

Response to Reviewer 3 Comments

REF3 – point 1:

M&M

Among the main observations, highlighting as deficiencies is the absence of a short description of at least the main pest management agricultural practices that are regularly applied in the vineyards studied (Conventional/IPM/Organic regime). It is also missing to describe the main agricultural practices aimed at management of soil and herbaceous vegetation cover in the growing area.

Response 1:

We appreciated the effort made by the Referee in revising our manuscript. The issue the Referee pointed out is of a significant interest, and the missing information is added to the new version of the manuscript. Specifically, “Vineyards were managed according to common practices in the Veneto region with application of fungicides and insecticides against the main grape pathogens and pests, and with grass cover constantly maintained” (lines 89-92). Furthermore, this information was also underlined in the Discussion (lines 464-466): “It should be mentioned that the vineyards where the experiments were performed were subject to standard application of fungicides, and specific management against grey mold was applied”.

REF3 – point 2:

L106. Infestation densities instead of treatments.

Response 2:

Accepted.

REF3 – point 3:

Results

L193. “Beat sampling revealed a higher count of stink bugs if compared to visual sampling, with the latter consistently underestimating their numbers (Tables 1 and 2; Figures 1A and S1). You indicate that beat sampling allows for greater capture records of stink bugs compared to visual sampling, and you indicate that this can be verified in Tables 1 and 2, but I cannot see it from the values indicated in them. Could you be more explicit? You also point out that it can be verified in Figure 1A, (and I suppose that if so, also in 1B), although in 1A the values represented refer only to the beat sampling. On the other hand, Supplementary Figure S1 lacks a graph footer so it does not allow us to know what type of sampling it refers to.

Response 3:

The table indicating the seasonal population dynamics of *H. halys* refers to the output for reported sources of variation (please note that table numbering changed following the suggestion made by the Referee no. 1). The comparison between visual sampling and beat sampling can be instead inferred by looking at the graphs in figures 1 and S1 (please also find the new version of the Suppl. file with figure captions). To fix this aspect, we updated the main text by removing the reference to the table where not appropriate.

REF3 – point 4:

L195-196. The authors report that in the beat samplings a variation in the values of *H. halys* can be seen during the season (refer to Fig. 1A). I wonder: why don't they also include Fig 1B here? After all, it is also corresponding to beat sampling, although referring to the year 2018...? In any case, no Figures are provided where the data or the seasonal variation of visual sampling is presented...

Response 4:

In this part the inclusion of Fig. 1B seems not consistent since here we are referring to 2017 data. However, the information for the 2018 growing season is presented a few lines below (see lines 224-226): “During the 2018 growing season, *H. halys* population level fluctuated during the samplings (Table 1), increasing at the end of the season in Cabernet Franc, and Raboso (Figure 1B)”. Finally, for the visual sampling please find the figure in the Suppl. file.

REF3 – point 5:

L196-198. “its infestation was also influenced by the grape cultivar (**Table 2**), resulting higher on Merlot and Pinot gris compared to Cabernet Franc and Glera (~~Table 2~~; Figure 2A)”.

Response 5:

Accepted.

REF3 – point 6:

In 2017 (Fig. 2A), statistically higher values are observed in the Merlot and Pinot gris cultivars compared to Cabernet Franc and Glera, although in Figure 2B (2018) the data are relatively different from those of 2017. It would be interesting to have of a possible explanation for this variation between both years (in the Discussion section).

Response 6:

Following Referee's remarks, we added more details on this in the Discussion section, i.e., "Variations in the preference for grape varieties between years may be attributed to fluctuations in pest populations and abiotic factors. However, certain varieties maintained their higher susceptibility to *H. halys* infestation across both years" (lines 377-380).

REF3 – point 7:

L213-214. "During the 2018 growing season, *H. halys* population level fluctuated during the samplings (Table 3; Figure 1B), increasing at the end of the season particularly in Cabernet Franc, Merlot and Raboso (Table 3; Figure 1B)" (a suggestion in view of Fig. 1B).

Response 7:

Accepted.

REF3 – point 8:

L214-216. "Overall, we observed differences among cultivars, with Cabernet Franc and Merlot showing the highest infestation levels, while Tai, Glera, Raboso and Cabernet Sauvignon the lowest (Figure 2B)". However, in 2017 the Cabernet Franc cultivar presented values lower than Merlot and Pinot Gris, and similar to Glera.

Response 8:

This information was added, as suggested, in lines 375-377: “Although Cabernet Franc and Merlot showed the highest infestation levels in 2018, in 2017 Cabernet Franc exhibited lower infestation levels compared to Merlot and Pinot gris, with values similar to Glera”. Please refer to the reply no. 6 for further details.

REF3 – point 9:

L 216. “Pinot gris experienced a moderate level of infestation”. The results between both years are relatively contradictory, since this statement corresponds to the year 2018 (Fig. 2B) although this is not the case in 2017 (Fig. 2A).

Response 9:

The statement is accurate for the 2018 growing season, to which this part of the text refers, while differences were detected comparing the results with the previous year. Please refer to replies no. 6 and 9 for the details on the difference on infestation densities between grape varieties.

REF3 – point 10:

L217-219. “*Halyomorpha halys* numbers were higher on red grape cultivars than on white ones (Figure 3A), and in late-ripening cultivars compared to early ones (Table 4; Figure 3B). Pest distribution along rows was influenced by the position, being higher at the border than at the center (Table 3; Figure 3C).” This result is compatible with a predominantly terrestrial dispersal of *H. halys* nymphs. The comparison between interior and edge zones is fully evident in Fig. 3C.

