RC1: 'Comment on egusphere-2026-1497', Anonymous Referee #1

Response to Reviewer #1

We sincerely thank the reviewer for the careful evaluation of our manuscript and for the constructive comments and suggestions. We believe that these comments have helped us to improve the clarity and scientific quality of the manuscript. All comments have been carefully considered and addressed in the revised version. Our responses are provided below.

General comment:

Reviewer comment:

The paper 'Field application of rice straw–sewage sludge compost in Mediterranean citrus orchards: effects on soil properties, nutrient status and fruit quality' by Rodríguez-Carretero et al. deals with the use of compost obtained from rice straw and sewage sludge on citrus trees. Although the Materials and Methods section states that the experiment was conducted over two growing seasons, the manuscript actually reports two independent experiments performed in two consecutive years. This distinction has important implications for the interpretation of the results. In particular, COMP1 and COMP2 were not directly compared under the same experimental conditions, as they were applied in different growing seasons. Therefore, conclusions regarding differences between the two composts are not fully supported. Furthermore, the duration of each experiment (one growing season) is insufficient to draw robust conclusions regarding changes in soil properties, especially those related to soil organic matter and soil physicochemical characteristics, which generally require long-term investigation.

Response:

We thank the reviewer for this important observation. We agree that the original version of the manuscript did not sufficiently emphasise that COMP1 and COMP2 were evaluated in two consecutive growing seasons rather than through a simultaneous comparison within a single experiment. To address this issue, the Materials and Methods section has been revised to clarify the experimental design, explicitly stating that COMP1 was applied at two rates (10 and 20 t ha^{-1}) in S1, whereas COMP2 was applied at the same rates in S2 to the plots that had previously received COMP1. Consequently, S2 does not represent an independent repetition of S1, but rather the evaluation of a successive compost application under commercial orchard conditions.

The statistical analysis section has also been revised to indicate that data from each growing season were analysed independently and that no statistical comparisons between seasons were performed. In addition, the objectives, results interpretation and discussion have been revised throughout the manuscript to avoid direct comparisons between composts and to focus on the agronomic performance of each compost under the conditions of the corresponding season. Particular attention has been given to the interpretation of seasonal trends and the potential influence of successive compost applications, while explicitly acknowledging that these observations are qualitative and do not constitute statistical comparisons between growing seasons.Regarding the duration of the study, we acknowledge

that one growing season is insufficient to draw definitive conclusions regarding long-term changes in soil properties. However, the study includes two consecutive years of compost application, allowing the evaluation of both short-term effects and the response following a subsequent compost application. Accordingly, the Discussion and Conclusions sections have been revised to better define the scope of the findings, to avoid overinterpretation of the observed soil responses, and to highlight the need for long-term studies to assess the persistence and cumulative effects of compost application on soil fertility and crop performance.

Additional comments are provided below:

Line 107, spell out ANP

Response:

ANP was already defined at its first appearance in the Introduction as Albufera Natural Park (ANP).

Line 137: actually here 2 experiments are reported, 1 year-long each

Response:

We agree with the reviewer and thank him/her for this important observation. The description of the experimental design has been revised to clarify the nature of the study. It is now clearly indicated that compost applications were carried out on the same trees across both growing seasons. Specifically, COMP1 was applied in S1, and COMP2 was subsequently applied in S2 to the same plots as part of a continued management strategy. Therefore, the study should not be interpreted as a direct comparison between two independent experiments, but rather as the evaluation of successive compost applications under commercial orchard conditions. In this context, S1 assessed the effects of the initial compost application, whereas S2 evaluated the response to a subsequent compost application on plots that had already received compost during the previous growing season. Consequently, the effects observed in S2 reflect the cumulative influence of successive compost applications rather than the isolated effect of COMP2.

These clarifications have now been incorporated into the Materials and Methods section and considered throughout the interpretation of the results and discussion.

The analysis of pruning residues, rice straw and sewage sludge would help to understand the fertilization potential of composts

Response:

We thank the reviewer for this suggestion. The physicochemical characteristics of the feedstocks used for compost production (rice straw, pruning residues and sewage sludge) were determined and reported in our previous publication describing the industrial-scale composting process. To improve clarity, we have incorporated the following sentence in Section 2.1:

"The physicochemical characteristics of the feedstocks used for compost production (rice straw, pruning residues and sewage sludge) have been previously reported by Rodríguez-Carretero et al. (2023)."

