

## RESPONSE TO COMMENTS 2

Dear editor and reviewers:

We highly appreciate the detailed valuable comments of the referees on our manuscript of ‘Does thermal carbonization (Biochar) of organic material increase more merits for their amendments of sandy soil?’. The suggestions are quite helpful for us and we incorporate them in the revised paper. We have referred to literatures and papers and re-analyzed the collected data and reconstructed the paper to improve the quality of our paper. We try our best to revise it and we hope these efforts will be worked.

As below, on behalf of my co-authors, I would like to clarify some of the points raised by the Reviewers. And we hope the Reviewers and the Editors will be satisfied with our responses to the ‘comments’ and the revisions for the revised manuscript.

Some detailed revisions were made with red color in the manuscript.

General comments: The authors report the use of a product (furfural) and its biochar as a soil amendment in a saline soil. This is an interesting article, in particular considering that reports comparing the effect of both, a biochar and its feedstock are scarce compared to those reporting just the effect of biochar. In addition, the use of biochar in soils in saline soils is scarce. Thus, in my opinion the article is suitable for publication in this special issue of SE. However, I have detected a number of weaknesses in the manuscript which should be addressed before publication. Overall, the authors should undertake major amendments, mainly as specified in the next section.

**Answer: Thank you for your kindly review. I will try my best to revise them carefully.**

Specific comments: The authors will need to present a more focused introduction, add some important references that I found absent in the text and to improve data presentation. The English used through the manuscript has much room for improvement. I have pointed out some but not all of the mistakes regarding the use of English language.

Page 537, line 12: I am a bit confused here and in page 538, line 4. There are not much details about the product used to prepare the biochar. Firstly, I think the authors want to mean “corncob” and not just “cob”. Secondly, I understand that they do not prepare the biochar directly from corn cob (as in the references cited in page 537, line 12, which should then be deleted), but instead distillate the corn cob. Much more information is needed in the materials section about the process of distillation and the characterization of the product obtained. Is it all furfural, this is a heterocyclic aldehyde

with chemical formula  $OC_4H_3CHO$ , or is there a mixture of products? Please, note that the information given at this point must be very precise to allow the reproducibility of the experiment.

**Answer: Thank you for your kindly review. We detailed revised them in the text. 1)In fact I want to mean “corncob” and not just “cob”.2)I add the references in the context.3) furfural is a mixture of products.**

In the introduction I would highlight what I believe is a strong point of this article. This is:

“While most scientists have reported the effect of biochar in the soil, there is a dearth of studies (but see exceptions such as Gascó et al., 2012; Wu et al., 2013; Méndez et al., in press) comparing both biochar and its feedstock”.

Gascó, G., Paz-Ferreiro, J., and Méndez, A.: Thermal analysis of soil amended with sewage sludge and biochar from sewage sludge pyrolysis. *J. Thermal Anal. Calorim.* 108, 769-775, 2012.

Wu, F., Jia, Z., Wang, S., Chang, S.X., and Startsev, A.: Contrasting effects of wheat straw and its biochar on greenhouse gas emissions and enzyme activities in a Chernozemic soil. *Biol. Fertil. Soils.* 49, 555-565, 2013.

Méndez, A., Paz-Ferreiro, J., Araujo, F., and Gascó, G.: Biochar from pyrolysis of deinking paper sludge and its use in the treatment of a nickel polluted soil. *J. Anal. Appl. Pyrol.* DOI: 10.1016/j.jaap.2014.02.001

Please, also notice that, even there is not a lot of literature available, biochar has been used before as amendment in saline soils. Please, take into account the article from

Lashari et al. (2013) in the introduction and when discussing the results.

Lashari, M.S., Liu, Y., Li, L., Pan, W., Fu, J., Pan, G., Zheng, J., Zheng, J., Zhang, X., Yu, X. Effects of amendment of biochar-manure compost in conjunction with pyroligneous solution on soil quality and wheat yield of a salt-stressed cropland from Central China Great Plain. *Field Crop Research* 144, 113-118, 2013.

