

RC2: 'Comment on egusphere-2026-1497', Susana Ferreira

The manuscript is generally well organised and presents relevant results regarding soil fertility and nutrient dynamics after compost application. However, some aspects related to experimental design, statistical interpretation, and discussion of the results should be clarified or interpreted more cautiously before the manuscript can be considered for publication.

We would like to thank the reviewer for the careful evaluation of our manuscript and for the constructive comments provided. We appreciate the positive assessment of the overall organisation of the manuscript and the relevance of the results presented. All comments have been carefully considered and the manuscript has been revised accordingly. Our responses are provided below.

Specific comments

Lines 92–99: The hypotheses and objectives should be reformulated more carefully. Since COMP1 and COMP2 were applied in different growing seasons, direct comparisons between both composts should be interpreted cautiously.

RESPONSE:

We thank the reviewer for this observation. We agree that the original wording 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 hypothesis and objectives have been reformulated.

The revised manuscript now explicitly recognises that COMP1 was applied in S1 and COMP2 was subsequently applied in S2 to the same plots that had previously received COMP1. Consequently, the study does not evaluate two independent compost treatments, but rather the short-term and cumulative effects of successive compost applications under commercial orchard conditions.

Accordingly, the revised hypothesis focuses on the effects of successive applications of sewage sludge-based composts produced with different bulking agents, whereas the objectives now address (i) the agronomic quality and regulatory compliance of the composts and (ii) the evaluation of their short-term and cumulative effects on soil properties, plant nutritional status, yield, and fruit quality. The revised manuscript focuses on evaluating the agronomic performance of industrial-scale sewage sludge-based composts produced with different bulking agents and assessing their effects under field conditions, rather than on directly comparing the two composts.

Section 2.2.1 (Lines 130–143): Although the manuscript refers to “two consecutive seasons”, the experiments differed between seasons regarding compost type and fertilisation management. This limitation should be acknowledged more explicitly.

RESPONSE:

We thank the reviewer for this valuable comment. The description of the experimental design has been expanded in Section 2.2.1. The revised manuscript now explicitly states that COMP1 was applied in S1 and COMP2 in S2 to the same plots that had previously received COMP1, meaning that the second growing season evaluated the response to a successive compost application under commercial orchard conditions. The revised text also clarifies that mineral fertilisation management differed between seasons, and that data from S1 and S2 were analysed independently, without statistical comparisons between growing seasons. These aspects are now more clearly described in the Materials and Methods section and are considered throughout the interpretation of the results.

Lines 139–142: The reduction in P fertilisation during S2 introduces an additional management factor that may influence comparisons between seasons.

RESPONSE:

We agree that the reduction in P fertilisation during S2 represents an additional management factor that may have influenced the observed responses. The revised manuscript now explicitly describes this modification and clarifies that data from S1 and S2 were analysed independently, without statistical comparisons between growing seasons. However, it should be noted that the reduction in P fertiliser inputs was implemented deliberately as part of the agronomic management strategy and was based on soil and foliar analysis results obtained during S1. This approach reflects commercial orchard management, where mineral fertilisation programmes are progressively adjusted according to crop nutritional status and soil fertility. In this regard, the reduction of P input forms part of the practical evaluation of compost use under field conditions rather than an unintended source of variability.

The manuscript has been revised accordingly, and the interpretation of seasonal responses now considers both the successive compost applications and the changes introduced in fertilisation management.

Section 2.2.5: The statistical approach should be described in greater detail. It would be useful to clarify more explicitly whether the seasons were analysed independently.

RESPONSE:

We thank the reviewer for this suggestion. The Statistical Analysis section has been revised to clarify that data from S1 and S2 were analysed independently. The revised manuscript now explicitly states that S1 evaluated the effects of the initial compost application, whereas S2 assessed the response to a subsequent compost application on the same plots that had already received compost during the previous growing season. In addition, compost type and fertilisation management differed between growing seasons. Consequently, no statistical

comparisons between seasons were considered appropriate and treatment effects were evaluated separately within each growing season.

Lines 247–250: The decrease in soil organic matter between seasons deserves additional discussion. Climatic conditions, mineralisation rates, irrigation management, or sampling variability could have contributed to this behaviour.

RESPONSE:

We thank the reviewer for this valuable observation. Following this suggestion, the discussion has been expanded to provide a more detailed interpretation of the decrease in soil organic matter observed between seasons. The revised manuscript now indicates that, in addition to compost management, differences in environmental conditions between seasons, variations in mineralisation rates and the inherent variability associated with field soil sampling may also have contributed to the observed trend. Given that seasons were analysed independently, these factors are discussed as potential contributors to the observed seasonal pattern rather than as statistically tested explanations.