Line 96, point 1 cannot be achieved, there is no comparison between COMP1 and COMP2

Response:

We thank the reviewer for this observation. We agree that the wording of the original objective could be interpreted as implying a direct comparison between COMP1 and COMP2. Since both composts were evaluated in different growing seasons and no statistical comparison between seasons was performed, the objective has been reformulated.

The revised manuscript no longer presents the study as a direct comparison between the two composts. Instead, the first objective is now focused on analysing the agronomic quality and regulatory compliance of industrial-scale sewage sludge-based composts produced using different bulking agents.

Furthermore, the overall objectives and hypotheses have been revised to emphasise the evaluation of industrial-scale sewage sludge-based composts produced with different bulking agents and the assessment of short-term and cumulative effects of successive compost applications under citrus orchards conditions, rather than than the direct comparison of COMP1 and COMP2.

The difference between the two composts clearly depends on the proportion of sewage sludge (line 107)

Response:

We agree that the proportion of sewage sludge is an important factor influencing compost composition. In the revised manuscript, we have clarified the composition of both composts and explicitly described the ratios used during composting. We also revised the discussion to avoid attributing observed differences exclusively to the bulking agent, acknowledging that both the nature of the bulking material and the relative proportion of sewage sludge may have contributed to the differences observed between composts. So, the interpretation of the field results considers both differences in compost composition and the cumulative effects associated with successive compost applications.

Line 98, point 2 is quite ambiguous since non comparison between the 2 compost were carried out

Response:

We agree that the original wording could be interpreted as implying a direct comparison between the two composts. Following this suggestion, the objective has been revised to avoid this interpretation. The revised manuscript now states that the study aimed to evaluate the short-term and cumulative effects of successive compost application on soil physicochemical properties, plant nutritional status, yield and fruit quality in a commercial citrus orchard under flood irrigation conditions. Consequently, the focus has shifted from comparing composts to assessing the agronomic responses associated with successive compost applications under field conditions.

Were COMP1 and COMP2 applied to the same soils or on different plots

Response:

Both composts were evaluated in the same commercial citrus orchard and on the same experimental plots, which were maintained and monitored throughout the study period. The same trees were followed during both growing seasons. COMP1 was applied in S1 and COMP2 in S2. Consequently, S2 evaluated the response to a subsequent compost application on plots that had already received compost during the previous growing season. To clarify this aspect, the description of the experimental design has been revised in the Materials and Methods section. The revised manuscript now explicitly states that the plots were maintained throughout both growing seasons and that the two composts were evaluated sequentially rather than simultaneously. The manuscript also clarifies that S2 reflects the cumulative effects of successive compost applications rather than the isolated effect of COMP2.

Line 200, The compost pH appears relatively low. Was the sewage sludge treated with gypsum? This hypothesis may be supported by the increase in soil Ca reported in line 269. Please clarify the source of Ca.

Response:

We thank the reviewer for this observation. To our knowledge, the sewage sludge used for compost production was not treated with gypsum prior to composting. Furthermore, no significant increase in assimilable Ca concentration was observed following compost application. As shown in Figure 1, Ca concentrations were very high in all treatments and seasons, reflecting the calcareous nature of the soil. We have clarified this point in the response to avoid possible misinterpretations.

Line 204 spell out OOC

Response:

OOC has been defined at its first appearance in the manuscript as oxidisable organic carbon.

In table, when ANOVA is not significant, no mean separation is required

Response:

We thank the reviewer for this observation. Mean separation letters were only included when treatment means were compared within each season. However, we agree that when the overall ANOVA is not significant, displaying mean separation letters may be considered unnecessary. Since this is largely a matter of presentation style and different journals adopt different conventions, we have retained the original format for consistency throughout the manuscript. Nevertheless, if the editor considers it more appropriate, we would be pleased to modify the tables accordingly.

Line 247: What is meant by “optimal” soil organic matter content? Please provide a reference range and clarify whether this statement refers to agronomic recommendations.

Response:

We thank the reviewer for pointing out this lack of precision. We agree that the term “optimal” was too general and could be open to interpretation. Therefore, the text has been revised to avoid this term. The revised manuscript now refers to the classification proposed by Legaz et al. (1995) and explicitly indicates the corresponding categories for soil organic matter content in citrus soils, providing a clearer agronomic interpretation of the results.

Line 250: OM decreased in the 2 seasons; how do you explain it?

