FIRST RECORD OF *DROSOPHILA SUZUKII* IN QUEBEC VINEYARDS

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Abstract

Aim : Surveys conducted between July and September 2012 in Quebec vineyards revealed the presence of the spotted wing drosophila (SWD), *Drosophila suzukii* Matsumura, just before harvest.

Methods and results : Red and white grapevine cultivars from four vineyards were surveyed for leafhoppers by using a tapping method. Unexpectedly, a total of 30 SWD adults were collected from red grapevine cultivars, *i. e.*, Marechal Foch, Gamay and Seyval Noir. Furthermore, a total of 101 SWD emerged from bunches selected in these vineyards and placed under laboratory conditions. No SWD were found in white cultivars.

Conclusion : This is the first mention of SWD in grapevines grown for wine in Quebec.

Significance and impact of the study : Spreading of SDW across Quebec vineyards may lead to important yield losses. Insecticide treatments need to be adapted to address this new entomological challenge.

Key words : spotted wing drosophila, grapevine, Quebec

Résumé

Objectif : Des études menées entre juillet et septembre 2012, dans des vignobles québécois, ont révélé la présence de la drosophile à ailes tachetées (DAT), *Drosophila suzukii* Matsumura, juste avant la récolte.

Méthodes et résultats : Lors d'un échantillonnage de cicadelles sur des cépages rouges et blancs de quatre vignobles, trente DAT adultes ont été collectées de façon inattendue par battage sur des cépages rouges, soit du Maréchal Foch, du Gamay et du Seyval Noir. Un total de 101 DAT ont émergé à partir de grappes sélectionnées en vignobles et placées en conditions de laboratoire. Aucune DAT n'a été détectée sur des cépages blancs.

Conclusion : Cela constitue la première mention de la DAT sur des cépages destinés à la production de vin au Québec.

Importance et impact de l'étude : La dispersion de la DAT à travers les vignobles québécois pourrait générer d'importantes pertes de rendement. Les traitements insecticides nécessitent donc des adaptations face à ce nouveau défi entomologique.

Mots clés : drosophile à ailes tachetées, vigne, Québec

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INTRODUCTION

The spotted wing drosophila (SWD), *Drosophila suzukii* Matsumura (Diptera, Drosophilidae), is an invasive pest that originates from Asia. In North America, the SWD was first detected in 2008 in California, where it caused serious damage the following years (Lee *et al.*, 2011 ; Pfeiffer *et al.*, 2012 ; Walsh *et al.*, 2011). Since 2009, this pest has spread across North America. SWD was also detected in 2008 in Europe (Cini *et al.*, 2012) and in 2011 in the French Sauternes vineyards (Rouzes *et al.*, 2012).

In Canada, the Canadian Food Inspection Agency (http://www.inspection.gc.ca) reported the occurrence of SWD in British Columbia, Alberta, Manitoba, Ontario and Quebec. Since its detection in British Columbia in 2009, this pest has spread to eastern Canada but has not yet been detected in Quebec vineyards.

In contrast to other *Drosophila* species, SWD attacks a large variety of healthy and ripening wild and cultivated fruits. Shortly before harvest, *D. suzukii* lays its eggs in healthy fruits such as cherries, strawberries, blueberries, caneberries (including raspberries and blackberries), peaches, grapes and a number of wild fruits. The SWD may cause severe yield losses (Lee *et al.*, 2011 ; Walsh *et al.*, 2011).

The SWD adults are brown or yellow little (< 4 mm) flies with red eyes. The antennae are short with branched arista. The abdominal segments possess unbroken dark stripes and the last segment is often dark. Males and females can be distinguished by their sexual dimorphism (Pfeiffer *et al.*, 2012). Males possess a single dark spot on the leading edge of each wing. On the first and second segments of their front legs, males also exhibit two black combs with 3 to 6 teeth parallel to the length of the legs. In contrast, females are deprived of these characteristics but possess a large serrated ovipositor that they used to lacerate the fruit skin. Eggs, larvae and pupae are difficult to identify due to their similarities with other species (Cini *et al.*, 2012). More information is available in Walsh *et al.* (2011).

MATERIALS AND METHODS

1. Survey

During surveys conducted from mid-July to the end of September 2012 on leafhoppers in vineyards, *Drosophila* adults were unexpectedly collected using a tapping method. Briefly, leafhoppers and *Drosophila* were collected by hand tapping grapevine leaves and bunches over an aluminum funnel sprayed with 75° ethanol. Tapping was done in red (Marechal Foch, Gamay, Seyval Noir, Pinot Noir, Lucy Kuhlman, and Baco Noir) and white (Seyval Blanc, Vidal, and Riesling) cultivars of four commercial Quebec vineyards located in Dunham (vineyards 1-3) and Saint-Jacques-le-Mineur (vineyard 4) (Table 1). No *Drosophila* trap was deployed in these vineyards.

