conditions outdoors in Germany are not suitable for *T. ludeni*, no damage has to be expected under the current climatic conditions. Under glass, it may come to significant damage if control measures show no effect.
Damage to be expected in endangered area in the Member States[15]	In southern Member States and under glass significant damage has to be expected on host plants if control measures show no effect.

Express PRA	*Tetranychus ludeni* Zacher
Control feasibility and measures[16]	Reddy (2001) states that *T. ludeni* has developed resistance on cotton and other host plants to all tested organophosphate insecticides. Sprays for the control of the mites are only partially effective because of the difficulties in applying them to the underside of the leaves. The predatory mite *Phytoseiulus persimilis* that is licensed as beneficial insect in the EU is effective against *T. urticae* and *T. ludeni* (Zhang, 2002, Escudero and Ferragut, 2005).
Detection and diagnosis[17]	Morphological: an identification key can be found e.g. in Marić et al. (2021). Molecular methods (PCR). The identification of the specimens in Hesse was conducted by JKI, Institute for Plant Protection in Horticulture and Forests (Dr. M. Götz, Dr. Q. Schorpp).
Remarks	The evaluation of the certainty of the assessment as low relates to the spread of *T. ludens* in Europe that possibly is distinctly higher than previously assumed because of the high likelihood of confusion with *T. urticae*. Furthermore, it is not clear how the infestation situation developed after the occurrence in Germany, determined by Zacher (1913). It is also not clear to which level the mite already adapted to lower temperatures and which impact the climate change has on the certainty of establishment outdoors.
Literature	CABI (2020): Crop protection compendium. Datasheet on *Tetranychus ludeni*. Online available: https://www.cabi.org/cpc/datasheet/53351 accessed on 01-07-2021. CHANNABASAVANNA, G. P. (1980): Influence of host plants on the development, fecundity and longevity of *Tetranychus ludeni* Zacher (Acari: Tetranychidae). Indian Journal of Acarology, 5 (1/2), 80-84. ESCUDERO, L.A., FERRAGUT, F. (2005): Life-history of predatory mites *Neoseiulus californicus* and *Phytoseiulus persimilis* (Acari: Phytoseiidae) on four spider mite species as prey, with special reference to *Tetranychus evansi* (Acari: Tetranychidae). Biological Control, 32 (3), 378-384. GOTOH, T., MORIYA, D., NACHMAN, G. (2015): Development and reproduction of five *Tetranychus* species (Acari: Tetranychidae): Do they all have the potential to become major pests? Experimental and Applied Acarology, 66 (4), 453-479.

LEITE, G.L.D., VELOSO, R.V.S., MATIOLI, A.L., SOARES, M.A., LEMES, P.G. (2021): Seasonal mite population distribution on *Caryocar brasiliense* trees in the Cerrado domain. Brazilian Journal of Biology, 82.

MIGEON, A., DORKELD, F. (2021): Spider Mites Web: a comprehensive database for the Tetranychidae. Online available: http://www1.montpellier.inra.fr/CBGP/spmweb accessed on 30-06-2021.

MARIĆ, I., MEĐO, I., MARČIĆ, D., PETANOVIĆ, R., JOVANOVIĆ, S., UECKERMANN, E.A. (2021): Spider mites (Acari: Tetranychidae) from Serbia: new species for the country and the Balkan Peninsula, with a key to all known Serbian species. Systematic & Applied Acarology 26(1), 304–316.

RAGUSA, E., SINACORI, M., TSOLAKIS, H. (2019): First record of Tetranychus ludeni Zacher (Acariformes: Tetranychidae) in Italy. International Journal of Acarology, 45 (1-2), 26-28.

REDDY, G. V. P. (2001): Comparative effectiveness of an integrated pest management system and other control tactics for managing the spider mite *Tetranychus ludeni* (Acari: Tetranychidae) on eggplant. Experimental & applied acarology, 25(12), 985-992.

RISTYADI, D., HE, X.Z., WANG, Q. (2019): Dynamics of life history traits in *Tetranychus ludeni* Zacher in response to fluctuating temperatures. Systematic and Applied Acarology, vol. 24, no. 11, pp. 2272-2277.

ZACHER, F. (1913). Untersuchungen über Spinnmilben. Mitteilungen aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft, 14, 37-41.

ZHANG Z.-Q. (2002): Taxonomy of *Tetranychus ludeni* (Acari: Tetranychidae) in New Zealand and its ecology on *Sechium edule*, New Zealand Entomologist, 25 (1), 27-34.

Remarks

Erläuterungen

[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,..)?

[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)?