FIRST OCCURRENCE OF *DROSOPHILA SUZUKII* IN THE SAUTERNES VINEYARDS

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Abstract

Aim: The present work reports the detection of a new fruit fly species in Sauternes vineyards (Aquitaine region, France): *Drosophila suzukii.*

Methods and results: *Drosophila* were collected in two Sauternes vineyards, at the beginning of the harvest time in 2011, using food traps with apple molasses baits. The surveys led to the detection of the invasive species *D. suzukii*. In addition, rotting bunches were randomly taken in each vineyard but no *D. suzukii* emerged from them. The Drosophila community found in traps and on bunches was dominated by D. melanogaster.

Conclusion: *D. suzukii*, although present in the vineyard agroecosystem of Sauternes, did not cause any noticeable damage in 2011. However, population monitoring should be continued.

Significance and impact of the study: This first occurrence report of the invasive species *D. suzukii* in the Bordeaux vineyard should motivate further surveys of this potential pest of green berries.

Key words: small fruit fly, grapevine, *Drosophila suzukii*, drosophila communities, monitoring

Résumé

Objectif : Ce travail signale la présence d'une nouvelle espèce de drosophile dans le vignoble aquitain de Sauternes : *Drosophila suzukii.*

Méthodes et résultats : Des drosophiles ont été collectées, dans deux domaines viticoles du Sauternais, au moment des vendanges 2011, par piégeage alimentaire à base de mélasse de pomme. Les déterminations ont conduit à la détection de l'espèce invasive *D. suzukii*. Des grappes mûres ont été prélevées dans les deux localités, mais aucune émergence de cette espèce n'a été détectée. Dans les pièges et les grappes, la communauté des drosophiles était dominée par *D. melanogaster*.

Conclusion : *D. suzukii* est présente dans l'agrosystème viticole sans toutefois occasionner de dégâts remarqués en 2011. Cependant, un suivi rigoureux des populations doit être entrepris.

Signification et impact de l'étude : Cette première détection dans le vignoble bordelais d'une espèce de drosophile invasive doit motiver une surveillance de ce possible futur ravageur de baies vertes.

Mots clés : drosophile, vigne, *Drosophila suzukii*, communautés des drosophiles, surveillance

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INTRODUCTION

European viticulture is constantly facing exotic pest invasions and pest niche changes, therefore, the monitoring of invasive species is of growing importance. The development of food traps for grapevine moths in vineyards (Thiéry *et al*., 2006) allows surveying additional new pest species like *Drosophila* species. *D. melanogaster* (also called vinegar flies or fruit flies) are a great concern in viticulture because they spread sour rot, which seriously damages white grape cultivars. The *Drosophila* community has been carefully studied in the Sauternes area where Capy *et al*. (1987) recorded *D. melanogaster* and *D. simulans*, respectively, as major species.

In 2011, near harvest time, we caught in Sauternes an atypical fruit fly species that was taller than the usual *Drosophila*: the Spotted Wing *Drosophila* (SWD), *Drosophila suzukii* (Matsumura, 1931). This species never reported in the Bordeaux vineyard before was recently introduced in Europe and France (Weydert & Bourgouin, 2012). Its specific behaviour and morphological characteristics make SWD a threat to the production of many fruits, including table grape and wine production (Walsh *et al*., 2011).

By focusing on the detection of *D. suzukii* in the Sauternes vineyard, the present work provides new data concerning the *Drosophila* grape community and considers the ability of *D. suzukii* to be a damaging pest of grape.

MATERIALS AND METHODS

All experiments were conducted in two vineyards of the Sauternes area, about 30 km south-east of Bordeaux: one located in Sauternes, the other in Barsac. The vineyard plots surveyed were protected against *Lobesia botrana* (European grapevine moth, Lepidoptera: Tortricidae) by using the mating disruption technique.

During the 2011 season, food traps were used for *L. botrana* monitoring. Each trap was filled with apple molasses diluted in water, as described in Thiéry *et al*. (2006). We put various numbers of traps per site: six in Sauternes, three in Barsac. The first count was performed on September 14, 2011. The *Drosophila* species were stored in 70% ethanol solution and *D. suzukii* were sorted from other *Drosophila* species and sexed in the laboratory.