Response 10:

Thank you for the comment, we have clarified the potential factor contributing to the higher infestation at the field border in the Discussion section, taking into account the feedback from Referee no. 1. (see lines 395-398: “The inability of the pest to complete its development solely by feeding on grapes [10,11] could have contributed to the increased infestation level at the border observed in the surveyed vineyards”).

REF3 – point 11:

L236-238. “Concerning white cultivars, the **percentage** of berries showing signs of infestation was **different among cultivars** (Table 5), higher on Glera than on Pinot Gris (Table 5; Figure 4), **as well as** while for red ones (Table 6), it was higher on Cabernet Franc than on Merlot (Table 6; Figure 5).

Response 11:

Accepted.

REF3 – point 12:

L238-241. The extent of damage to berries due to *H. halys* infestation varied across phenological stages in white cultivars (Table 5), while there was no significant difference observed for the red ones (Table 6). Why do you state that in the red clusters there were no significant differences based on phenology? The p value was 0.0235. Please explain.

Response 12:

In this case, significant differences were observed in damaged berries when considering the phenological stage of the plant. However, the interaction with pest density was not significant ($p = 0.4086$). This indicates that differences among varieties themselves were not influenced by pest density and may therefore be attributed solely to the characteristics of each variety rather than to *H. halys* infestation.

REF3 – point 13:

L241-244. “On white cultivars, a significant interaction between these two factors was also detected (Table 5). In the case of these cultivars, Glera berries exhibited the highest damage when infestation occurred at 50% veraison, while no similar effect was observed for Pinot gris (Figure 4)”. OK

Response 13:

Thank you for the check.

REF3 – point 14:

L244-246. In the case of red cultivars, the percentage of damaged berries per cluster considering grape cultivars showed a general increase when the infestation increased, with Cabernet Franc more susceptible to *H. halys* damage than Merlot (Figure 5). OK

Response 14:

Thank you for the check.

REF3 – point 15:

L261-263. The percentage of berries with signs of *B. cinerea* due to brown marmorated stink bug infestations was different between white-berry cultivars (**Table 7**) but not for red-berry ones, and the incidence of this pathogen was higher on Pinot gris than on Glera (~~Table 7~~; Figure 6A).

Response 15:

Accepted.

REF3 – point 16:

L264-268. “On red cultivars, the percentage of berries with signs of *B. cinerea* and sour rot was different between cultivars (**Table 8**), with higher levels on Merlot than on Cabernet Franc (data not shown). On white cultivars, the presence of signs of grey mold and sour rot associated with *H. halys* infestation differed among phenological stages (**Table 7**), with a higher incidence following infestations from the grape ripening period (Figure 6B).

Response 16:

Accepted.

REF3 – point 17:

L279-283. An effect of brown marmorated stink bug infestation on the mean berry weight emerged on red cultivars but not on white ones (Tables 9 and 10). On red cultivars indeed, berry weight was higher in the case of 0.5 and 1 *H. halys* adults per cluster than in the other two ~~treatments~~ **infestation densities** (Figure 7A), with differences in the interaction cultivar*plant phenological stage (Figure 7B).

Response 17:

Accepted.

REF3 – point 18:

In Figure 7A there must be a mistake in the title of the ordinate axis, should it be “average berry weight”? while “Damaged berries (%)” should be in Figure 7B.

Response 18:

Thank you for the comment. We have replaced the incorrect figure with the correct one in the revised version of the manuscript.

REF3 – point 19:

L 373-376. “Nevertheless, in the conditions under study we noticed a continuous occurrence of different developmental stages of the pest throughout the sampling period that suggests a certain degree of plant suitability.” In my opinion, this represents a great contribution on the knowledge of ecology of *H. halys*.

Response 19:

We thank the Referee for the comment. Please note that the sentence was slightly changed following the Referee’s no. 1 comments as: “Nevertheless, we consistently observed different developmental stages of the pest occurring throughout the sampling period in the conditions under investigation, indicating a certain level of plant suitability”.

REF3 – point 20:

Conclusions

In my opinion it is too similar to Discussion. In the Conclusions the main contributions of this study are somewhat mixed with results from studies reported by other authors, which does not allow this section to be clearly differentiated from the Discussion itself. It would be much more appropriate for the authors to present here only the conclusions, and in a more synthetic way, which would make it gain in performance. Information included here, such as the type of management that is applied in a standard way in the study area, is specific to Materials and Methods, and not in the Conclusions. Similarly, statements such as: “Moreover, the occurrence of *B. cinerea* and sour rot infections can be influenced by climatic conditions during the ripening period. At the time of the experiments, conditions were not particularly conducive to gray mold development... it should be moved to Discussion.

Response 20:

We accepted the input made by the Referee and modified the Conclusion as: “In conclusion, our results showed that *H. halys* can infest vineyards and its density is higher at the margins of the field than in the center. Pest infestation density was influenced by grapevine cultivars and their phenological stage. However, from the cage experiment we found that direct feeding damage is relevant only at high infestation levels, as reported by Smith et al. [37] in the US. Notably, infestation levels like those that cause damage on grape clusters were not observed in field conditions, nor at vineyard margins. However, not only direct damage may affect grapevine production, since we found secondary damage related to the increase in pathogens incidence following stink bug infestation similarly to what was observed in other crop systems [26,65], thus representing an important implication in the management of grapevine diseases and being the main issue related to *H. halys* infestation on grapevine”.

Please note that a couple of citations were maintained in order to fulfill Referee’s no. 1 requirements.