RESULTS OF A SURVEY OF JAPANESE FLOWER THRIPS (*Thrips setosus* Moulton, 1928) IN CROATIA IN 2017 AND 2018

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ABSTRACT

Thrips setosus Moulton, 1928 (Thysanoptera: Thripidae), the Japanese flower thrips, is a highly polyphagous Asian thrips species that can transmit Tomato spotted wilt virus. The presence of *T. setosus* in the EPPO region was reported for the first time in the Netherlands in 2014. After that, the EPPO Secretariat decided to add this potentially damaging thrips species to the EPPO Alert list. Subsequently, it was also recorded in other European countries (France, Germany and the United Kingdom). *T. setosus* was found in Croatia in 2016 on potted hydrangea plants in a nursery in Turanj (N 43°58'18.5" E 15°25'1.5"), a place situated in coastal part of Croatia. The origin of the finding is unknown but could be linked to imports of hydrangea plants from the Netherlands. A survey of *T. setosus* in Croatia was started in 2017 and continued in 2018. Visual inspections and thrips samplings were conducted in protected and outdoor vegetable and ornamental crops in 63 different localities in 15 counties. Thrips were collected by beating of infested plants on a white paper surface. Altogether 182 samples of thrips were collected for species identification. Thrips in collected samples were identified to the species level on the basis of morphological characters of adult females, using classical identification method according to relevant morphological keys. Species *T. setosus* was determined in 29 samples. A preliminary risk analysis according to EPPO Standard PM 5/5(1) was conducted and the conclusion was that *T. setosus* presents high phytosanitary risk to production of protected fruiting vegetables, as well as chrysanthemum cultivation in Croatia. Therefore, appropriate phytosanitary measures for pest eradication and prevention of its spreading were recommended to the Sector for Phytosanitary Policy of Ministry of Agriculture. No official measures have been undertaken, but the growers on localities where *T. setosus* was found were advised to take measures for limiting the spread of *T. setosus,* which included foliar insecticide treatments of hydrangea plants.

Key words: Croatia, survey, *Thrips setosus,* Thysanoptera

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1 INTRODUCTION

Japanese flower thrips *(Thrips setosus* Moulton, 1928), species native to eastern Asia, has recently been introduced into the Netherlands, Germany, France and the United Kingdom. It was found for the first time in Croatia in 2016 on hydrangea plants (Šimala *& al.,* 2017 a). The origin of the finding is unknown, but it could be linked to import of hydrangea plants from the Netherlands, where *T. setosus* was first recorded in 2014, also on hydrangea plants (OEPP/EPPO, 2014). Until then, this thrips species had only been known from Japan and South Korea, where it is a polyphagous pest of minor importance with no known association with hydrangea. Japanese flower thrips is known to feed on numerous plant species from at least 21 botanical families (Vierbergen & Loomans, 2016). Although it is called a flower thrips, it is a typical leaf feeding thrips and does not feed on pollen (Murai, 2001). It is a known pest of solanaceous crops such as tomato, pepper and eggplant and is known to attack chrysanthemum, cucumber, hellebore, hosta, hydrangea, impatiens, petunia, poinsettia, soybean and many more. Damage on leaves is similar to damage caused by other thrips species: silvery spots with dark excrements on the underside of the leaf. *T. setosus* is one of the ten species of thrips able to transmit Tomato spotted wilt virus (TSWV) (EFSA, 2012). This destructive viral disease transmitted by western flower thrips *(Frankliniella occidentalis* Pergande, 1895) causes severe damages in Croatia, especially in production of greenhouse pepper, tomato and chrysanthemum. *T. setosus* presents a high potential risk, especially to greenhouse production of fruitong vegetables and chrysanthemum, which was the reason for conducting a survey of *T. setosus* in Croatia in 2017 and 2018.

2 MATERIALS AND METHODS

A survey of *T. setosus* was conducted in greenhouse and outdoor vegetable and ornamental crops in continental and coastal part of Croatia in 2017 and 2018. Host plants were visually inspected for the presence of thrips or the symptoms of feeding, with each inspection site being examined mostly twice, in rare occasions only once, and nurseries even four times during the vegetation. Thrips were sampled by beating of infested plants on a white paper surface for subsequent laboratory analysis. Several adult thrips specimens were collected from each plant species with fine brush and immersed into Eppendorf vials containing AGA solution (10 units of 60 % ethyl-alcohol, 1 unit of glycerine and 1 unit of glacial acetic acid). All sampled thrips specimens were slide mounted in Canada balsam according to the standard method (Mound & Kibby, 1998) and examined using an Olympus BX 51 high power microscope (magnification 100-400x). Thrips in collected samples were identified to the species level on the basis of microscopic morphological characters of adult females, using the classical identification method according to morphological keys by Zur Strassen (2003) and Palmer (1992). Slide-mounted specimens were labelled with all data relevant for faunistic entry and deposited in the collection of Laboratory for zoology of Centre for Plant Protection.

