Bulletin of Insectology ***64*** *(Supplement): S269-S270, 2011*
ISSN 1721-8861

Monitoring *Scaphoideus titanus* for IPM purposes: results of a pilot-project in Piedmont (NW Italy)

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Abstract

A pilot-project was conducted in Piedmont to determine if insecticidal sprays against *Scaphoideus titanus*, the vector of grapevine 'flavescence dorée' disease, can be decreased in case of low populations of the leafhopper. Field samplings included a sequential sampling of nymphs on leaves and yellow sticky traps for capturing adults in vineyards subject to different pest management strategies. Population levels of *S. titanus* were lower in conventional than in organic vineyards, the latter being always more variable, suggesting some problems in the distribution of the active ingredient. The vineyards that were under the proposed threshold received just one spray, however no increase in the presence of *S. titanus* was observed. As a result, provided a suitable sampling plan, it is possible to reduce insecticidal sprays against this leafhopper vector.

Key words: grapevine, 'flavescence dorée', leafhopper vector, mandatory phytosanitary procedures.

Introduction

The nearctic leafhopper *Scaphoideus titanus* Ball (Hemiptera: Cicadellidae) is the main vector for 'flavescence dorée' (FD) phytoplasmas (16SrV, subgroups C and D) (Boudon-Padieu, 2003). In Italy, the control of *S. titanus* and FD is mandatory, and include insecticidal treatments and removal of infected plants. Usually, at least two-three sprays are necessary in conventional and organic farming, respectively. However, if no or little FD occurs, they may be dropped to one, provided the population levels of the leafhopper are low enough, in order to preserve non-target organisms. This research consists in a pilot-project for targeting the efforts in controlling *S. titanus* in grapevine growing areas of Piedmont (North-Western Italy).

Materials and methods

Data were collected in 2009-2010 in 22 vineyards situated in 12 districts of the Cuneo Province (44.38271-44.56752 °N; 7.85674-7.98295 °E), and subject to traditional or organic pest management against *S. titanus*: active ingredients used included thiamethoxam (TH), organophosphates (OP), etofenprox (E), pyrethroids (P), and natural pyrethrum (NP). All the vineyards were of cv "Dolcetto", except one (cv "Chardonnay"), and their size range was 0.5-0.9 ha. Plants with FD symptoms were detected only in one of them (no. 12) and were up to 2% of the total.

Nymphs of *S. titanus* were sampled at the middle of June, before insecticidal sprays, with direct observations on the leaves following a sequential sampling plan with a fixed precision level of 0.75 (Lessio and Alma, 2006): counts were interrupted either when the stop was reached, or if the pest density was lower than 0.02 nymphs per 5 leaves per plant (no more than one nymph on 137 plants). Adults were sampled with yellow sticky traps, 3 per vineyard, placed at the beginning of July and changed every 10 days until the middle of October. In Piedmont, the thresholds for dropping to one insecticidal spray are < 0.02 nymphs, and ≤ 2 adults on 3 traps/ha. Data were analysed with a hierarchical cluster method, using the level of nymphs and adults as variables, in order to find a trend in clustering of vineyards subject to different PM strategies.

Results

During 2009, nymphs and adults of *S. titanus* were found in 15 and 18 vineyards out of 22, respectively; three vineyards were under the threshold of 0.02 nymphs and 2 adults. In 2010, no nymphs were found in 5 vineyards, whereas adults were captured in different numbers in all vineyards; 2 vineyards were under the threshold. The highest presence of both nymphs and adults was recorded in the same vineyard (no. 5), that was subject to organic farming, in both years. The cluster analysis showed the presence of 5 and 6 groups in 2009 and 2010, respectively (table 1, figure 1). Cluster 1 was the most represented, and included vineyards with low populations of nymphs and adults. As a result, NP-treated vineyards were almost evenly distributed within different clusters, indicating a great variability in the effectiveness of this active ingredient, probably depending on the accuracy of distribution (e.g. sprays during day or evening, pH of the solution, etc.) or on the date of application. In 2009, the majority of vineyards (13) were in cluster 1, and adopted a PM strategy based on TH + OP. In 2010, PM strategies were more heterogeneous due to the fact that many farmers applied just one spray, provided low population levels of the vector were detected; however 16 vineyards were in cluster 1 (figure 1).