**Answer: Thank you very much for your kindly review. To some aspect, we agree with you. Maybe we have a little overestimate our study. There are some studies comparing biochar and its feedstock on soil properties. Furfural is little different from the general founded feedstock in literature because furfural is considered a good modifier of saline soil. The focused point of**

present study was to compare the amendments difference of furfural and its biochar. As you cited article (Lashari et al. (2013)), they also added another ingredient- pyroligneous solution which may be important for the amendments of saline soil.

Page 540, line 20-21: How has this been tested? It cannot be done with a one-way ANOVA. In my opinion it is better for this experimental design to use a repeated measure ANOVA (RMANOVA) instead of the analysis done by the authors. I would also advice the authors to provide a better characterization of the biochar used, including proximate analysis and porosimetry.

Answer: Thank you for your kindly review. I felt so sorry for misunderstanding here. In the present study, we focused on the effects of treatments or incubation time on the soil properties. That is we only compare the differences among the treatments at one incubation time or the incubation time at one treatment. And we did not compare them both at the same time. As a result, we think a one-way ANOVA can be OK with this kind of work. At the same time, we also referenced some similar research. For example, Novak (2009) used one-way ANOVA to study the effects of different amount of biochar on soil properties at one incubation time. Zhang(2012) also used this statistics method to study the gas emissions with different amount of biochar application. I present more detailed information of the biochar in revised edition.

Article referenced:

Novak, J.M., Busscher, W.J., Laird, D.L., Ahmedna, M., Watts, D.W., Niandou, M.A.S, Impact of biochar amendment on fertility of a Southeastern coastal plain soil. *Soil Science*, 2009, 174:105–112.

Zhang, A., Bian R., Pan G., Cui L., Hussain Q., Li L., Zheng J., Zheng J., Zhang X. and Han X. Effects of biochar amendment on soil quality, crop yield and greenhouse gas emission in a Chinese rice paddy: a field study of 2 consecutive rice growing cycles. *Field Crops Research*, 2012, 127: 153-160.

Title: It is very vague at present. There is no mention to the type of organic material.

Also, would it be better to highlight the salinity of the soil instead of the textural characteristics ?

Maybe a better title would be: Furfural and its biochar improve the general properties of a saline soil.

Answer: Thank you for your kindly review. I think it is a good idea, but at first I want to use questions to draw the reader's interest.

Page 536, line 2: “of a saline soil”

Answer: Thank you for your kindly review. I did it.

Page 536, line 12: Do not write “5% of the furfural addition”, write “furfural addition at a rate of 5%” or similar.

Answer: Thank you for your kindly review. I did it.

Page 536, line 20: Please, re-write as: In general, furfural and biochar exhibited a different effect depending on the property.

Answer: Thank you for your kindly review. I did it.

Page 537, line 3: This reference has not been included in the reference list.

Answer: Thank you for your kindly review. I have added it into reference list.

Page 537, line 6: “The fertilization of organic materials” change to “Amendment with organic materials”

Answer: Thank you for your kindly review. I did it.

Page 537, line 9: Please, delete “Axing” Page 537, line 10: Delete “which is corresponding with the research results of Li (2008).” And start the sentence “Cai et al. (1997) and Li (2008), reported thatfurfural: : ... “

Answer: Thank you for your kindly review. I did it.

Page 537, line 11: “from furfural”

Answer: Thank you for your kindly review. I did it.

Page 537, lines 15-16: This sentence is very general and does not need references.

Answer: Thank you for your kindly review. I want to add the references for later context why we use it .

Page 537, line 27: “stones and vegetation were removed by hand”

Answer: Thank you for your kindly review. I did it.

There should be more information about the soil. What is the texture? Please, classify the soil according to FAO or USDA. In which Province was the soil sampled? What are the climatic characteristics of the sampling area? When was the soil sampled?

Answer: Thanks for your kindly review. In October 2012, the testing soil were collected from the

0 to 10-cm depth of saline soil at Yellow River Delta (37°45'50"N , 118°59'24"E) which is located in the northeast of Shandong province of China. The sampling site has a warm continental monsoon climate with distinctive seasons and a rainy summer. The soil is typical saline alluvial soil (Fluvisols, FAO) developed on loess material of the Quaternary period, which was carried by water from the Loess Plateau..

Page 538, line 1: "natural withered". Do you mean air-dried? Do not repeat "screen" and "screaned", write "then sieved in a mesh to 2-mm".

