



Testing the use of mating disruption in the management of vine mealybug populations in Alentejo vineyards

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Extended abstract: The vine mealybug (VM), *Planococcus ficus* (Signoret) (Hemiptera, Pseudococcidae) has been increasing its importance in some areas, in Portugal. Chemical control is still the most common management tactic used against VM. However, it is often ineffective due to mealybug cryptic behaviour, waxy body cover, and clumped spatial distribution pattern. Also, the use of insecticides may be unsustainable, due to resistance, low selectivity, human toxicity, or risk or hazard assessment. Furthermore, the use of synthetic insecticides is not allowed in organic vineyards. Therefore, there is a need to find sustainable control tactics.

Mating disruption has been tested as an alternative sustainable control tactic in different countries. Walton et al. (2006) tested mating disruption for the first time against the VM, using a sprayable microencapsulated formulation. However, this formulation showed a short effective lifetime. Other formulations were later developed, including membrane dispensers (e. g., Checkmate VMB-XL, Suterra Inc.), rope dispensers (Isonet PFX; Shin-Etsu Chemical Co. Ltd.), and aerosol spray cans (Puffer, Suterra Inc.). Different dispenser's density and pheromone doses have been tested, ranging between 300 and 1250 dispensers/ha, and between 45 and 187.6 g/ha, respectively (Cocco et al., 2014; 2018; Langone et al., 2014; Lucchi et al., 2019). Lucchi et al. (2019) found no differences among 300, 400, and 500 dispensers/ha in MD effectiveness. Cocco et al. (2018) refer an optimal pheromone load of 90 g/ha. Sharon et al. (2016) reported trap shutdown was dependent on mealybug density. It was observed after 1-year treatment, in low mealybug infestation level, but only after 2 years in case of high infestation level. Cocco et al. (2018) showed that mating disruption applied over consecutive years influence the reproductive biology of VM, by reducing the percentage of ovipositing females and pre-oviposition period.

In Portugal, mating disruption experiments were carried out in three vineyards of Alentejo region, in 1-2ha plots, between 2017 and 2019, to test its effectiveness against the VM. In mating disruption plots, 500 Isonet PF dispensers/ha were installed in early May. Male-flight activity was monitored weekly, using pheromone traps. Mealybug infestation was evaluated in June and July by visual observation, in 30 vines/plot. The level of infestation was determined using the index: 0 - no mealybugs; 1 - isolated individuals; 2 - few mealybug colonies; and 3 - several to many colonies. At harvest, the percentage of infested grape bunches and the number of mealybugs per bunch were determined, by sampling at least 50 bunches per plot. The disruption index varied between 20 % and 86 %, in 2017, 77 % and 80 %, in 2018, and 88 % and 93 %, in 2019. Overall, the mean infestation index per vine in June-July and the number of mealybugs per grape bunch at harvest in control plots were 0.18 and 0.79, about 2.4 and 4.3 times higher than in mating disruption (0.07 and 0.18), respectively.

Different aspects should be taken in consideration in future research to improve the effectiveness of mating disruption in the control of VM:

- 1) the existence of different VM phenotypes (Kol-Maimon et al., 2010) may affect the effectiveness of mating disruption in some VM populations;
- 2) the kairomonal effect of the VM sex pheromone on the parasitoid *Anagyrus vladimiri* Triapitsyn (= *Anagyrus* sp. near *pseudococci*) (Franco et al., 2008, 2011) may enhance biological control in mating disruption plots;
- 3) the MD mechanism (Miller & Gut, 2015) should be clarified;
- 4) dual purpose mating disruption dispensers (*Lobesia botrana* and VM) (Baba et al., 2019) and aerosol devices (Benelli et al., 2019) may contribute to improve cost effectiveness of mating disruption for the VM.

Key words: *Planococcus ficus*, mealybugs, grapevine, pheromones, IPM

Acknowledgements

Thanks are due to Francisco Mata, António Mau, João Maria Correia, Filipe Perdiz, Hugo Pardal, André Pilirito and Andreia Ribeiro from ATEVA, for the help in the selection of the experimental plots, application of mating disruption dispensers, and field monitoring; to João Correia, Miguel Feijão, and Nuno Bico for allowing us to conduct the experiments in their farms; to Vera Zina, André Garcia, and Mauricio Bigolin, for the help in field sampling; to Biosani and Shin-Etsu, for providing the pheromone dispensers used in the experiments. This research was supported by KKL-JNF Israel (2015-2017), program PDR2020-1.0.1-FEADER-03200 (partnership 82/164) “Grupo Operacional IntenSusVITI, Intensificação sustentável da vitivinicultura através da poda mecânica,” and national funds provided by the Fundação para a Ciência e Tecnologia including R&D Unit’s projects UID/AGR/00239/2013, UID/AGR/04129/2013, UID/AGR/00239/2019 and UID/AGR/04129/2019.

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