Table 1. Results of hierarchical cluster analysis of vineyards with different levels of *S. titanus* nymphs (mean density calculated with sequential sampling plan) and adults (mean captures per 3 traps).

Cluster	2009			2010		
	No. vineyards	Nymphs (mean)	Adults (mean)	No. vineyards	Nymphs (mean)	Adults (mean)
1	16	0.06	3.19	13	0.08	4.57
2	3	0.05	26.67	4	0.03	12
3	1	0.65	91	1	0.33	39
4	1	0.11	55	1	0.11	32
5	1	1	475	1	0.71	91
6	-	-	-	1	0.71	216

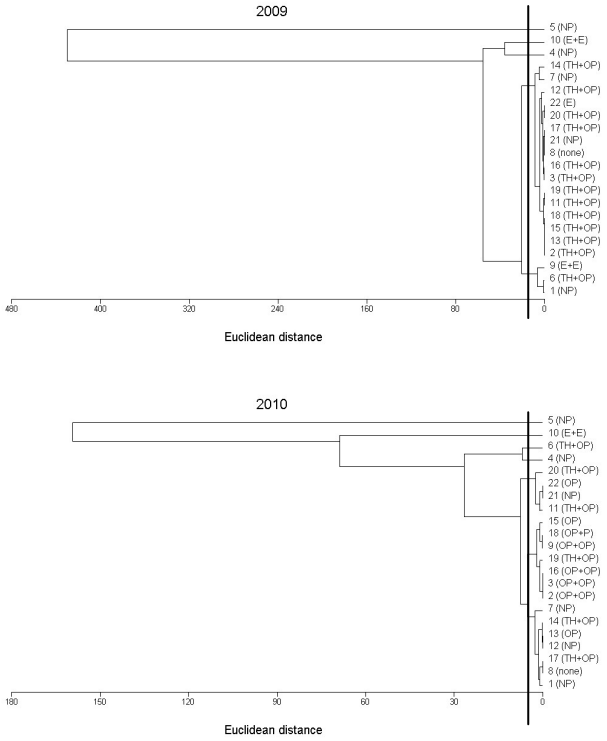

Figure 1. Dendrogram showing the vineyards subject to different PM strategies (see text for details) and falling into different clusters of *S. titanus* density. The vertical line indicates the points of dendrogram cutting.

Discussion

This pilot-project showed how a correct monitoring of the leafhopper vector, *S. titanus*, is important for targeting pest management strategies. When populations at the nymphal stage are very low (<0.02), one spray is enough to prevent infestation and therefore disease outbreaks if no FD is present within the vineyard. However, monitoring with traps permits to shift to 2 sprays within the season in case of an increase of adults' captures. The reduction of spraying should also have a benefit for honeybees and foraging insects, especially given the high toxicity of certain active ingredients Iwasa *et al*., 2004). The reduction cannot be applied in the case of organic pest management, as pyrethrum has no or little persistence and must be repeated at least 3 times during the season, however it has in any case a low environmental impact. Another risk factor is the presence of wild grapevine close to the vineyards, which can host both *S. titanus* and 16SrV phytoplasmas (Lessio *et al*., 2007; Lessio *et al*., 2011). In this case, decreasing insecticidal sprays should be considered carefully.

Acknowledgements

We are grateful to all those who helped in field monitoring and to the farmers who provided vineyards for analysis. This research was supported by "Regione Piemonte-Servizi di Sviluppo Agricolo".

The present work has been carried out in the frame of COST action FA0807 "Integrated Management of Phytoplasma Epidemics in Different Crop Systems"

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