Answer: Thank you for your kindly review. I did it.

Page 538, line 5: As I mentioned before, more information is required here.

Answer: Thank you for your kindly review. I did it.

Page 538, line 22-23: Please, specify both the volumes of rainfall added and the amount of leachate collected.

Answer: Thank you for your kindly review. I did it.

Page 539, line 20-21: Please, check this sentence.

Answer: Thank you for your kindly review. I did it.

Page 540, line 5: Always report the same number of decimals for a same property.

Page 540, line 6: Indissolvable?

Answer: Thank you for your kindly review. Yes , it is.

Page 540, line 11-12: Please, rewrite.

Answer: Thank you for your kindly review. I did it.

Page 540, line 14, a RMANOVA will allow to add a P and F value to this sentence.

Answer: Thank you for your kindly review. I deleted it. In fact I just did the analysis within each treatment.

Page 540, lines 21-22: This is possibly because SOM losses or gains in a short time are difficult to be measured directly because of 1) the large amount of organic matter in soils and 2) the low magnitude of changes compared to the total organic carbon stored in the soils.

Answer: Thank you for your kindly review. I agree with you.

Page 540, line 24: "8 times compared to"

Answer: Again, thank you very much for your very kindly and careful review

Page 541, lines 2-3: Please, do not mention crop yields here. It is still uncertain the mechanisms involved in the increase of soil productivity after biochar addition.

Answer: Thank you for your kindly review. I did it.

Page 541, line 21: This is a very general sentence to include here as the porosity of this biochar has not been measured.

Answer: Thank you for your kindly review. I agree with you and revised it.

Page 542, line 1: This is written in a confusing way. In fact available P is maximum at nearly neutral pH values, which are the values after biochar or furfural addition. The authors seem to imply in the sentence that available P is maximum in acid soils.

Answer: Thank you for your kindly review. In the present study, the soil were alkaline, when the acidic furfural or biochar added into it, the pH of soil will be lowered and then more available P will be released.

Page 542, lines 5-6: Is not the other way round? The furfural performing better?

Answer: Thank you for your kindly review. I have corrected it.

Page 542, line 8: Please, provide a reference to justify that the mechanism is immobilization.

Answer: Thank you for your kindly review. I did it .

Page 542, lines 9-11: This explanation seems not to be very plausible in the context of the biochar.

Answer: Thank you for your kindly review. Sorry I did not get you exactly. In our study, the carbonization of furfural significantly increased content of exchangeable  $\text{Ca}^{2+}$  (table 1). Therefore, the available phosphorus reduced with increase of exchangeable  $\text{Ca}^{2+}$  during the carbonization (Tunisi, 1999). We think, that is a very possible explanation of reducing available phosphorus when carbonization of furfural.

Page 542, line 23: Please, notice that in the reference Bhupinder is the first name of the author. Thus, it should be Singh et al. 2010. Move the reference to the corresponding alphabetical order in the reference list. Moreover, what is the reference indicating here? That this author obtained similar results? Please, clarify.

Answer: Thank you for your careful review. I have changed the reference and clarify what the

reference indicating here.

Page 543, line 12: There are other parts of the text where this happens, but this one is particularly notorious. The word increased/increasing is repeated 3 times in the same line. Please, avoid the repetition of words.

Answer: Thank you for your kindly review. I revised it.

Page 543, line 19: Do you mean concentration or availability instead of “activity”?

Answer: Thank you for your kindly review. You are right, I revised it.

Page 543, line 21: There is no conclusive evidence in this study. I would suggest, “This is possibly related: : :?”. Same in line 25.

Answer: Again, thank you very much for your very kindly and careful review. I modified it.

Page 544: Lines 1,2. This is a bit confusing. Please, re-write. Page 544, line 6: “was not reduced”

Answer: Thank you for your kindly review. I did it .

Table 2: Please, complete the name of the treatments.

Answer: Thank you for your kindly review. I revised it.

Figure 3: Please, add the units for TOC in the graph.

Answer: Thank you for your kindly review. I did it.

Figures 1 to 8: When you affirm that "different letters represent significant differences", I guess you mean "different letter, for the same sampling date, represent". Please, be specific.

Answer: Thank you for your kindly review. Yeah, this is what I really want to express, I have modified all of them.

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