

SOIL Discuss., referee comment RC2
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Comment on soil-2021-88

Anonymous Referee #2

Referee comment on "The function and composition of active bacterial communities diverge during the hydration and desiccation of desert biocrust - a field study" by Capucine Baubin et al., SOIL Discuss., <https://doi.org/10.5194/soil-2021-88-RC2>, 2021

Reviewer comments to Baubin et al. "The response of desert biocrust bacterial communities to

hydration-desiccation cycles"

General comments: In their manuscript, Baubin and coauthors investigated the presence of bacteria and the chlorophyll concentrations as related to hydration-desiccation cycles in biological soil crusts. This is a very interesting and timely topic, as water is considered as one of the dominating factors influencing the microbial composition in biocrusts, and the scientific community just starts to understand the functional roles of different bacteria. However, the manuscript suffers from some major flaws and the results are only superficially analyzed, as described below. Thus, major reviewing is needed before the study can be published in SOIL.

Specific comments:

Sampling methodology: As the first sample was taken in June and the next ones were taken in January of the following year, it would be important to know the climatic conditions before the first sampling and also between the first and the follow-up samplings, as this information is necessary to thoroughly interpret the results. Information on the habitat, where these samples were taken, is missing. What was the surrounding vegetation, how was the geomorphology, what about fog and dew at the site? This information is necessary to the reader to interpret the results.

I see a major general problem in the presentation and discussion of the results. In this study, the RNA and thus the active organisms were investigated. Thus, the results do not give information on the community composition, but on the composition of active bacteria in biocrusts at different time points before, during and after a rain event. The argumentation thus has to be adopted throughout the manuscript.

Relative abundance at order level: In figure 3, it is hard to tell the colors apart from each other (e.g. Chitinophagales vs. Cytophagales). At the latter also a "p" is missing. It also seems that the sorting of the orders varies from one time point to the next. As an example, in T[R] it seems that "unclassified" is next to the Actinobacterial orders, whereas in T[1] to T[3] it is all the way at the bottom. In the text, only the changes from T[0] to T[1] are described, but the changes from T[R] to T[1] are largely ignored. This is unfortunate, as there are major changes that need to be interpreted (and look quite interesting)!

Temporal changes in microbial function: the results shown in figure 4 are hardly discussed at all. This is hard to understand, as they look quite interesting as well. It also would be good to include the statistical results in figure 4, as this will facilitate an interpretation of the results without the necessity to search in the supplement.

In the discussion (line 269 ff.) the authors wonder why the response to desiccation is slower than the response to hydration, but the results show that desiccation also happens much slower and thus it seems reasonable that the organisms stay active over longer time-spans. This then, indeed, could also be caused partly by EPS, but the argumentation has to be adopted accordingly. Looking at the statistics of the water contents (Table A4, A5) it seems highly questionable that the water content of T[0] versus T[R] and of T[R] and T[1] should not be significantly different. Thus, the statistics need to be thoroughly checked again!

There are multiple language problems throughout the text, which need to be fixed by a native speaker or professional language editing.

Technical corrections:

Line 35: The term biome does not completely fit for "arid environments". Better write "drylands"

Line 42: Biocrusts are not only fixed by EPS, but also the organisms themselves, as e.g. fungal hyphae, entangle soil particles and thus stabilize the soil matrix.

Line 43: I don't think that "desolate" is always the correct term for biocrust habitats. They could also stabilize the soil in regions where e.g. succession starts again.

Line 47: Biocrusts could be a main source of C and N and a strong contributor to soil respiration, but I would not say that this always is the case!

Line 52: It is critical to speak of cryptogams as a "seed bank". They do not produce seeds and they mainly outlast as desiccated plants and not as seed-like structures or spores.

Line 121: The section is named "Chlorophyll concentration and water content", but the calculation of the water content has been described before.

Line 178: please write the version, company and location of the company in brackets; the description, what R is, is not needed.

Line 187-189: It is written that at T1 the sampling site was greener than at any other sampling time, but in the referred figure, only pictures of T0 and T1 are shown. It would be very interesting to also see images of the other time points (T2, 3, 4)

Line 196: The term "However" does not make sense here, as also the other parameters, that were described before, behaved in the same manner.

Figure 2: It would be very helpful to include the statistical results in the figure (letters a, b, c...). The number of replicates should be added in the legend.

Line 263: Delete comma at end of line