SOIL Discuss., referee comment RC1
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Comment on soil-2021-140

Anonymous Referee #1

Referee comment on "Stronger microbial nutrient limitations in subsoil along the precipitation gradient of agroecosystem: Insights from soil enzyme activity and stoichiometry" by Jingjing Yang et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-140-RC1, 2022

General comments:

I revised the paper "Stronger microbial nutrient limitations in subsoil along the precipitation gradient of 2 agroecosystem: Insights from soil enzyme activity and stoichiometry". The topic of the paper could be interesting for soi scientists, but the paper showed some issues.

Much information in Materials and methods are absent or not complete. I suggest including the analysis of available P in soil, in particular to better discuss the effect of P concentration on enzyme activities.

The authors analysed different soil sampled in different site in a climate transect, in my opinion the authors should better describe the soil type and the different soil properties. The biological parameters as enzyme activities are strictly related to soil physio-chemical properties, the weather, the temperature and the season during the soil sampling, therefore the authors should better highlight these parameters.

The authors showed the results of different parameters putting together the results obtained in different soils. I suggest the authors show the results of different soils to highlight the effect of climate transect on soil properties (chemical and biological parameters).

Consequently, the discussion is affected by the results presentation. In many cases, the

discussion of their results is not completely clear. In particular, the authors should consider that the enzyme activities are strongly affected by the soil depth and this aspect should be more stressed in the text.

I suggest a strong revision of the paper, including the analysis of available P in soil, considering the physio-chemical properties of soils, sampled in the different climate transect sites, and the soil depth effect on soil enzyme activities.

Specific comments:

Materials and methods

L128: please explain the acronym MAP the first time you use it.

L 128: please replace 6.2 °C to 4.1 °C with 6.2°C to 4.1°C

L136-138: The basic information reported are not sufficient to understand the potential interaction between the enzymes and soil particles. The soil texture (clays %, sand % etc.) should be included in the soil analysis. Additional information as cation exchange capacity could be another suitable information to explain the results of the experiment.

L149: "during the maize harvest period", the authors should clarify if they sampled the soil immediately after harvest or before the harvest. The agricultural equipment induces a disturbance in soil, and it should be considered. Moreover, did you perform the soil sampling simultaneously? The temperature and the weather affect the biological parameters as enzyme activities.

L152: Soil moisture (SM)

L152-153: the protocol the authors used to measure the soil moisture is not clear.

L154: You should replace with "the analysis of edaphic properties"

L156-158: please briefly describe the methods you used to determine TN, TC, TP or

report the proper references. Moreover, the P availability in soi in general is very low in comparison to total P, therefore the available P (e.g. Olsen P)

L163: why did you modify the protocol proposed by Saiya-Cork et al. 2002? You should include some words about that.

L165: Did you measure the acetate buffer pH? The buffer pH is a crucial parameter for enzyme activities because the efficiency of enzyme activity measured could be affected by buffer pH.

L166: Indicate the method you used to homogenize the soil samples

L 167: The figure S1 did not improve the fundamental information to understand the protocol the authors used. Therefore, I suggest the authors delete the S1 figure and better describe the protocol used in the text. In particular, the preliminary experiment should be described to understand the information the authors achieved by this experiment. Moreover, the specific substrates for each enzyme activities should be clearly indicated.

L215-220: the authors could report the soil pH, TC, TN and TP for each site in a table to clearly show the effect of climate transect on pH and soil nutrients, the average and standard deviation of the soil properties. In the text it's not clear the soil type analysed and the weather in the site during the soil sampling. These information are fundamental to understand the real effect of precipitation. Otherwise, you could relate the soil pH and nutrient to the climate transect and not to the precipitation. The soil pH and soil nutrient cannot be related only to precipitation because the soil physio-chemical properties affect the soil pH, too. The authors showed a strong acidification of soil, and the explanation cannot be related only to precipitation. I suggest reporting the data for each site analysed, considering the effect also to the soil depth.

L226-272: the same observations previously reported for soil pH and nutrients can be considered also for soil enzyme activities: the soil properties and not only the precipitations affect the soil enzyme activities and they have to be considered in the text. Moreover, why did you report the results of 0-50cm layer? The 0-5.0 cm layer are not included in soil pH and nutrients section.

The enzyme activities are strongly affected by the soil depth therefore in general the enzyme activities analysis is related to 0-20 cm. I suggest considering this aspect.

The discussion: the discussion is necessarily affected by the results presentation. The

discussion of soil chemical properties should be insert before the discussion of enzyme activities. Moreover, I suggest considering the climate transect effect on soil properties and consequently the authors can discuss the effect of precipitations. The description of the soil properties in different site can help to understand the effect of climate transect and consequently the effect of precipitation. The figure 5 is interesting and it should be better discussed and explained in the text.

L301-303: this sentence is not clear. The authors analysed the total P and not the available P in soil. The amount of available P in soil is very lower than total P and strictly related to soil type. The amount of available P could help the authors to better explain their results.

L305-307: this sentence is not clear. Please explain why the C and N limitation should affect the phosphatases and not the other enzymes.