Express – PRA[1)] for *Rhagoletis zoqui* – Occurrence –

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Initiation: Occurrence outdoors in North-Rhine Westphalia, one specimen was caught with a yellow trap on *Prunus* sp.

Express PRA[1)]	***Rhagoletis zoqui* Bush, 1966**		
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 fruit fly *Rhagoletis zoqui* is endemic in temperate climatic regions in Mexico and so far, it did not occur in Germany and the EU. *R. zoqui* is listed in the Annexes of Directive 2000/29/EC as non-European Tephritidae but it is not listed by name. The species is not listed by EPPO. *Rhagoletis zoqui* infests the fruits of walnut trees (*Juglans* spp.). Due to appropriate climate conditions, it is assumed that *R. zoqui* is capable to establish outdoors in Germany. The establishment in other EU Member States with temperate climate and adequate low winter temperatures is possible, too. Due to its medium damage potential for the production of walnuts, *R. zoqui* poses a low phytosanitary risk for Germany and a medium phytosanitary risk for other EU Member States. Based on this risk analysis, it is assumed that the pest may establish in Germany or another Member State and cause not insignificant damage. Additionally, *R. zoqui* is a non-European Tephritidae and therefore a quarantine pest according to Directive 2000/29/EC. Thus, measures should be met according to § 4a of the Plant Inspection Order in order to prevent the introduction. The occurrence of *R. zoqui* has to be notified. It is recommended to conduct a regional monitoring in locations with *Juglans* sp. in the near of the trap catch, in order to detect the infestation site and the extent and to control it.		
Taxonomy[2)]	Insecta, Diptera, Tephritidae, Rhagoletis; species: *Rhagoletis zoqui* Bush, 1966		

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Common name	La mosca del nogal de Castilla (Walnuss-Fliege)
Synonyms	---
Does a relevant earlier PRA exist?	No
Biology	*Rhagoletis zoqui* is a part of the *Rhagoletis suavis*-species group and very closely related with *R. completa*. In cases where the distribution areas overlap, it comes to hybridizations of both species (TADEO et al., 2013). The mating of those hybrids result in less larval emergence than through intraspecific matings (RULL et al. 2012). *R. zoqui* develops on the husk of walnuts. Males are territorial and defend a certain areal on a fruit, where they wait for the females. *R. zoqui* is univoltine, thus, it produces only one generation per year. The larvae leave the fruits and pupate in the soil. The pupae hibernate in diapause in 5-15cm depth in the soil and normally, complete their development in the subsequent spring. However, the pupae need at least 3 months with temperatures of 4°C or less for the termination of the diapause, otherwise they remain in diapause until the following year or longer. The adults emerge over a period of 2-4 weeks, during the maximal availability period of the host fruits (BUSH, 1969).
Is the pest a vector?[3)]	No
Is a vector needed?[4)]	No
Host plants	Walnut: *Juglans regia* (APARICIO-DEL MORAL et al., 2015), *Juglans mollis* (FOOTE, 1981), *Juglans pyriformis* (ALUJA et al., 2000)
Symptoms[5)]	Colouring of the fruits around the puncture sites for the oviposition, early fruit fall.
Presence of the host plants in Germany[6)]	The walnut (*Juglans regia*) is distributed throughout Germany as park tree, in forests and gardens. In 2017, 5,547 ha walnuts were commercially harvested in Germany (FAOSTAT, 2019).
Presence of the host plants in the Member States[7)]	*Juglans* sp. produces fruits in the north of Northern Scotland and Southern Norway. In Central Europe *Juglans* sp. is widely distributed. In the south, the trees are present in Portugal, in Northern Spain and nearly everywhere in Italy

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	(VERHEGGEN et al., 2017). The most important growing countries for walnuts in the EU are France (20500 ha), Greece (13200 ha) and Spain (10367 ha). Besides Germany, further producers in the EU are Croatia, Bulgaria, Hungary, Italy, Portugal, Poland, Rumania, Slovenia, Slovakia, Cyprus, Czech Republic, Belgium and Luxemburg (FAOSTAT, 2019).
Known infested areas[8)]	Mexico
Pathways[9)]	Soil, walnuts (with pericarp), accidental transport of adults ("Hitchhiking").
Natural distribution[10)]	Females of *Rhagoletis pomonella* are able to fly at least app. 1.5 km during the maturation (BUSH, 1969), it is assumed that *R. zoqui* has a similar spread capacity.
Establishment and distribution to be expected in Germany[11)]	*R. zoqui* belongs to the nearctic *Rhagoletis*-species that are adapted to a temperate climate (BUSH, 1969; TADEO et al., 2013). In Germany, the establishment must be expected everywhere where host plants are present.
Establishment and distribution to be expected in the Member States[12)]	Wherever host plants are available and adequate low winter temperatures are reached to complete the diapause of the pupae. Presumably, *R. zoqui* has similar demands like the sister species *R. completa* that has already been introduced to Europe and is mainly established in Central Europe, whereby *R. zoqui* favours a more humid climate and has a significantly smaller natural geographical distribution (RULL et al., 2012).
Known damage in infested areas[13)]	*R. zoqui* is endemic to Mexico where it leads to regional yield losses and quality losses. An increased pathogen susceptibility of the walnuts raises the costs for management in commercial plantings (APARICIO-DEL MORAL et al., 2015). Typical damage caused by *Rhagoletis* sp. on walnuts are shrivelled growth of the husk and kernels. The nutshells change colour to black and must be cleaned labour-intensive to guarantee the marketing of the nuts.
Limitation of the endangered area in Germany	Wherever *Juglans* sp.is present.
Damage to be expected in endangered area in Germany[14)]	Infestation of individual trees with damage on fruits. In regions where *R. completa* is already established no additional damage is expected. The control measures for *R. completa* should also be appropriate for *R. zoqui*. The

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	infestation with *R. completa* in non-treated *Juglans* sp. can reach an infestation intensity of 100%. It is possible that the species compete (territorial behaviour of the males and hybridisation), which may lead to a short-term weakening of the populations and the regional repression of a species.
Damage to be expected in endangered area in the Member States[15)]	There may be losses in quality and yield in commercial walnut plantings. No additional damage is expected in regions where *R. completa* is already established (see above).
Control feasibility and measures[16)]	The control options correspond to those of *Rhagoletis completa* and *R. suavis*. In conventional walnut plantings, chemical agents against the adult animals are available. The use of entomopathogenic nematodes against the pupae of *Rhagoletis* sp. is to be tested (VERHEGGEN et al., 2017). The animals are relatively mobile, and the host plants are present geographically dispersed and the control is difficult. Thus, the successful eradication after an establishment in Germany seems unlikely.
Detection and diagnosis[17)]	*Rhagoletis zoqui* is morphologically distinguishable from *R. completa* via the wing pattern and the colouring of the body (RULL et al., 2012). An identification key is available (FOOTE, 1981). The larvae can be detected in walnut fruits. The adults may be caught by means of yellow traps (see EPPO Diagnostic Protocol for *Rhagoletis completa*; EPPO, 2011).
Remarks	*R. zoqui* and *R. completa* tend to mate with each other. Both species even seem to favour hybridization (RULL et al., 2012). Thus, *R. zoqui* presumably will not succeed to establish persistently in regions where *R. completa* is already widespread and common.
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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

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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)?