Netherlands Food and Consumer
Product Safety Authority
Ministry of Agriculture,
Nature and Food Quality

Quick scan for *Taeniothrips eucharii* and hippeastrum chlorotic ringspot virus

National Plant Protection Organization, the Netherlands

Quick scan numbers: QS2021ENT008 and QS2021VIR001

Quick scan date: 20 December 2021

No.	Question	Quick scan answer for *Taeniothrips eucharii*	Quick scan answer for hippeastrum chlorotic ringspot virus
1.	What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? *Add picture of organism/damage if available and publication allowed*.	*Taeniothrips eucharii* (Whetzel), (Thysanoptera: Thripidae) EPPO code: TAETEU Common name: Oriental lily-flower thrips  Damaged plant of *Baucarnea* and long winged female; in microscopic slide: short winged female and long winged male.	*Hippeastrum chlorotic ringspot virus* (HCRV), genus *Orthotospovirus*, family Tospoviridae

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2.	What prompted this quick scan? *Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.*	In the Netherlands, *Taeniothrips eucharii* was first collected in 1989 (Vierbergen, 1991). Since then, it has been found several times on plant bulbs and other plants for planting originating from greenhouses within the country. Recent research has shown that the oriental lily-flower thrips is a vector of hippeastrum chlorotic ringspot virus (HCRV) (Xu et al., 2017). HCRV is not known to be present in NL nor in other EU member states. The NPPO-NL has intercepted *T. eucharii* on *Beaucarnea* from Guatemala (2009, 2017), *Eucharis* from Thailand (1990), *Haemanthus* from Thailand (1994), *Lycoris* from Japan (1989), *Nolina* from China (2012), and *Ophiopogon* from China and Indonesia (1995, 2006). These imports are a potential pathway for HCRV.	See answer for *T. eucharii*
3.	What is the current area of distribution?	*T. eucharii* originates from eastern Asia and occurs in Malaysia, China, Taiwan, Japan and Korea (Mound & Tree, 2008). It has been introduced to Bermuda (Whetzel, 1923), USA (records from Hawaii, Georgia, Florida (Denmark, 1981)), Australia (Queensland, New South Wales (Mound & Tree, 2008), and Iran (Ilam province) (Miri et al., 2020). In the Netherlands, it has been found in heated greenhouses only. It has not been reported from other EU member states but may have a wider distribution considering that it has been present in the Netherlands for several decades and the presumably large EU-internal trade volumes of its host plants.	HCRV has been reported from the Fujian, Guangxi and Yunnan province in China (Dong et al., 2013; Li et al., 2017; Y. Xu et al., 2017). HCRV is a thrips - transmitted pathogen and *T. eucharii* is the only known vector of HCRV. The vector specificity of HCRV is however, little studied. It remains uncertain whether HCRV could spread beyond the distribution range of *T. eucharii* (see also Question 6).
4.	What are the hostplants?	*T. eucharii* is polyphagous and has been found on a wide variety of plant species. However, it has only been reported to reproduce on monocotyledonous plants. The main host plants are in the Liliaceae (*Lilium, Liriope*), Amaryllidaceae (*Eucharis, Hymenocallis, Narcissus, Crinum, Lycoris, Zephyranthes*) and Asparagaceae (*Beaucarnea*, *Lycoris, Ophiopogon, Rohdea, Sansevieria*) (Kurosawa, 1937; O'Neill, 1962; Vierbergen et al., 2010).	Based on limited information, main natural hosts are *Hippeastrum* sp. *& Hymenocallis littoralis* (Amaryllidaceae). HCRV has been reported once infecting *Nicotiana tabacum, Philodendron bipinnatifidium & Zephyranthes candida* (Dong et al., 2013; Wu & Liu, 2017; Xu et al., 2013). Additionally, HCRV sequences have been uploaded in NCBI GenBank isolated from *Clivia miniate* (KY484838.1)*, Crinum asiaticum* (KY911358.1)*, Ficus elastica* (KM359728.1) and *Oxalis corniculata* (KY911360.1). Experimental hosts are *Capsicum annuum, Lactuca sativa, Phalaenopsis, Solanum lycopersicum* (Dong et al., 2013*;* Xu et al., 2013)
5.	Does the organism cause any kind of plant damage in the current area of	Yes. Damage by the thrips occurs regularly both outdoors and in greenhouses. Feeding damage causes scarring and discolouration of flowers, leaves and stems (O'Neill, 1962; Vierbergen, 1991), which can make ornamental plants unmarketable or at least decrease the	The following symptoms have been reported in natural hosts of HCRV

