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Interactive comment on "Crop residue decomposition in Minnesota biochar amended plots" *by* S. L. Weyers and K. A. Spokas

Anonymous Referee #1

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This article is interesting and very relevant for this special issue and I recommend publishing it provided some modifications are done. The use of a high number of field-weathered biochars is particularly relevant as these types of studies use a much lower number of samples and are not generally done under field conditions. However, it is my feeling that the authors should improve the characterization of the biochars to add more value to their results. With respect to the selection of materials, it is worth to mention that they always used plant materials and at temperatures over 500°C. It would have been interesting to use other kind of materials such as sludges or manures to prepare the biochars and also to expand the range of temperatures to 350-500° C. Maybe in this case, there would have been more different between the treatments.

Abstract: There are some references to time here "2.5 years prior to start of this study",

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"14 weeks". I miss the date of the start of the study.

Abstract: Line 14-15 is contradicted with page 609, lines 16-17. Is the difference statistical significant or not? Moreover, when I see Table 2 I cannot decide by myself for the biochar. Definitely, wood pellets seem to increase soil microbial biomass. Please, add some letters to Table 2 to indicate significant differences between treatments.

Abstract: Is the last line a good ending for the abstract? Re-applications of biochar have not been considered in this study.

Introduction: In the last paragraph I miss some mention to its potential to improve crop yield (Liu et al., 2013) and, as mentioned by the editor in a previous comment, soil quality.

Liu, X., Zhang, A., Ji, C., Joseph, S., Bian, R., Li, L., Pan, G., Paz-Ferreiro, J. 2013. Biochar's effect on crop productivity and the dependence on experimental conditions-a meta-analysis of literature data. Plant and Soil 373, 583-594.

The authors state in the introduction that different biochars can have dissimilar effect on soils due to the range of different properties that biochar can exhibit. However, in Table 1 they provide little information of the biochars. I would add at least ash content and pH. Some available nutrient content analysis or pore size distribution would also be interesting and could be helpful to interpret the data, in particular the former are a better candidate. Also, what was the particle size of the biochar? Are there differences among them?

Page 601, lines 18-19: Do not repeat the word "different".

Page 601, lines 21-23: Not sure about why mentioning cascading effects here as they are not the subject of research in this article.

Page 602: I miss here the study of Zavalloni et al. (2011) and also Cely et al. (2014).

Zavalloni et al., (2011) Microbial mineralization of biochar and wheat straw mixture in

SED
6, C123–C126, 2014

soil: A short-term study. Applied Soil Ecology 50, 45-51.

Cely, P., Tarquis, A., Paz-Ferreiro, J., Méndez, A., Gascó, G. 2014. Factors driving carbon mineralization priming effect in a soil amended with different types of biochar. Solid Earth Discussions 6, 849-868.

Material and methods: Have the data of microbial biomass being corrected to account for biochar absorption? Would different values of Kec be necessary for the different biochars used in the experiment? (Durenkamp et al., 2010).

Durenkamp, M., Luo, Y., Brookes, P.C. 2010. Impact of black carbon addition to soil on the determination of soil microbial biomass by fumigation extraction. Soil Biology & Biochemistry 42, 2026-2029.

Also, I miss some key information. When were the litterbags put in the soil? Is it referring to July 2009? When were the samples for biomass taken? It is uncertain to which Fall it is referring. How much soil per plot was sampled for biomass analysis? Were soil samples sieved prior to biomass analyses?

Page 604, line 2: July of which year?

Page 604, line 17: There is a mention here to respiration. However, those values are not reported in the manuscript.

Page 605, lines 22-24: This is a bit speculative.

Page 606, line 14: Shouldn′t it be “over time” instead of “overtime”?

Page 606, line 20: There are a few studies considering mesofauna in soils amended with biochar. See Marks et al., (2014) and Domene et al. (2014)

Marks, E.A.N., Mattana, S., Alcañiz, J.M., Domene, X. 2014. Biochars provoke diverse soil mesofauna reproductive responses in laboratory bioassays. European Journal of Soil Biology 60, 104-111.

Domene, X., Mattana, S., Hanley, K., Enders, A., Lehmann, J. 2014. Medium-term effects of corn biochar addition on soil biota activities and functions in a temperate soil cropped to corn. Soil Biology and Biochemistry 72, 152-162.

Page 607, line 10: I find this sentence a bit confusing as it somehow implies that forest soils are always acidic (which is true in the soils analysed by Wardle et al., 2008). Although it is true that some forest litter can have an acidifying effect, please, bear in mind that there are forest over calcareous soils which have pHs over 7. An example of this would be the forests on calcareous soils in the Mediterranean region. Re-write to credit differences to different pH values rather than to the type of vegetation cover, as it is implied now.

Page 608, lines 8-10: This is in contradiction with the results section.

Page 608, lines 17-19: The study of Liu et al. (2013) mentioned previously show differences with biochar type and, more interesting, uses a larger number of samples than the article mentioned here.

Page 608, line 20: But it was not statistically significant.

Page 609, lines 6-7: The particle size of the biochars has not been indicated at any point in the study. Please, report it in Table 1 or in the text.

Page 609, line 17: If this result is not statistically significant, then this cannot be affirmed.

Page 609, lines 19-21: This is a bit speculative. If some of the microbial/faunal communities in soil are redundant, then there could be changes in their composition without processes as decomposition being significantly affected.

Interactive comment on Solid Earth Discuss., 6, 599, 2014.