Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., author comment AC1
https://doi.org/10.5194/hess-2022-392-AC1, 2023

Reply on RC1

Yiben Cheng et al.

Author comment on "An Experimental Investigation of Precipitation Utilization of plants in Arid Regions" by Yiben Cheng et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-392-AC1, 2023

We thank Editor and an anonymous reviewer for their constructive comments. Based on your comments, we have made extensive modification on the original manuscript and restructured the paper to improve the consistency. Specifically, we have adjusted the research methods and discussion to avoid repetitive and unnecessary description. We have also made efforts to improve the writing.

We have revised the text to clearly state the aims of our research in the introduction. We assume that transpiration ceases during the precipitation event and the relative humidity (RH) of the air reaches 100%, a presumption that has been supported by many previous field experimental observations. The first step in our experiment was to demonstrate that Tamarisk leaves absorb atmospheric vapor under high RH conditions, and the experiment results demonstrated that Tamarisk leaves absorbed atmospheric vapor if the RH was greater than 75%. This suggests that the leaves certainly absorb atmospheric vapor during the precipitation period when RH is close to 100%. Second, we dried and weighed the leaves samples to calculate the amount of atmospheric vapor that was absorbed by the leaves. Third, we recorded the duration of precipitation, including light precipitation which was defined in the introduction. As we collected Tamarisk leaves for weighing before and after the artificial precipitation experiment and dried them afterward to calculate the moisture content of the leaves, then the percentage of precipitation absorbed by the leaves can be computed. Overall, our objective was to investigate the absorption of precipitation by Tamarisk, so we did not quantify the absorption of atmospheric vapor by Tamarisk leaves under non-precipitation conditions with high RH. The process of absorption of unsaturated atmospheric vapor by Tamarisk will be a subject of future investigations. We have moved Figure 7 and the associated results to the first paragraph of results. We decided to remove VPD as an indicator and we will analyze the results based entirely on RH.

We have added the fundamental process of atmospheric vapor absorption by leaves and the status of related research in the discussion section, please see section 4.1 with the following sentences: "How plants absorb atmospheric vapor is still an open question. At the plant scale, there are two pathways for the vegetation to uptake atmospheric vapor (Liu et al., 2021). First, atmospheric vapor condenses and infiltrates into the root soil layer for uptake. Second, plants uptake atmospheric vapor through the leaves. The isotopic tracer experiments have showed that $\delta^{18}O$ in specially designed artificial precipitation event was found in the plant stems, suggesting that leaves can absorb the

atmospheric vapor during precipitation events (Hill et al., 2021). At the leaf scale, there are three possible pathways for atmospheric vapor to enter the leaf (Zhang et al., 2019). First, when plant leaves breathe and the stomata is open, vapor can enter the leaves. Second, when precipitation event happens, atmospheric water pressure is below leaf water pressure, thus water enters the leaf through membrane, driven by the water pressure gradient. Third, there are some hydrophilic proteins on the cell surface and these protein channels can absorb water and transport the absorbed water into cells. How the three pathways work is not exactly clear at present (Zhuang et al., 2021)." All the issues that should be corrected in the revised version are listed in the supplement.

Thanks again to the anonymous reviewers for their careful and meticulous review.

Please also note the supplement to this comment:
https://hess.copernicus.org/preprints/hess-2022-392/hess-2022-392-AC1-supplement.pdf