

***Interactive comment on “Evaluating the response of  $\delta^{13}\text{C}$  in *Haloxylon ammodendron*, a dominant  $\text{C}_4$  species in Asian desert ecosystem, to water and nitrogen addition as well as the availability of its  $\delta^{13}\text{C}$  as the indicator of water use-efficiency” by Zixun Chen et al.***

**Anonymous Referee #1**

Received and published: 4 November 2020

Water use efficiency is an important parameter reflects plant’s adaptation to changes in soil water availability. This study assessed whether or not there are linkage between leaf carbon isotope composition and water use efficiency in a  $\text{C}_4$  shrub, *Haloxylon ammodendron* growing under different water and nitrogen conditions. The authors reported that leaf photosynthetic parameters, but not carbon isotope composition, were affected by water and nitrogen addition treatments. However, carbon isotope composition of assimilating branch was not correlated with water use efficiency, which may have

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resulted from bundle sheath leakiness and lower activity of carbonic anhydrase. The topic of the study is very interesting and the results are useful for the prediction of plant drought adaptation. However, lack of correlation between carbon isotope composition of assimilating branch and water use efficiency may have also resulted from differences in temporal scale. Carbon isotope composition was determined by the growing condition and photosynthetic discrimination of the period of formation (days); whereas WUE was calculated based on short-term gas exchange measurements (mins). In another word, the measured branch may have emerged a few weeks or even months before the leaf gas exchange measurements. Lack of treatment effects on carbon isotope composition of assimilating branch may associate with rooting depth and water sources. The studied C4 shrub has the ability to access and uptake groundwater, which will reduce its dependency on precipitation and water addition treatment. The authors need to provide more information on plant water sources. Meteorological information is required for the experimental year. L189, using of 450 mmol mol<sup>-1</sup> CO<sub>2</sub> need to be justified. L191, why the authors used 1000 umol m<sup>-2</sup> s<sup>-1</sup>, but not higher photon flux density, such as 1500 or 2000? L191, what are the meanings of “kept stable”? This sentence need to be described more clearer.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-286>, 2020.

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