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Discussions

Interactive comment on "Differences in instantaneous water use efficiency derived from post-carboxylation fractionation respond to the interaction of CO_2 concentrations and water stress in semi-arid areas" *by* Na Zhao et al.

Anonymous Referee #2

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Interactive comment on "Differences in instantaneous water use efficiency derived from post-carboxylation fractionation respond to the interaction of CO2 concentrations and water stress in semi-arid areas"

General comments

In the context of global warming derived from the rising CO2 levels, severe drought conditions can be anticipated and are poised to change rapidly. Simultaneously, elevated CO2 concentrations ([CO2]) and more frequent droughts may also have interactive effects on physiological indexes and processes in plant. The carbon discrimination (13Δ) assimilated recently could more subtly provide timely feedback to environmental changes and their influences on diffusion via plant physiology and metabolic process within plants. Post-photosynthetic fractionation at the biochemical level is a well-documented phenomenon, which is caused by the difference in signatures between metabolites and intramolecullar position isotopic effects. Further, there is no clear consensus on the interpretation of δ13C changes in response to the interaction of increasing CO2 and soil-water stresses. This paper distinctly presents the interaction of CO2 concentrations and water stress on the instantaneous water use efficiency and carbon isotope composition. The post-photosynthesis fractionation can explained the differences of the instantaneous water use efficiency measured by the gas-exchange method and the carbon isotopic composition from water-soluble compounds of leaves. The results of this study suggested that rising [CO2] coupled with moistened soil generated increasing disparities of δ13C between the water soluble compounds (δ13Cwsc) and estimated by gas-exchange observation (δ13Cobs) in two species. Thus, cautious descriptions of the magnitude and environmental dependence of apparent post-carboxylation fractionation are worth our attention in photosynthetic fractionation. The experiment is well-designed and the data is generally well presented. This manuscript is suitable and has a merit for publication in this journal, although some details on the methodology and statement on results require some improvements (in special comments).

Special comments

In abstract, the author tried to state the carbon fractionation was generated from the carbon assimilation in the chloroplast to the sugars synthesized in the cytoplasm before photosynthetic products transportation outward the leaf. The vague concepts on Line 11-14 are stated. Separation of the long sentence into the shorter ones would be more beneficial for the readers to understand.

The replications of the measurements of gas-exchange and extractions of water-soluble compounds of leaves could not be found in the part of the materials and methods. Please specify the replications of leaves and trees measured in the gas-exchange and the number of leaves extracted the water-soluble compounds.

There are the 13C fractionation coefficients of two species involved in Tab. 1, which has not been defined in the introductions of methods. Please add and detail the definition of the 13C fractionation coefficients in the materials and methods.

In Line 202-232, the results of photosynthetic parameters were described one by one in detail. I would recommend stating the parameters with the same or similar trends all together. The physiological response of plants to the interactions of rising CO_2 and water stresses could be better presented.

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