Lines 265–278 and Figure 1: Several soil parameters showed statistically significant differences; however, the agronomic relevance of some changes should be discussed more carefully.

RESPONSE:

We thank the reviewer for this observation. Following this suggestion, the discussion has been revised to better distinguish between statistical significance and agronomic relevance. Additional explanations have been incorporated for several soil parameters, including pH, electrical conductivity, organic matter and nutrient availability, emphasising whether the observed changes are likely to have practical implications for citrus cultivation under the conditions of the study. Particular attention has been given to discussing the practical significance of the observed changes in relation to soil fertility, salinity risk and nutrient management.

Lines 288–290 and Figure 2: The microbial and dehydrogenase activity results are interesting, but these parameters are naturally variable and strongly affected by environmental conditions. This should be acknowledged more explicitly.

RESPONSE:

We thank the reviewer for this valuable comment. The discussion has been expanded to more explicitly acknowledge the natural variability of microbial biomass C and dehydrogenase activity. The revised manuscript now highlights that these biochemical indicators are strongly influenced by environmental factors such as soil moisture, temperature and sampling time, which may partly explain the variability observed between seasons and among studies

reported in the literature. In addition, the Discussion now explores possible explanations for the contrasting responses observed between S1 and S2, including differences in the composition of the organic fraction supplied by the composts, particularly oxidisable organic carbon, which represents a more readily available substrate for soil microorganisms.

Lines 318–321: Since compost application did not significantly affect yield or most fruit quality parameters, the conclusions should better reflect that the main observed effects were related to soil properties.

RESPONSE:

We agree with the reviewer. The conclusions have been revised to better reflect the main findings of the study. The revised text now emphasises that the principal effects of successive compost application were related to improvements in soil fertility and soil health indicators, including soil organic matter, organic N, and nutrient availability, as well as soil biological activity. In contrast, whereas effects on plant nutritional status, yield and fruit quality were limited under the study period. The Conclusions also now highlight the agronomic potential of industrial-scale rice straw–sewage sludge compost as a sustainable strategy for residue valorisation and soil fertility enhancement under Mediterranean citrus-growing conditions.

Lines 323–341: The discussion comparing COMP1 and COMP2 should be moderated because both composts were not evaluated simultaneously under identical field conditions.

RESPONSE:

We thank the reviewer for this observation. We agree that direct comparisons between COMP1 and COMP2 should be interpreted with caution because both composts were evaluated in different growing seasons and under different management conditions. Furthermore, COMP2 was applied in S2 to the same plots that had previously received COMP1 in S1, meaning that the second growing season evaluated the response to a successive compost application rather than an independent assessment of COMP2.

Accordingly, the discussion has been revised throughout the manuscript to avoid direct comparisons and to ensure that the results are interpreted within the context of each growing season independently. Particular emphasis is now placed on the discussion of seasonal trends, the potential influence of successive compost applications, and the factors that may explain the different responses observed during S1 and S2, without performing statistical comparisons between growing seasons.

The discussion would benefit from a more explicit consideration of the limitations associated with extrapolating these results to drip-irrigated Mediterranean citrus orchards, since the study was conducted under flood irrigation conditions.

RESPONSE:

We thank the reviewer for this valuable suggestion. A statement has been incorporated into the discussion acknowledging that the experiment was conducted under flood irrigation conditions and that caution should be exercised when extrapolating the results to drip-irrigated citrus orchards, where soil water distribution and nutrient dynamics may differ. In addition, the Conclusions section now highlights the need for long-term studies under different irrigation systems to evaluate the persistence and cumulative effects of successive compost applications and to assess the applicability of the observed responses to other citrus production systems.

Technical comments

Line 53: Spell out "ANP" at first mention.

RESPONSE:

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

Lines 116 and 165: Spell out "OOC" at first mention.

RESPONSE:

OOC was already defined at its first appearance in the manuscript as *oxidisable organic carbon*. We have nevertheless checked the text and ensured that the definition is clearly stated in the revised version.

Table 6 formatting should be revised for consistency.

RESPONSE:

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

Some sentences in the Discussion section could be simplified to improve readability.

RESPONSE:

We thank the reviewer for this suggestion. Several sentences throughout the Discussion section have been revised and simplified to improve clarity and readability.

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.