2. Identification

When the first *Drosophila* adults were found, pictures were taken under a stereomicroscope (Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, Quebec) and emailed to Agriculture and Agri-Food Canada laboratory in Summerland (British Columbia) for preliminary identification. Then, the specimens were sent to the Canadian

Table 1. Occurrence of *D. suzukii* adults collected by tapping in Quebec vineyards in 2012.

Locality (GPS coordinates)	Vineyard	Cultivar	Collection date				
			3-7 Sept	10-14 Sept	17-21 Sept	24-28 Sept	1-5 Oct
Dunham	1	Gamay	2 ♂	2 ♀	1 ♀ 2 ♂		
(45°06'-72°51')		Marechal Foch	1 ♀ 2 ♂				
	2	Marechal Foch			2 ♀ 1 ♂		
		Seyval Noir			3 ♀ 3 ♂	4 ♀ 5 ♂	
	3	Seyval Noir			1 ♂		
St-Jacques-le- Mineur	4	Lucy Kuhlman					
(45°13'-73°26')		Baco Noir					
		Pinot Noir				1 ♀	

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Table 2. Emergence of *Drosophila* adults from bunches selected in Quebec vineyards and placed in laboratory conditions in 2012.

Locality	Vineyard	Cultivar	Number of bunches	Number of emerging adults	
				Total number of *Drosophila*	*Drosophila suzukii*
Dunham	1	Gamay	2	57	1 ♀ 3 ♂
		Marechal Foch	2	56	3 ♀ 3 ♂
	2	Marechal Foch	2	74	4 ♀ 5 ♂
		Seyval Noir	8	526	52 ♀ 30 ♂

National Collection of Insects & Ottawa Plant Laboratory - Entomology, CFIA (Ottawa, Ontario) to confirm their identity.

3. Adult emergence from bunches

On 21st September 2012, bunches of Marechal Foch, Gamay and Seyval Noir were selected from vineyards 1 and 2 (Table 2), where *Drosophila* were observed. Bunches were placed in laboratory conditions (on sand in ventilated plastic boxes at 20 °C) (Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu) for 15 days to observe the emergence of SWD adults.

RESULTS

A total of 30 SWD (14 females and 16 males) were collected by tapping in the four commercial vineyards. The first five SWD adults were collected on 6th September 2012 in vineyard 1 (Table 1) from the red grapevine cultivars Marechal Foch and Gamay. These five specimens were deposited as vouchers in the Canadian National Collection of Insects (Ottawa, Ontario). No specimen was collected after harvest.

A total of 713 *Drosophila* specimens emerged from the bunches placed in laboratory conditions, among which 41 males and 60 females of *D. suzukii* (Table 2). The other specimens were not identified to species.

DISCUSSION

To our knowledge, this is the first report of SWD in grapes cultivated for wine in Quebec. It seems that red cultivars were preferred by SWD over white cultivars.

No SWD adults emerged from bunches collected in 2010 and 2011 in British Columbia and incubated at 20 °C in laboratory conditions (Sweeney and Hueppelsheuser, unpublished data). The authors concluded that SWD did not represent a risk for grapes under British Columbia conditions. Similarly, no SWD emerged from bunches collected in Sauternes, France (Rouzes *et al.*, 2012). In contrast, we observed SWD adult emergence from bunches collected in Quebec vineyards. This observation implies that SWD is able to complete its life cycle in bunches and suggests that SWD may fly to suitable overwintering sites near cool-climate vineyards.

The presence of SWD also implies that insecticide treatments must be adapted to address this new entomological challenge (Lee *et al.*, 2011 ; Pfeiffer *et al.*, 2012), especially because *D. suzukii* attacks fruits before and during harvest. In 2012, the Canadian Pest Management Regulatory Agency promptly registered spinosad as adulticide against *D. suzukii*, for application before oviposition in fruits. In Quebec, spinetoram, malathion, cypermethrin and spinosad were recommended in 2012 for different crops. Spreading of the SWD may incur important economic costs due to potential yield losses.

CONCLUSION

Our study demonstrated the occurrence of *D. suzukii* in Quebec vineyards. Further studies should be done to quickly acquire information on the biology, the risks and the sustainable management techniques of SWD in cool-climate vineyards.

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