3 RESULTS AND DISCUSSION

A survey of *T. setosus* in Croatia was started in 2017 and continued in 2018. During a two year survey, visual inspections and thrips samplings were conducted in greenhouse and outdoor vegetable and ornamental crops in 63 different localities in 15 counties of Croatia. In 2017, 62 visual inspections and thrips samplings were carried out in vegetables and ornamentals in 32 localities. A total of 65 samples of thrips were collected from 21 plant species. In 2018, 86 visual inspections were conducted in 44 localities and 117 samples of thrips were collected from 31 plant species. Majority of samples were taken from hydrangea, sweet pepper, cucumber, tomato and chrysanthemum, which are the most important cultivated host plants of *T. setosus*. In a total of 182 collected samples, 14 thrips species were identified (Table 1). *F. occidentalis* was the most abundant thrips species. It was identified in 60,4 percent (110 samples) of all analysed samples. This was expected, since it is the most widely spread and harmful thrips species of greenhouse vegetables and ornamentals in Croatia. Unexpectedly, a new invasive thrips species *T. setosus* was identified during a two year survey in as many as 29 samples, alone or in mixed population with *F. occidentalis, Thrips tabaci* Lindeman, 1889 or *Echinothrips americanus* Morgan, 1913 (Figure 1). Twenty six positive samples were collected from hydrangea plants and one from cucumber, cyclamen and *Brugmansia* sp. plants respectively. All positive samples were collected in garden centres in 11 following localities: Lučko (N 45°45'27.2“ E 15°52'14.01“), Gaženica (N 44°5'52.49“ E 15°15'39.95“), Poreč (N 45°13'37.76“ E 13°36'14.15“), Umag (N 45°25'34.09“ E 13°33'1.12“), Turanj (N 43°58'18.5“ E 15°25'1.5“), Split (2 localities: N 43°30'24.36“ E 16°29'54.24“ and N 43°30'50.32“ E 16°30'0.51“), Kaštel Sućurac (N 43°32'40.06“ E 16°27'21.7“), Dubrava Šibenska (N 43°44'7.99“ E 15°56'49.69“), Metković (N 43°4'6.29“ E 17°38'32.23“) and Štefanec (N 46°21'47.26“ E 16°29'38.54“), except for one sample that was collected in a nursery in Sračinec (N 46°20'12.04“ E 16°15'42.18“), on hydrangea plants from domestic production. On the base of recently published literature (Raspudić *& al.,* 2009; Šimala *& al.,* 2008; Šimala *& al.,* 2017 b; Zur Strassen, 2003) and comparison to the latest check list of Thysanoptera in Croatia (Raspudić *& al.,* 2003), *Scolothrips longicornis* Priesner, 1926 and *Thrips viminalis* Uzel, 1895 are newly recorded species for the thrips fauna in Croatia.

Table 1: Thrips species identified in collected samples (2017-2018).

PLANT FAMILY	PLANT SPECIES	THRIPS SPECIES					
		Aeolo-thrips glorio-sus	*Aeolo-thrips inter-medius*	*Aeolo-thrips mela-leucus*	*Echino-thrips ameri-canus*	*Frankli-niella intonsa*	*Frankli-niella occident-talis*
Amarylli-daceae	*Allium cepa*					+	
Apiaceae	*Apium graveolens*						+

Araceae	*Alocasia* sp.						
	Calla sp.						+
	Dieffenbachia sp.				+		+
	Philodendron bipinnatifidum				+		
	Zantedeschia sp.				+		
Asphodelaceae	*Hemerocallis* sp.						+
Asteraceae	*Aster* sp.						+
	Chrysanthemum sp.				+	+	+
	Dahlia sp.					+	+
	Gazania sp.						+
	Osteospermum sp.						+
	Zinnia sp.						+
Campanulaceae	*Platycodon* sp.						+
Caryophyllaceae	*Dianthus* sp.						+
Convolvulaceae	*Ipomoea* sp.			+			
Cucurbitaceae	*Cucumis sativus*				+	+	+
Euphorbiaceae	*Euphorbia pulcherrima*				+		
Fabaceae	*Phaseolus vulgaris*						+
Gesneriaceae	*Streptocarpus* sp.						+
Hydrangeaceae	*Hydrangea* sp.	+	+				+
Iridaceae	*Gladiolus* sp.						+
Malvaceae	*Hibiscus rosa sinensis*				+		+
Passifloraceae	*Passiflora* sp.				+		
Paulowniaceae	*Paulownia* sp.					+	+
Primulaceae	*Cyclamen persicum*					+	+
Rosaceae	*Rosa* sp.						+
Solanaceae	*Brugmansia* sp.						+
	Capsicum annuum	+				+	+
	Datura sp.						

