



EGUsphere, author comment AC1
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Reply on RC1

Baisha Weng et al.

Author comment on "Effects of Warming and Increased Precipitation on Soil Amino Sugars on the Qinghai–Tibet Alpine Meadows" by Baisha Weng et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1290-AC1>, 2023

We thank the reviewer for his/her positive evaluation of our manuscript. We address below all the comments and criticisms raised.

Abstract:

Line 10-15: "The results showed warming stimulated the accumulation of microbial residues, while increased precipitation led to their decline." This contradicts the contents of Table 3. From Table 3, I can see that warming slightly decrease amino sugars concentrate but increased precipitation increases their concentrate. Please check which one is correct.

Response: We checked the data and structural equations in Table 3. We believe the main reason is that although air temperature has a negative effect on the amino sugars in Table 3, this effect is not statistically significant (see Table S2). In the structural equation model, the increase of air temperature was connected with amino sugar through indirect and insignificant direct effects. In all, we will emphasize important results and significant conclusions in the revised manuscript.

Line 15: the contribution of fungal residue to what. SOC or microbial residue?

Response: It means the contribution of fungal residues was more significant than that of bacteria to soil nitrogen transformation and accumulation.

Line 15-20: "The increased precipitation had no significant effect on soil extracellular enzyme activities and amino sugar concentrations". Authors wrote that 'increased precipitation led to their decline' (L 10-15). However, increased precipitation do not affect amino sugar in here. It is very confused. Is there a different "accumulation of microbial residues" between "amino sugar concentrations"?

Response: Sorry for the vague words. Our original intention is the change of amino sugar reflected by the increase of precipitation in Table 3, but this change is not significant. We will modify this part of the expression.

Introduction:

Line 30-35: "Indicators of bacterial and fungal biomass." It should be necromass or residue rather living biomass.

Response: We will replace "Indicators of bacterial and fungal biomass" with "Indicators of bacterial and fungal residue" in the revised manuscript.

Line 30-35: "amino sugars can be effective indicators for studying the different mechanisms of soils" Which mechanisms you mean here, please clarify.

Response: The characteristics of soil amino sugar accumulation and change reflect the microbial regulation mechanism of soil organic matter cycle.

Reference: Li, L., Wilson, C.B., He, H., Zhang, X., Zhou, F., Schaeffer, S.M., 2019. Physical, biochemical, and microbial controls on amino sugar accumulation in soils under long-term cover cropping and no-tillage farming. *Soil Biology and Biochemistry* 135, 369-378.

Line 40: "aboveground and underground biomass" it is should be "aboveground and underground plant biomass"

Response: We agree and will make the change in the revised manuscript.

Line 40-45: "Existing research on how the soil responds to climate change has primarily been based on transect data, including soil respiration, carbon, nitrogen pools, and pH" This sentence makes no sense here.

Response: We agree and will remove the sentence in the revised manuscript.

Line 60: The hypothesis is too general, it should be more specific and given the correspond explanation.

Response: We organize the hypotheses and add hypotheses about the impact of depth on amino sugars, as follows:

Our hypotheses were (1) that warming and increased precipitation might cause opposite effects on soil microbial residues due to the impact on soil physical properties, chemical properties, and enzyme activities; (2) that increased depth would facilitate amino sugar accumulation in soil. To test the hypothesis, we examined GluN, MurA, GalN, soil extracellular enzyme activity, biomass, and C and N concentrations for 4 scenarios in 4 fields. We applied these data to structural equation modeling to identify key drivers of

climate change impacts on soil microbial residues.

Second paragraph of Introduction Section: the key point of this paragraph is unclear, author should not give many statements about enzymes. The objective of this paper is global change effects on amino sugars, these should be strengthened. The last few sentences of the second paragraph are pretty weak, it doesn't make any sense to me.

Response: Thank you for your comments. We will shorten the statements about enzymes and strengthen the global change effects on amino sugars in the revised manuscript.

Line 60-65: "soil extracellular enzyme activity, biomass, and C and N concentrations for 4 scenarios in 4 fields." The C and N content of what? soil or microbe?

Response: What we want to express is the soil C and N concentrations in the four sites.

Material and methods:

The duration of the experiment is not introduced. Please clarify that why increasing rainfall only in July and August.

