Soil
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Manuscript Title: Effects of returning corn straw and fermented corn straw to fields on the soil organic carbon pools and humus composition
Article Type: Research paper
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Response to the first reviewer's comments

First of all, we would like to thank you for your valuable comments and suggestions which help us to improve our manuscript. Below we try to address all the points which you have indicated in your assessment opinions.

RC1: 'Comment on soil-2021-105', Anonymous Referee #1, 24 Nov 2021

General comment

Comment: The topic of the manuscript titled "Effects of returning corn straw and fermented corn straw to fields on the soil organic carbon pools and humus composition" is of interest for the "SOIL" readership.

Response: Thank you very much for your support of our manuscript. We further revised our manuscript according to your comments. We have revised the manuscript carefully, and all changes in the revised manuscript are made using Track Changes to make reviewing easy.

Specific comments

(page, line: comment)

Comment: 1, 24: Please write the acronym SOC here instead of on line 27

Response: This suggestion has been adopted. We have revised the acronym SOC as follows (page 1, line 24-28):

Text: "Recycling and returning crop residues as soil amendments has proven to be an important prospect for increasing soil organic carbon (SOC) content and increasing crop yield (Villamil et al., 2015) and for managing crop straw residues. Ma et al (2019) found that soils amended with wheat straw and with wheat straw-decomposing microbial inoculants had average annual SOC sequestration rates of 0.77 and 1.67 t C ha^{-1} yr^{-1} higher than those of no straw amended soils in the 0 – 20 cm depth, respectively."

Comment: 3, 72: There is a new reference for the Soil Survey Staff. The USDA recommended citation is the following: Soil Survey Staff. 2014. Keys to Soil Taxonomy, 12th ed. USDA-Natural Resources Conservation Service, Washington, DC

Response: Thank you for the suggestion. We have made revisions and updates in the text and references as follows (page 3, line 71-72):

Text: "Soils in the study area are classified as Argiudolls according to the United States Department of Agricultural Soil Taxonomy (Soil Survey Staff. 2014)."

References: "Soil Survey Staff.: Keys to Soil Taxonomy: 12th edition. Natural Resources Conservation Service, USDA-Natural Resources Conservation Service, Washington, DC."

Comment: 3, 85: Authors should detail the mineral salt solution they mixed to the corn straw. This could have influenced the characteristics of the fermented corn straw. For example, it showed higher N content than the unfermented corn straw (Table 2).
Response: We thank the reviewer for the suggestion. We have detailed the mineral salt solution that was mixed with the corn straw as follows (page 3, line 82-89):

Text: "The mineral salt nutrient solution (g L^{-1}) was prepared as a mixture of: $(NH_2)_2CO$ 4.2 g, $(NH_4)_2SO_4$ 19.6 g, $CaCl_2$ 0.028 g, KH_2PO_4 28 g, $MgSO_4$ 4.2 g, $FeSO_4 \cdot 7H_2O$ 0.07 g, $MnSO_4$ 0.021 g, $ZnSO_4$ 0.019 g, $CoCl_2$ 4.2 g, yeast paste 7 g, pH=5.

References: "Zhang, Y., Dou, S., Hamza, B., Ye, S., Zhang, D.: Mechanisms of three fungal types on humic-like substances formation during solid-state fermentation of corn straw, Intl. J. Agric. Biol., 24, 970 – 976, doi:10.17957/IJAB/15.1377, 2020b."

Comment: 3, 93-105: Authors adjusted the C/N ratio of the corn straw residues to 25:1 adding urea. Apparently, they did not do the same procedure for the fermented corn straw, that showed a C/N ratio of about 10 (Table 2). Thus the mineralization of the two biomasses could have occurred differently also because of this parameter. Authors should consider also this when discussing their data.
Response: Thank you for the suggestion. In order to emphasize this point, we have modified the Discussion section. We added this content on the part of "4.1 Effects of different treatments on SOC and soil labile organic carbon fractions" to factor in the differences in the C/N ratio of the two materials used (page 8, line 215-221):

Text: "The closer the substrate's C/N ratio is to the microorganisms' C/N ratio, the more significant the fraction of substrate C that remains in the soil (Hessenet al., 2004). Furthermore, according to Sprunger et al. (2019) low C/N ratio of organic residues promote the accumulation of soil organic matter. Whereas, organic inputs applied to the soil with a large C/N ratio such as the CS treatment in the case of our study, may lose more C in turnover compared with organic amendments with a small C/N ratio (Dannehl et al., 2017). The C/N ratio of organic amendments and the C fate in soil had a negative connection (Dannehl et al., 2017) The aforesaid point of view was further supported by our research."

