

SOIL Discuss., referee comment RC1
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Comment on soil-2021-49

Anonymous Referee #1

Referee comment on "Effects of the application of biochar and straw on phosphorus of Hedley fractionation and phosphorus form" by Xue Li et al., SOIL Discuss.,
<https://doi.org/10.5194/soil-2021-49-RC1>, 2021

This manuscript reports a study on the effects of biochar combined with a mineral fertilizer and straw combined with mineral fertilizer on soil P. The topic is very relevant and is within the scope of SOIL. However, there are many studies in the literature of the effects of biochar and crop residues on soil P (some cited by the authors in their manuscript; e.g., Lehmann et al., 2003, Gundale and DeLuca, 2006, Wang et al. 2017), and it is not clear how the present study contributes to the current knowledge. Also, a major limitation of the present study is that the experimental design does not allow to separate the effects of biochar and straw from those of the mineral fertilizers, and neither from those of the crop (which is differently affected by the treatments).

Specific comments

- L. 1. "on sustainable phosphorus management" is too vague for the title.
- L. 15. State the objective of the study before describing experimental and methodological details.
- L. 17. What do you mean by long-term here?
- L. 21. The Hedley fractionation separates P into several plant-available and refractory forms. What do you mean by the Hedley-P fraction?
- L. 27-28. "...and reduces environmental pollution." This conclusion is not supported by the data, it is out of the reach of the study.
- L. 40-41. Provide references for these statements.
- L. 53. Provide references to the studies mentioned here. There are previous studies on the effects of straw on soil P (e.g., Zheng et al., 2019, Li, et al., 2019), so what is the original contribution of the present study to the current knowledge?
- L. 53-54. What do you mean by P activation coefficient or unutilized straw in this context? Please clarify.
- L. 56. This sentence is unclear and needs a reference.
- L. 63. There are previous studies on the effects of biochar on soil P (e.g., Lehmann et al., 2003, Gundale and DeLuca, 2006, Wang et al. 2017). The authors need to stress the novelty of their contribution.
- L. 84-90. These statements need to be supported by references.

L. 91. So the novelty is in the use of the Hedley fractionation method and NMR spectroscopy on soils amended with straw and biochar. Yet it is not clear how this may provide new mechanistic insights into the dynamics of P in soils amended with straw and biochar.

L. 97, "were to..." It seems that a verb is missing here (investigate?).

L. 100-101. There is no data in this study on "the reduction of environmental pollution."

L. 112-115. These treatments do not allow to isolate the effects of biochar and straw from those of the mineral fertilizers and the crop.

L. 115-116. Were biochar and straw applied annually or just once? Please clarify here.

What was the rationale behind these rates.

L. 121. The biochar used in the study was obtained at temperatures from 450 to 600 °C. This seems like a very wide range, and pyrolysis temperature is known to be determinant on biochar properties. Further details on the pyrolysis process, such as heating and retention time, would be needed.

L. 131. Report size in mm.

L. 176. What is the effect of this pretreatment on soil P content and speciation?

L. 195-199. Did you check for normality and homoscedasticity? Please clarify.

L. 276, "after correction." Please clarify the correction used here.

L. 295. Add references for this statement.

L. 303. Provide the effects of the treatments on crop yields, as they affect nutrient content and speciation in soils.

L. 360, 382. Add references to support these statements.

L. 422-427. The combination of treatments used does not allow to separate the effects of biochar and straw from those of the mineral fertilizers and the crops.

Figure 1. The grey shades used here to indicate P forms are very hard to differentiate.