

## Revision report

Egusphere-2025-943 - Living cover crops reduce pesticide residues in agricultural soil

The article entitled “Living cover crops reduce pesticide residues in agricultural soil” presents a study conducted in a greenhouse with the overall objectives of evaluating the effects of cover crops on pesticide dynamics in soil and soil solution and relates that with the physicochemical properties of the tested pesticides.

The subject of the article is original and relevant, and the findings are interesting. In particular, I appreciated the study of the pesticide levels not only in soil but also in the soil solution, and the analysis of the results under the light of the physicochemical properties of the active substances that were used. Both of these topics are important to shed light on the possible fate of pesticides in soil and may be of help to interpret the results.

My main concerns are generally focused on some aspects of the methodology and on the conclusions that were derived from the results which, in some cases and in my opinion, are not supported by them. All of these aspects, and some others, are detailed below. The line numbers refer to the manuscript without tracked changes.

### Title

The title should emphasize what, in my opinion, are 2 strong points related with this article: the analysis not only of soil, but also of the soil solution and the inclusion of the physicochemical properties of the active substances. In addition to this, the title does not exactly correspond to what was found. While, in general, cover crops were associated with lower pesticide concentrations in soil, in some cases this did not occur, especially for the “thin cover” modality. For example, at day 80 the tebuconazole content in that modality was significantly higher than in the control and the contents of fluxapyroxad, MCPB and pyraclostrobin did not significantly differ between the 2 modalities.

### Abstract

A brief synthesis of the methodology should be included in the abstract.

### Introduction

L88-89 – As the authors did not evaluate plant uptake of pesticides, they could not test this hypothesis. Therefore, in my opinion, “hypothesised” should be replaced by “considered”.

## Materials and Methods

Figure 1 – The authors refer that day 0 corresponds to 5 Jan 2024. Considering this, day 45 should correspond to 19 Feb 2024 and day 80 to 25 Mar 2024. However, in Supplementary Material (SM) table S2, the results from 3 sampling days are shown: 5 Jan 2024, 19 Feb 2024, and 29 Apr 2024. Therefore, it appears to exist a discrepancy in the 3<sup>rd</sup> sampling day between Materials and Methods and SM. Could you please clarify this?

The legend should contain more information. For example, a brief description of the modalities.

L106-107 – Considering that the authors have the information regarding the pesticide applications, including the day of application, the active substances that were applied and their application rates, why not determining the predicted concentrations at the sapling days and compare these values with the measured concentrations?

L115-117 – There are 2 factors varying in the modalities: plant species and plant density/plant biomass. This should be taken into consideration while interpreting the results.

L144-145 and L148-149 – Why were the temperatures of storage different between soil samples and soil solution samples?

L181-186 – I found the list of physicochemical properties that was chosen by the authors comprehensive and well justified.

L204-206 – Why not use the Analysis of Variance (ANOVA) followed by a post-hoc (after checking their assumptions) to compare all the 3 modalities? The 2 t-tests only allowed the comparison between each one of the 2 cover crop modalities and control and not between the 2 cover crop modalities themselves. Of course, a third t-test could be added, but I believe that multiple t-tests increase the probability of Type I errors.

## Results and Discussion

L210 – I believe that the application rates refer to what was presented in Table 1. Therefore, that table should be mentioned here. Furthermore, what the authors call “application rates” here is designated by “quantity” in Table 1. This terminology should be homogenised.

L212-213 – In here only iodosulfuron-methyl-sodium and mefenpyr-diethyl are referred, while below (L214) a third active substance is referred as not quantified in all the samples.

L220-254 – I appreciated the effort made by the authors in discussing the obtained results under the light of the pesticide physicochemical properties and I think that this is one of the strong points of the paper. However, I think that the results that are being explored are difficult to be followed by the reader. I noticed that plots were presented in Supplementary Materials, but those plots should be mentioned here. Considering the importance of these results for the discussion, in my opinion, they should be presented here and not in the Supplementary Material. This could be done by either presenting them in Table(s) or in Figure(s).

L251 – I agree that the referred procedure could have induced a bias. However, that was not confirmed by the authors. Therefore, in my opinion, it should be written “This may have introduced a bias...”, instead of “This introduced a bias...”.

L308-309 – Instead of “highly applied”, I believe a more accurate expression would be, for example, “applied at higher application rates”.

L387 and L389 –  $3.5 \times 10^{-9}$  and  $1.3 \times 10^{-4}$  (the “x” symbol is missing).

L390 – “suggesting” instead of “suggestion”

L409-410 – I suggest using the format (author(s), year) for the referred sources.

L417 – Highly volatile compounds are primarily lost to the atmosphere and not to ground water. So, solubility should be the most important aspect here.

L450-451 – As other effects are possible, it is not certain “that any practice that increases living cover crop and microbial activity will contribute to pesticide degradation.” Consider replacing “will contribute” by “may contribute” or something equivalent. In addition to this, I believe that instead of “crop cover” the authors meant “cover crop”.

L464-465 – In my opinion, the authors cannot separate the effects of cover density from the effects of the species that were tested. For that, it would be necessary to test the same density with different species and the same species with different densities.

L472-473 – Considering what is shown by Figure S1 from Supplement S4, while the results show that the content of mefenitrifluconazole in the modality “thick cover” was lower than in the control (bare soil), its content in the modality “thin cover” was actually higher. Therefore, in my opinion, the accuracy of this statement should be improved.

## Conclusions

L516 – The results obtained by the authors show that in many cases the cover crop modalities were associated with lower pesticide contents. However, in some cases no significant differences were found, and in others, a higher pesticide content was found. Therefore, I would suggest increasing the accuracy of the sentence.

L537-538 – While the reduction in pesticide use, especially the most hazardous ones, is a desirable goal, it is not backed-up by the findings presented in this paper. Therefore, the accuracy of this sentence should be improved.

## Supplementary Material

The legends of the Tables and Figures should contain more information. For example, when applicable the details regarding the different modalities should be described and the units of measurement should be indicated.

If I am not mistaken most of the Supplementary Materials are not referred in the main manuscript. Please confirm this and correct it when applicable.

Tables S3 and S4 – The meaning of “LQ” should be explicit.

Table S4 – The meaning of “ND” is not explained.

Table S4 – The authors referred that a total of 18 active substances were analysed in the samples. However, only the results from 14 active substances are presented in this table.

Supplements S4 and S6 – The results refer not only to the pesticide contents in soil, but also to the pesticide contents in the soil solution. However, the y axis refers only to soil (i.e., the unit is  $\mu\text{g kg}^{-1}$  of fresh soil). Please correct this.