Response

The decrease in OM observed between growing seasons may be related to the rapid mineralisation of organic matter under Mediterranean conditions, where relatively high temperatures favour microbial activity and organic matter turnover. However, additional factors may also have contributed to this trend, including differences in environmental conditions between seasons, variations in mineralisation rates, and the inherent variability associated with field soil sampling. Since statistical comparisons between seasons were not performed, these observations are interpreted qualitatively. This explanation has been incorporated into the revised Discussion section.

Table 6 different font

Response:

We thank the reviewer for noticing this formatting inconsistency. The font style in Table 6 has been corrected to ensure consistency with the rest of the manuscript.

No comparison between COMP1 and COMP2 can be made (line 326-328)

Response:

We thank the reviewer for this observation. We agree that a direct statistical comparison between COMP1 and COMP2 is not appropriate because both composts were evaluated in different growing seasons. Furthermore, COMP2 was applied in S2 to the same plots that had previously received COMP1 in S1, so S2 reflects the response to a successive compost application rather than an independent evaluation of COMP2. Accordingly, the manuscript has been revised and statements implying direct comparisons between composts have been removed. The Results and Discussion sections now focus on treatment effects within each growing season and on the interpretation of seasonal trends without performing statistical comparisons between seasons.

Comparison of chemical analysis between COMP1 and COMP2 (line 334) are adventurous since only 4 replications were used

Response:

We thank the reviewer for this comment. We acknowledge that a larger number of compost samples could have provided a more robust estimation of compost variability. However, the final characterisation was based on four representative composite samples of each compost, each obtained from several subsamples collected from different locations within the composting piles. The statistical analyses presented in Table 1 were performed to characterise and compare the physicochemical properties of the composts used in the study. Nevertheless, following the reviewer's suggestion, we have revised the discussion to avoid overinterpreting these differences and to ensure that the observed contrasts between COMP1 and COMP2 are presented with appropriate caution.

Line 347, 2 years of compost application are unlikely to be sufficient to produce soil physicochemical changes, such effects generally require long-term study

Response:

We agree that changes in several soil physicochemical properties generally require long-term applications. The Discussion has been revised to place the results within the appropriate temporal context and to indicate that the responses reported here correspond to the first two years following compost implementation. Nevertheless, the significant changes detected in several soil fertility indicators, including organic matter, organic N, available P and K, demonstrate that measurable effects of compost application can already be observed during

the early stages of implementation. Therefore, the present study should be considered as an assessment of short-term and early cumulative responses, whereas longer-term studies are still required to evaluate the persistence and long-term implications of these changes.

Line 385-386: I suggest that the Authors estimate the amount of C applied through compost relative to the total soil C pool. Without such information, the reported increase appears difficult to reconcile with the amount of compost applied and may reflect analytical variability rather than a true treatment effect.

Response:

We appreciate this suggestion. However, bulk density was not measured during the experiment, which prevents an accurate estimation of the total soil C pool. Accordingly, no reliable estimation of soil C stocks could be performed. We have therefore tempered the interpretation of the observed increases in soil organic matter and acknowledge that part of the variation may reflect the inherent variability associated with field measurements.

Nevertheless, the increase in soil OM was accompanied by changes in other soil fertility indicators, including increases in organic N and plant-available nutrients, as well as enhanced biological activity during S1. These concurrent responses support the interpretation that compost application had measurable effects on soil properties, although the magnitude of changes in soil C stocks cannot be reliably quantified from the available data.

Additional long-term studies including soil C stock determinations would be valuable to further assess this aspect.

Since compost was not tilled into the soil, this reduces the effect on soil physical characteristics

Response:

We agree that incorporating compost into the soil can enhance its influence on certain soil physical properties. However, in the present study, compost was surface applied intentionally in order to reproduce the management practices commonly used in commercial citrus orchards under Mediterranean conditions. Therefore, this should not be considered a limitation of experimental design, but rather a reflection of realistic agricultural management.

Despite the absence of tillage, significant effects of compost application were observed for several soil fertility indicators, including organic matter, organic N, available P and K, soil pH, and biological activity. These results indicate that measurable soil responses can occur under the management conditions typically used by growers.

The Discussion section has been revised to clarify this aspect and to place the results within the context of commercial citrus production systems.

We sincerely thank the reviewer again for the constructive comments and suggestions. We hope that the revisions made in response to these comments have substantially improved the quality and clarity of the manuscript.