

Response to reviewer 5

Reviewer Comment 1: The material and methods sections seems a little bit chaotic, please provide an order of subsection that makes it easier for the reader to understand, for example, name the subsection 2.1 “Experimental design” instead of “Soil and compost materials” and reorganize the information etc.

Response: We thank the reviewer for this constructive suggestion. In response, we have added a new Subsection 2.1 "Experimental design" that provides an overview of the entire experimental workflow and its sequential steps. Accordingly, the subsequent subsections have been retitled as follows: the former Subsection 2.1 is now 2.2 Collection of soil and compost; the new 2.3 Soil incubation and CO₂ emission monitoring covers incubation conditions and CO₂ measurement method; the former Subsection 2.3 is now 2.4 Determination of physicochemical parameters of soil and incubated soil; and the former Subsection 2.4 is now 2.5 Statistical analysis.

Reviewer Comment 2: Further, please, include references for the physicochemical characterization in section 2.2."

Response: We thank the reviewer for this suggestion. Methodological references have now been added for all physicochemical characterization methods in Section 2.4 (formerly 2.3), including pH and EC (Allison et al., 1954), TOC (Walkley and Black, 1934), available phosphorus (Olsen et al., 1954), ammonium and nitrate (Mulvaney, 1996), available potassium (Helmke and Sparks, 1996), and CEC (Chapman, 1965). All corresponding references have been included in the updated Reference list.

Reviewer Comment 3: Further, regarding the incubation, the authors say that the CO₂ emissions were measured 14 times, but only 12 days appear.

Response: We thank the reviewer for catching this inconsistency. The CO₂ emission was indeed monitored at 12 time points during the 90-day incubation. The incorrect statement of "14 times" in the original manuscript was a typographical error and has been corrected to "12 times" in the revised manuscript (line 129).

Reviewer Comment 4: The material and method section lack information about how some parameter were assessed such as total P, total K... Further, please explain better the treatments. S.

Response: We thank the reviewer for this comment. We have added the analytical methods for total carbon (TC) and organic matter (OM) in Section 2.4. Specifically, TC was determined by dry combustion using an elemental analyzer (Nelson and Sommers, 1996), and OM was calculated from TOC as $OM (\%) = 1.724 \times TOC (\%)$.

Total phosphorus (TP) and total potassium (TK) were not measured in our experiment. For the compost materials, their TP and TK contents were obtained from the product specifications provided by the manufacturer. Regarding the incubated soils, we did not analyze TP and TK because available phosphorus (AP) and available potassium (AK) represent the plant-available forms and were used as predictors in our regression model, which we considered sufficient for assessing nutrient availability after compost amendment.

Reviewer Comment 5: Section 2.4 is too fragmented to understand.

Response: We thank the reviewer for this comment. The statistical analysis paragraph 1 has been rewritten to follow a clear stepwise logic: the purpose of the analysis is stated first, the prerequisite assumption checks are presented as necessary conditions before ANOVA rather than isolated statements, the post-hoc test is causally linked to those assumptions, and the software information is placed at the end. Each sentence now builds on the previous one, forming a

coherent narrative instead of a fragmented checklist (lines 145-155).

Reviewer Comment 6: Regarding the figures, they appear too small.

Response: We thank the reviewer for this comment. High-resolution versions of all figures will be provided separately to the editorial office, who will format them to an appropriate size for optimal readability by readers in the final published version.

Reviewer Comment 7: The use of 'mechanistic' is still present in the manuscript.

Response: We thank the reviewer for pointing this out. We have removed all instances of the word "mechanistic" from the manuscript. The two occurrences were deleted to make the sentences more concise (line 86 and line 126).

Reviewer Comment 8: Manuscript would benefit from an English style proofreading, especially in M&M and results sections.

Response: We thank the reviewer for this suggestion. The entire manuscript has been carefully edited for English language, grammar, and style. Particular attention was paid to the Materials and Methods and Results sections. In the M&M section, the experimental design paragraph was added, section headings were revised, analytical methods and references were updated, and the data analysis subsection was completely rewritten with a clear stepwise logic to improve readability. In the Results section, all sentences were reviewed and revised for grammatical accuracy, proper hyphenation, consistent terminology.

Reviewer Comment 9: Line 294: phosphorus in compost is not primarily mineral, but organic.

Response: We thank the reviewer for raising this point. We would like to clarify that in mature composts and animal-manure-based amendments, total phosphorus is predominantly present as inorganic mineral phosphates, chiefly calcium phosphates such as $\text{Ca}_3(\text{PO}_4)_2$ and hydroxyapatite,

with minor amounts of iron or aluminum phosphates (e.g., FePO_4), while organic P forms constitute a smaller fraction. This is well documented by sequential P fractionation studies of manure-based composts and organic fertilizers (Takahashi, 2013; Haygarth and Sharpley, 2000; Sharpley and Moyer, 2000).

Takahashi, S.: Phosphorus characterization of manure composts and combined organic fertilizers by a sequential-fractionation method *J. Plant Nutr. Soil Sci.*, 176, 494–496, <https://doi.org/10.1002/jpln.201200169>, 2013.

Haygarth, P. M. and Sharpley, A. N.: Terminology for phosphorus transfer, *J. Environ. Qual.*, 29, 10–15, <https://doi.org/10.2134/jeq2000.00472425002900010002x>, 2000.

Sharpley, A. N. and Moyer, B.: Phosphorus forms in manure and their availability to plants, *J. Environ. Qual.*, 29, 7–11, <https://doi.org/10.2134/jeq2000.00472425002900010002x>, 2000

Reviewer Comment 10: Line 321: This cite and reference are wrong, Antonio is the name of the author

Response: We confirm that the cited author names and reference list in our revised manuscript do not contain "Antonio" as an author name. The references and in-text citations have been checked and are correct in the submitted version.