Response: We will introduce the duration of the experiment in the revised manuscript, which is a four-year continuous warming and increased precipitation experiment. In addition, we will introduce the reason why the experiment is set in July and August, which is that the precipitation in July and August is concentrated, and according to the results of the future Shared Socioeconomic Pathways, the future precipitation in our study area will increase the fastest in July and August.

Line 75-80: Please move the relevant content about "Soil moisture and temperatures measurement" to Section 2.2.

Response: We agree and will move the relevant content about "Soil moisture and temperatures measurement" to Section 2.2 in the revised manuscript.

Line 85-90: I wonder what biomass is this, microbial biomass? Soil faunal biomass? Please clarify that "Biomass" is actually plant biomass.

Response: Yes, we are referring to plant biomass, and we will clarify in the revised manuscript.

Line 120-125: I am not sure why author use glucose as the internal standard 2. As far as know, it should be N-methylglucamine.

Response: We agree and will change this sentence to the following:

- methylglucamine (internal standard 2) was thoroughly mixed and freeze-dried for 8 h and then derivatized with nitrile acetyl ester.

Section 2.3: The other analysis such as correlation analysis and variance analysis should be added.

Response: We agree and will add correlation analysis and variance analysis to Section 2.2 in the revised manuscript.

Results:

Line 140-145: 3 Material and methods. It should be results.

Response: We are very sorry for such an error, which we have corrected in the revised manuscript.

“3.2.2 Soil extracellular enzyme and amino sugars” I can not find anything about the enzymes in this section.

Response: We're sorry for the subtitle; it should be "Warming Treatment".

Discussion:

Line 200-205: I am not sure why decline in GalN will decrease the proportion of GluN in TASS.

Response: We are sorry vague sentence caused your misunderstanding. Both the effect of increasing temperature on the reduction of GluN in the experiment and the indirect positive effect shown in the structural equation model are insignificant. Although the concentration of GluN decreases during the warming treatment, the proportion of GluN in TAS increases because the concentration of GalN decreases more significantly. In the revised manuscript, we will pay more attention to the prominent transcriptional regularities and clarify the reasons for the contradictory regularities more clearly.

Line 215-220: If “fungal residues are more difficult to decompose than bacterial”. Bacterial necromass will be degraded faster, and the fungal necromass will be persisted longer. The more fungal necromass and less bacterial necromass should increase GluN/MurN ratio.

Response: Thank you for your suggestion. We will refine this section in the revised manuscript.

Line 235-250: Discussion about mechanisms of warming effects on amino sugars is pretty weak, please add more related content.

Response: Under the condition of warming, the aeration in the soil is improved when the soil moisture is reduced, and the reduction of soil moisture will not only reduce the soil microbial carbon accumulation effect by more than 20 times but also effectively reduce the soil inorganic nitrogen content. The previous research results are relatively similar to the impact path shown by the structural equation model in this study. We will supplement this part in the revised manuscript.

Line 260-265: Why TC inhibit the synthesis of GluN, and TN inhibit GalN but increase MurA? Can authors please explain these phenomenon. "It may be since increased nitrogen input can attenuate soil respiration (Xing et al., 2022), affecting different microbiota evolution." This is oversimplify for me.

Response: After comparison, TC and TN negatively impact GluN and GalN, while muramic acid will increase with the increase of TC and TN. But it is worth noting that these paths are all indirect paths or insignificant paths. In general, soils with higher nitrogen concentration will have higher amino sugar content due to the high nutrient environment that favors microbial anabolism. However, the reason for the different turnover rules of GluN and GalN may be that the microbial community in central Tibet mentioned in this study is dominated by actinomycetes and bacteria, and the transcription process of MurA in bacterial residues is more clear.

Line 275-280: It's pH, not PH.

Response: We agree and will make the change in the revised manuscript.

Table 1 and 3: I can not see the significance between treatments. Also, is there any interaction effects of warming and increased precipitation on amino sugars?

Response: We put the significance in the supplementary Figure S1-2.

According to the conclusion of the structural equation model, there is no significant effect. As far as the interaction is concerned, the path coefficients between amino sugars are not significant, which has no practical significance.

Figures 4-6: Authors should combine all amino sugars (GluN, MurN, GalN) into one SEM, rather than measuring the global change effects on GluN, MurN, and GalN separately.

Response: We agree and will combine all amino sugars into one SEM in the revised manuscript.