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	distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism? *Yes/no + plant species on which damage has been reported + short description of symptoms.* *Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).*	ornamental value of these plants. However, plant growth or reproductivity are not known to be affected by this feeding damage.	• *Hippeastrum* sp.: necrotic and chlorotic ringspot, concentric rings and chlorotic lesions (Dong et al., 2013; Xu et al., 2013) • *Hymenocallis littoralis:* chlorotic mottling, concentric chlorotic rings and marginal necrosis (Li et al., 2017) • *Nicotiana tabacum:* necrotic spots (Xu et al., 2013) • *Philodendron bipinnatifidium:* vein necrosis and chlorotic lesions (Xu et al., 2013) • *Zephyranthes candida:* necrosis and chlorosis (Wu & Liu, 2017) In general, tospoviruses can cause severe damage to vegetable crops such as tomato and pepper (e.g. Martínez et al., 2019).
6.	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses b. Outdoors c. Otherwise (e.g. storage facilities, human environment)	The thrips has already established itself across several Dutch greenhouses in which Liliaceae, Amaryllidaceae or Asparagaceae are cultivated. The thrips is unlikely to become established outdoors due to climatic constraints. Its current area of distribution covers mostly humid subtropical climates (Cfa) according to the Köppen-Geiger climate classification (Beck et al., 2018). Thus far the species has not been reported outdoors in temperate climates.	Establishment of HCRV depends on the presence of its vector. *T. eucharii* is the only known vector of HCRV. At the infested site in China where *T. eucharii* was identified as vector, HCRV was not detected in *Frankliniella occidentalis*, which is the most prevalent thrips species in greenhouses in the Netherlands and European Union. However, only transmission of HCRV by *T. eucharii* has been studied; transmission by *F. occidentalis* or other thrips species has not been studied (Y. Xu et al., 2017). Possible additional vectors could influence the probability of establishment.
7.	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	The recent finding in Iran (Miri & al., 2020) indicates that *T. eucharii* can probably establish (in parts of) Southern Europe. Climate projections indicate that the area where establishment can occur will increase across southern Europe over the next 50 years (Beck et al., 2018). Additionally the species can probably establish in greenhouses growing monocotyledonous host plants (see also Question 4).	Establishment of HCRV depends on the presence of the vector(s), see Question 6.
8.	What are the possible pathways that can contribute to spread	*T. eucharii* can spread naturally but trade of flower bulbs and other plants for planting is the most likely pathway for spread over longer distances (Mound & Tree, 2008; O'Neill, 1962).	As far as known, natural spread of HCRV can only occur by its vector species *T. eucharii,* that in the northern half of Europe can most likely establish in greenhouses only.

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	of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?		In the southern half of Europe, *T. eucharii* can likely also establish outdoors (EFSA, 2012). HCRV can also be spread by trade of plants for planting including flower bulbs (EFSA, 2012). While above ground plant parts show severe symptoms, no symptoms have been described on dormant flower bulbs. If infected flower bulbs are symptomless, the probability of spread via this pathway would be higher compared to other plants for planting because visual inspection would be ineffective. Moreover, flower bulbs are vegetatively propagated which also increases the probability of spread.
9.	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	*T. eucharii* has probably been present in Dutch greenhouses for many years (see Q2). Economic damage has never been reported and, therefore, the species does not seem to be a serious greenhouse pest. Most likely the species is easily controlled by insecticides or biological control agents (already applied against other pest) in Dutch greenhouses. In absence of any control measures, it may become a more serious pest. Symptoms of feeding damage have commonly been reported. However, there has been no reports of major damage caused by the thrips in its current area of distribution. For these reasons no major impacts are being expected if the species were to become established outdoors in southern EU member states.	Tospoviruses that can infect a wide range of plant species including bulbous crops are already present in the EU (tomato spotted wilt virus and impatiens necrotic spot). However, these viruses are not often reported in bulbous crops. This is most likely because of the host plant preference of their main vector *Frankliniella occidentalis*. This thrips species does not prefer monocotyledonous species. Therefore, HCRV in combination with *T. eucharii* could increase the impact caused by tospoviruses in horticulture in the EU and especially in Amaryllidaceae. The virus causes symptoms on leaves (see Q5) and any cosmetic damage on ornamental plants can already lower the value of these plants or even make them unmarketable. Damage levels will, however, strongly correlate with the success in controlling the vector *T. eucharii*. The vector seems to be easily controlled (see left: Q9 *T. eucharii*). Therefore, economic damage may be limited in commercial crops if HCRV were to become established together with its vector *T. eucharii*.
10.	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)?	No	No

