

RESPONSE TO COMMENTS 1

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.

1. It would be necessary to improve the introduction with more references about the use of biochar in similar soil in China and other parts of the world.

Answer: Thank you for you kindly review. I have add some references about the use of biochar in soil in the context.

Why do you use a sandy soil?

Answer: Thank you for you kindly review. First, we studied the saline soil amendments in Yellow River delta and the soil texture was generally related to sandy soil. Second, by literature review, we know that quality of sandy soil will be greatly improved with organic materials (e.g. biochar) amendments.

2. Authors should explain better what is furfural in the introduction and its actual uses.

Why is a good idea to make biochar from furfural? You should give some reasons in the text.

Answer: Thank you for you kindly review. 1)Now I have added the content that “Furfural is the corncob after industrial distillation. It is in dark brown and belongs to strong acid organic materials with pH around 2. Furfural contains N(0.5%—0.6%), P₂O₅(0.2—0.15%), K₂O(0.15%), humic acid substances(36%),and the content of organic materials is above 98% (Yang, 2008; Li et al., 2008). Cai(1997)and Li(2008), reported that furfural may be an excellent modifier of saline soil because it can lower the soil pH and ESP and increase crop yield.

2) We already know that furfural is a good modifier of saline soils. Biochar addition may also greatly improve soil fertility. However, we still do not know if carbonization of furfural could increase more merits for amendment of saline soil. As a result, we want to compare the differences of the conventional furfural and the new emerged biochar on chemical properties of saline soils.

3. Why do you chose the next pyrolysis conditions? 4h carbonization under 300~D
~C.

Answer: Thank you for your suggestions. We referenced the general carbonization method for biochar production. (Lehmann, et al., 2009)

4. Describe all the metohds that you have used in the paper.

Answer: Thank you for your kindly review. Because these methods are generally used in soil analysis, we have roughly described them in the text and gave more detailed information in the following part.

1) pH: soil/water=1:2.5. Weigh 4 g air-dried soil samples through 2 mm in 50 ml centrifuge tube, and add 10 ml deionized water(without CO₂) to centrifuge tube. Oscillation for 10 minutes, stewing for 30 min, and use pH meter to measure the pH of clear liquid.

2) EC: water/soil=1:5. Weigh 4 g air-dried soil samples through 2 mm in 50 ml centrifuge tube, and add 20 ml deionized water(without CO₂) to centrifuge tube. Oscillate for 10 minutes, and then filter. And use multiple parameter analyzers to measure the EC of the filter liquor.

3)TC and TN determined by Element analysis.

4) Exchangeable K⁺/Ca²⁺/Na⁺/Mg²⁺ : Weigh 4 g air-dried soil samples through 2 mm in 50 ml centrifuge tube, and add 20 ml ammonium acetate to centrifuge tube. Oscillate for 10 minutes, and then filter. And use flame atomic absorption spectrophotometer to measure them.

5) CEC: sodium acetate- flame atomic absorption spectrophotometer,28

6)TP: first, use heating digestion method molybdenum antimony colorimetric method:0.2g air-dried soil samples through 2 mm and then add 10ml H₂SO₄ in digestion pipe on digestion furnace ,then to 100ml Volumetric flask. At last use molybdenum antimony colorimetric method to measure it

7)AP: Weigh 1g air-dried soil samples through 2 mm in 50 ml centrifuge tube, and add 20 ml 0.5M NaHCO₃ with pH=8.5 to centrifuge tube. Oscillate for 10 minutes, and then filter. And use molybdenum antimony colorimetric method to measure it .

8)NO₃⁻-N and NH₄⁺-N: measured by continuous flow analyzer(Fresh soil samples)

5. Also, it could be a good idea to add the proximate analysis of biochar (fixed carbon, volatile matter, ash).

Answer: Thanks again for your valuable suggestions. We did it.

6. Do you think that is it a good idea to add a material with an acid pH to this type of soil?

Answer: Thank you for your kindly review. Our sample had very high soil alkalinity (>8.0). As a result, furfural (with great acidity) addition will decrease soil alkalinity thereby increase some important soil nutrient and improve crop growth. Generally, application of furfural into alkaline soils is an important method to amend these soils.

Xu Gang^b, Shao Hongbo^{a,b*}

a. Institute of Life Sciences, Qingdao University of Science & Technology, Qingdao 266042, China

b. Yantai Institute of Coastal Zone Research(YIC), Chinese Academy of Sciences(CAS), Yantai 264003, China

Corresponding authors: shaohongbochu@126.com