Response to Smith’s comment

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A commentary on our recent article on Journal of Plant Ecology (Liang et al. 2013) by Smith (2014) argues that it is not appropriate to lump data from different experiments together to demonstrate the thermal acclimation of leaf dark respiration.

We agree that many factors, as listed by Smith (2014), would impact the responses of leaf carbon exchanges to warming and the consequent thermal acclimation. Although not all factors were included, we discussed in the article that light and vapor pressure deficit (VPD) could have affected our conclusions (Liang et al. 2013). The “acclimation” in our paper did not exactly accord with the physiological definition (Atkin and Tjoelker 2003; Smith and Dukes 2013). It is hard to make the environmental factors as well as warming magnitude coherent in a synthesis study because the data were from different experiments. Therefore, the “acclimation” in our meta-analysis was more like an apparent one rather than the physiologically intrinsic one as defined by Atkin et al. (2005) and Smith and Dukes (2013).

In fact, the changes in the responses of dark respiration to warming over time were the combined consequence of warming and the associated changes in environmental factors and plants themselves. Therefore, it is possible that the lower responses of dark respiration under prolonged exposure time resulted from (i) physiological acclimation of leaves, especially newly developed leaves under warming (Atkin and Tjoelker 2003; Campbell et al. 2007; Loveys et al. 2003), and (ii) the lower water availability, substrate availability and/or higher VPD, which usually accompany climate warming (Atkin and Tjoelker 2003; Barber et al. 2000; Joseph et al. 2014; Xie et al. 2010).

Overall, our meta-analysis demonstrated that the response of leaf dark respiration was likely to lower if the climate warming continues. In other words, the apparent thermal acclimation would occur after a long-term warming. The reason could be the physiological acclimation, or other environmental constraints, or their combination. We agree with Smith (2015) that the intrinsic thermal acclimation of plant leaf carbon exchange is difficult to examine by the traditional meta-analysis such as Liang et al. (2013). It would be valuable that future research clearly clarifies whether the intrinsic or apparent thermal acclimation is studied.

REFERENCES


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