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	If "no", go to question 12		
11.	If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)? *Only to be answered in case of an interception or a find.*	Not relevant	Not relevant
12.	Additional remarks		
13.	References	Beck HE, Zimmermann NE, McVicar TR, Vergopolan N, Berg A & Wood EF, 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution. Scientific data, 5, 1-12. Denmark, H. (1981). An oriental thrips, Taeniothrips eucharii (Whetzel). *Florida (Thysanoptera: Thripidae). Florida Dept. Agr. Cons. Serv., Divn. PI. Ind., Ent. Circ*, *224*, 1-2. Dong, J. H., Yin, Y. Y., Fang, Q., McBeath, J. H., & Zhang, Z. K. (2013). A new tospovirus causing chlorotic ringspot on Hippeastrum sp. in China. *Virus Genes*, *46*(3), 567-570. https://doi.org/10.1007/s11262-012-0873-z EFSA. (2012). Scientific Opinion on the pest categorisation of the tospoviruses. *EFSA Journal*, *10*(7). https://doi.org/10.2903/j.efsa.2012.2772 Kurosawa, M. (1937). Descriptions of four new thrips in Japan. *Kontyu*, *11*(3), 269. Li, Q., Xu, Y., Zhu, M., Dong, Y., Hu, J., Li, Y., & Liu, Y. (2017). Genetic diversity of the nucleocapsid protein gene of hippeastrum chlorotic ringspot virus from Hymenocallis littoralis in southern China *Acta Virol*, *61*(1), 116-122. https://doi.org/10.4149/av_2017_01_116 Martínez, R. T., de Almeida, M. M. S., Rodriguez, R., Cayetano, X., de Oliveira, A. S., Silva, J. M. F., Melo, F. L., & Resende, R. O. (2019). Analyses of orthotospovirus populations and dispersion under different environmental conditions in Brazil and in the Dominican Republic. *Tropical Plant Pathology*, *44*(6), 511-518. https://doi.org/10.1007/s40858-019-00307-x Miri, B., Moeini-Naghadeh, N., Vahedi, H., & Mirab-balou, M. (2020). Taeniothrips eucharii (Whetzel) (Thysanoptera: Thripidae): a newly recorded species on rangeland plants in Iran. *6*, 21-26. Mound, L. A., & Tree, D. J. (2008). The oriental lily-flower thrips Taeniothrips eucharii (Whetzel) (Thysanoptera: Thripidae) new to Australia. *Australian Entomologist*, *35*(4), 159-160. https://www.cabdirect.org/cabdirect/abstract/20093012236 O'Neill, K. (1962). An Oriental Taeniothrips (Thysanoptera: Thripidae) Infesting Certain Amaryllidaceae. *Annals of the Entomological Society of America*, *56*(3), 399-401. https://doi.org/10.1093/aesa/56.3.399 Vierbergen, G. (1991). Thysanoptera: tripsen. Thripidae. Taeniothrips eucharii - tweemaal geïmporteerd en geëlimineerd. *Verslagen en Mededelingen Plantenziektenkundige Dienst*, *168 (Jaarboek 1989/1990)*, 93-94. Vierbergen, G., Kucharczyk, H., & Kirk, W. D. (2010). A key to the second instar larvae of the Thripidae of the Western Palaearctic region (Thysanoptera). *Tijdschrift voor Entomologie*, *153*(1), 99-160.	

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		Whetzel, H. (1923). The plant diseases situation. *Agriculture Bulletin, Bermuda Department of Agriculture.*, *2*, 2-7. Wu, B. W., & Liu, Y. T. (2017). First Report of Hippeastrum chlorotic ringspot virus Infecting Zephyranthes candida in China. *Plant Disease*, *101*(11), 1960-1960. https://doi.org/10.1094/pdis-12-16-1837-pdn Xu, Y., Gao, X., Jia, Z., Li, W., Hu, J., Li, Y., Li, Y., & Liu, Y. (2017). Identification of Taeniothrips eucharii (Thysanoptera: Thripidae) as a Vector of Hippeastrum chlorotic ringspot virus in Southern China. *Plant Dis*, *101*(9), 1597-1600. https://doi.org/10.1094/PDIS-01-17-0045-RE Xu, Y., Lou, S. G., Li, X. L., Zheng, Y. X., Wang, W. C., & Liu, Y. T. (2013). The complete S RNA and M RNA nucleotide sequences of a hippeastrum chlorotic ringspot virus (HCRV) isolate from Hymenocallis littoralis (Jacq.) Salisb in China. *Arch Virol*, *158*(12), 2597-2601. https://doi.org/10.1007/s00705-013-1756-x	
14.	**Conclusions**	This quick scan was prompted by a scientific paper which has shown that hippeastrum chlorotic ringspot virus (HCRV) is transmitted by the oriental lily-flower thrips, *Taeniothrips eucharii. T. eucharii* is present in the EU but HRCV has thus far only been reported from China. HCRV may enter the EU with import of plants or thrips carrying the virus. HCRV can probably establish in areas where the vector is present. Damage can especially be expected in Amaryllidaceae, but economic impact may be limited as the vector seems easily to control in commercial crops.	
15.	**Follow-up measures**	The risk of hippeastrum chlorotic ringspot virus (HCRV) and its vector *Taeniothrips eucharii* will be communicated to stakeholders in the Netherlands.	