

Management of *Halyomorpha halys* by exclusion nettings: investigation on side effects towards the pear brown spot caused by *Stemphylium vesicarium*

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Extended abstract: The difficulties in the control of Brown Marmorated Stink Bug (BMSB) *Halyomorpha halys*, and the severe damage recorded on pear orchards, an important crop in Emilia-Romagna (Northern Italy) and highly susceptible to infestations of this invasive alien species, has led to the wide use of multifunctional exclusion netting (Caruso et al., 2020). The technique is estimated to be widespread in almost 10 % of regional areas cultivated by pear trees (17,000 ha), with the forecast of further extensions of physical protections, especially “whole block net” type, in the coming years.

Several studies have been carried out on the side effects of these structures on other pests, highlighting their strengths and some shortcomings (Alaphilippe et al., 2014). However, the need has emerged to investigate more precisely the variations of the microclimate and its influence on brown spot (*Stemphylium vesicarium*) infections due to the increasing damage caused by this disease on the pear orchards of Northern Italy, in the last three years.

The investigation was carried out, over a two-year period 2020-2021, in the experimental orchards of the Navarra Foundation in Ferrara (Italy). Different netting systems were compared: “single row white net”, “single row grey net”, “single row black net”, “whole block grey net”, and “anti-hail grey net”, and control (uncovered orchard). The trials were carried out on an orchard of ‘Abbé fétel’, the most widespread pear cultivar in Emilia-Romagna. This cultivar is highly susceptible to brown spot infection. Inside the 6 treated orchards, data loggers were installed to record microclimate parameters such as temperature, relative humidity (RH), and leaf wetness, from May to September, in which the different cover nets were employed. Microclimatic data were used to run the BSP cast forecasting model for brown spot infection (Llorente et al., 2002), to compare the infection risk levels among the different netting systems. Finally, the damage caused by brown spot and BMSB were assessed. The results obtained are summarized below:

- a) the predisposing microclimatic conditions and the risk of brown spot infections (RH, leaf wetness and output of BPS cast) in “anti-hail net” and “whole block net” were significantly higher compared to single row nets and uncovered orchards;
- b) there are no significant differences between “whole block net” and “anti-hail net” regarding the trend of microclimatic parameters and the risk of brown spot (BSP cast);
- c) the microclimatic characteristics and the risks of brown spot (BSP cast) on “single row white net” in particular do not differ significantly from the control;

d) brown spot damage detected at harvest is consistent with the microclimate trends and the output of BSP cast model. The results showed an increase in the incidence of the infected fruits in the “anti-hail” (10.5 %) and “whole block net” (10.4 % of damage) orchards compared to “single-row net” (1.2 %) and uncovered orchards (2.0 %). There were no differences between “whole net” and “anti-hail net”.

e) BMSB damage is significantly lower on the plots with “single row net” (1.0 %) and “whole block net” (3.0 %) compared to “anti-hail net” (6.0 %) and uncovered orchard (11.0 %).

This two-year investigation confirms that microclimatic conditions in orchards under anti-hail net increase the risk of brown spot infections (BPS cast). However, the results do not differ significantly from the orchards under the whole block net system. This type of protection is the one most used in Emilia-Romagna. Therefore, based on this study, we can conclude that, when compared with the anti-hail system, use of the whole block net system does not cause increased risks of brown spot infections because of the limited air circulation given by the perimeter closures. The findings of this study highlight the positive influences on the microclimate of single-row nets, particularly under the white ones, with conditions similar to uncovered orchards. Finally, the exclusion netting systems (single row and whole block net) confirm its effectiveness against BMSB.

Key words: exclusion netting, *Halyomorpha halys*, microclimate, *Stemphylium vesicarium*

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