	Lycopersicum esculentum						+
	Solanum melongena						+
Verbenaceae	*Lantana camara*						+

Table 1 continued.

PLANT FAMILY	PLANT SPECIES	THRIPS SPECIES							
		Scolothrips longicornis	*Thrips atratus*	*T. flavus*	*T. italicus*	*T. major*	*T. setosus*	*T. tabaci*	*Thrips viminalis*
Amaryllidaceae	*Allium cepa*							+	
Apiaceae	*Apium graveolens*								
Araceae	*Alocasia* sp.	+							
	Calla sp.							+	
	Dieffenbachia sp.								
	Philodendron bipinnatifidum								
	Zantedeschia sp.								
Asphodelaceae	*Hemerocallis* sp.								
Asteraceae	*Aster* sp.							+	
	Chrysanthemum sp.					+		+	
	Dahlia sp.			+				+	
	Gazania sp.								
	Osteospermum sp.								
	Zinnia sp.								
Campanulaceae	*Platycodon* sp.								
Caryophyllaceae	*Dianthus* sp.								
Convolvulaceae	*Ipomoea* sp.								
Cucurbitaceae	*Cucumis sativus*						+	+	+
Euphorbiaceae	*Euphorbia pulcherrima*								
Fabaceae	*Phaseolus vulgaris*								
Gesneriaceae	*Streptocarpus* sp.								

Hydrange-aceae	*Hydrangea* sp.	+			+	+	+	+	
Iridaceae	*Gladiolus* sp.								
Malva-ceae	*Hibiscus rosa sinensis*								
Passiflora-ceae	*Passiflora* sp.								
Paulowni-aceae	*Paulownia* sp.								
Primula-ceae	*Cyclamen persicum*						+	+	
Rosaceae	*Rosa* sp.					+		+	
Solana-ceae	*Brugmansia* sp.						+		
	Capsicum annuum					+		+	
	Datura sp.	+						+	
	Lycopersicum esculentum		+						
	Solanum melongena							+	
Verbena-ceae	*Lantana camara*								

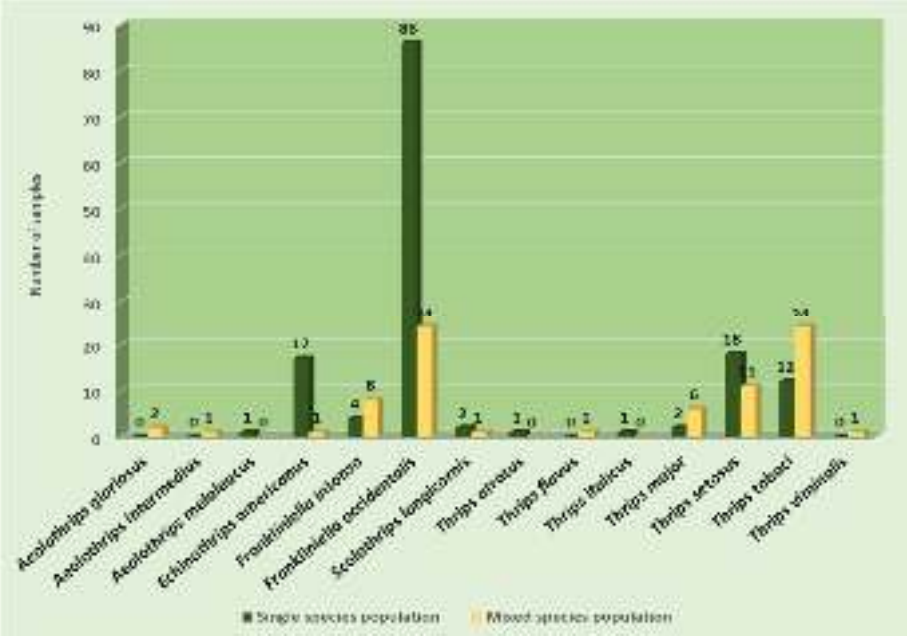

Figure 1: Number of collected samples according to thrips species (2017-2018).

4 CONCLUSIONS

A survey of Japanese flower thrips *(T. setosus),* carried out in 2017 and 2018, confirmed that interceptions of *T. setosus* on hydrangea plants from The Netherlands are common in Croatia. Plants of hydrangea are obviously the main pathway of its spreading within the EU. Due to its highly polyphagous nature and the ability to transmit very harmful Tomato spotted wilt virus, *T. setosus* presents a high potential risk especially to greenhouse production of fruiting vegetables and chrysanthemum, crops that are an important part of Croatian agricultural production and economy. Therefore, appropriate phytosanitary measures for pest eradication and preventing of its spreading were recommended to the Sector for Phytosanitary Policy of Ministry of Agriculture, which included foliar insecticide treatments of hydrangea plants on all localities in which *T. setosus* was found.

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