References: "Hessen, D.O., Ågren, G.I., Anderson, T.R., Elser, J.J., de Ruiter, P .C.: Carbon sequestration in ecosystems: the role of stoichiometry, Ecology, 85, 1179 –

1192, doi: 10.2307/3450161, 2004.
Dannehl, T., Leithold, G., Brock, C.: The effect of C:N The relation between CUE and ratios on the fate of carbon from straw and green manure in soil. Eur. J. Soil. Sci., 68(6), 988 – 998, doi:10.1111/ejss.12497, 2017.
Sprunger, C. D., Culman, S. W., Palm, C. A., Thuita, M., Vanlauwe, B.: Long-term application of low C:N residues enhances maize yield and soil nutrient pools across Kenya, Nutr. Cycl. Agroecosyst., 114, 261 – 276, doi:10.1007/s10705-019-10005-4, 2019."

Comment: 7, 210: Authors did not compost the corn straw residues, but they fermented it. Composting and fermentation are not exactly synonyms. Please correct here and throughout the paper.

Response: The suggestion of the reviewer was adopted. We changed the word "composting" to "fermentation" throughout the manuscript.

Comment: Figure 1: It should show all details of treatments, i.e., the common base fertilization and the C/N ratio adjustment.

Response: Thank you for the suggestion. We have modified **Figure 1** and updated it in the manuscript. The revised version of **Figure 1** was as follows:

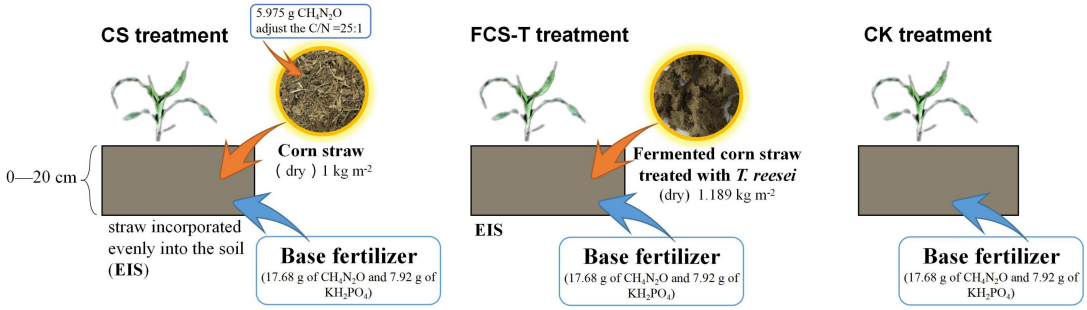

Figure 1: Schematic diagram of three different treatment methods in the field

Comment: Table 1 and 2 should show g kg^{-1} or mg kg^{-1} instead of g/kg and mg/kg. Table 2 does not report any statistical analysis between the two biomasses.

Response: Thank you for the suggestion. We have corrected all similar errors in the pictures and tables. The statistical analysis label here in **Table 2** was forgotten by us. According to the raw data:

	C (g kg^{-1})	H (g kg^{-1})	N (g kg^{-1})	O (g kg^{-1})	C/N
CS	376.1	51.02	7.432	565.4	50.607
	377.5	50.96	7.478	564.1	50.482
	375.6	51.56	7.419	565.4	50.625
stdev	1.0	0.33	0.031	0.8	0.078
average	376.4	51.18	7.443	565.0	50.571
FCS-T	317.8	43.64	29.622	608.9	10.730
	320.3	44.13	29.391	606.2	10.898

	320.1	43.84	29.487	606.6	10.854
stdev	1.4	0.25	0.116	1.5	0.087
average	319.4	43.87	29.500	607.2	10.827

We have supplemented the test value of the two biomasses and statistical analysis label here.We modified the **Table 1** and **Table 2** in the manuscript as bellow:

Table 1. Basic properties of the soil in field experiments

Soil	pH	Organic matter ($g\ kg^{-1}$)	Alkaline N ($mg\ kg^{-1}$)	Available P ($mg\ kg^{-1}$)	Available K ($mg\ kg^{-1}$)
Black soil	6.55±0.31	51.18±1.41	7.44±0.57	565.0±2.3	59.00±0.85

Note: Values (± standard deviation) were averaged over 3 replicates.

Table 2. Elemental composition of materials used in field experiments

Materials	C ($g\ kg^{-1}$)	H ($g\ kg^{-1}$)	N ($g\ kg^{-1}$)	O ($g\ kg^{-1}$)	C/N
CS	376.4±1.0	51.18±0.33	7.44±0.03	565.0±0.8	50.57±0.08
FCS-T	319.4±1.4	43.87±0.25	29.50±0.12	607.2±1.5	10.83±0.09

Note: Values (± standard deviation) were averaged over 3 replicates. CS, corn straw; FCS-T, fermented corn straw treated with *T. reesei*.

Thank you very much for your consideration.
Kind regards,
(Yifeng Zhang)