In order to determine *Drosophila* communities on bunches, ten rotting bunches were randomly taken from one plot of each area two weeks after scoring in the food traps (i.e., on September 28, 2011). The bunches were stored individually in plastic boxes with perforated lids and tulle and placed in a climatic chamber for two days under a 16:8 (L: D) photoperiod, a 22 ± 1°C temperature and 70 ± 10% RH. We assume that a 2-week interval between adults trapping and emergence of new generation is sufficient.

RESULTS

In the samples collected from food traps on September 14, 2011 (Table 1) we counted 1504 and 558 *Drosophila,* respectively, for the Sauternes and Barsac areas. For the two experimental sites, we noted the presence *D. suzukii*. In this late grape harvest area, the proportion of this species was less than 5% of the *Drosophila* sampled. The male/female ratio remained constant; females always represented 60% of the adults caught.

No *D. suzukii* was observed from the bunches collected in the two experimental sites (Table 2). A total of 153 individuals have emerged from 20% of the bunches collected in the Sauternes area. The proportion of the species was 96.7% of *D. melanogaster* and 3.3% of *D. simulans*. Fewer individuals (24) have emerged from 10% of the bunches collected in the Barsac area. They were *D. melanogaster* only. Again, the frequency of females was always higher than that of males.

DISCUSSION

A pioneering study by Capy *et al*. (1987) on *Drosophila* communities in the Sauternes vineyards did not reveal the presence of *D. suzukii* and no publications refer to it in the Bordeaux vineyard. As damage to grape has recently been reported in Italy (Weydert and Bourgouin, 2012) and because SWD prefers a temperate

Table 1. Number of Drosophila and proportion and sex of *Drosophila suzukii* counted on food trap samples on September 14, 2011 for each sampling area.

Species / Area	Sauternes (1)		Barsac (2)	
	Males	Females	Males	Females
Drosophila suzukii	24	35	7	11
Drosophila spp.	1445		540	
% Total *D. suzukii*	**3.9%**		**3.2%**	

(1) Total number for the six traps, (2)Total number for the three traps

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Table 2. Number of individuals and sex of *Drosophila* species emerging from bunches collected on September 28, 2011 for each experimental site.

Species / Area	Sauternes		Barsac	
	Males	Females	Males	Females
Drosophila melanogaster	66	82	8	16
Drosophila simulans	2	3	0	0
Total	153		24	
% *D. melanogaster*	96.7%		100%	
% *D. simulans*	3.3%		0%	
% Bunches with *Drosophila spp.* emerged	20%		10%	

climate (Walsh *et al*., 2011), like that of the Bordeaux region, one should suspect a rapid expansion in French Atlantic climate area.

We found *D. suzukii* in traps but not on bunch sampling, like observed in citrus orchard in Corsica Island (Weydert & Bourgouin, 2012). Their abundance on grape could not be measured, however, their presence in our traps suggests that populations are established in the surveyed areas. Thus, our trapping results would probably correspond to SWD leaving the bunches, as was observed in 2011 on raspberries in the same region.

D. suzukii may expand over the wine territories. It has already been observed near Paris (David, pers. comm.), but also in Swiss vineyards (Kerlhi, unpublished data) and in Trentino, Italy (Rucci, unpublished data). The potential pest status of SWD is not yet known. Being the first *drosophila* attacking fruits in the season, it may represent a pioneer species and favour the fruit colonization by other *Drosophila* species. These two points should, however, be confirmed. The danger may also be represented by *D. suzukii* egg laying behaviour, which could directly damage green berries. Considering the risk related to this species, IOBC 'Integrated Production in Viticulture' experts concluded in autumn 2011 that SWD should be surveyed in the different European vineyards.

Landolt *et al*. (2012) showed that the combination of vinegar and wine attracted greater numbers of *D. suzukii* into traps compared with vinegar or wine alone; this behaviour could cause problems during bottling by increasing the risk of entry of flies in bottles. The present work was based on apple molasses bait (Thiéry *et al*., 2006). This type of trap could be interesting because it allows the monitoring of both the European grapevine moth and *Drosophila* species. This tool has commonly been used in the vineyard for a number of years.

CONCLUSION

Our work strongly suggests focusing on *D. suzukii* in vineyard. It also motivates the urgent acquisition of field data in order to better understand the population dynamics of *D. suzukii* and show if this species can perform its biological cycle on grapevine in Aquitaine. This should help to prepare for the management of this species that could become a pest of grape berry or a pioneer for other *Drosophila* species.

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