

Biogeosciences Discuss., referee comment RC1
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Comments on bg-2021-168

Anonymous Referee #1

Referee comment on "Phosphorus stress strongly reduced plant physiological activity, but only temporarily, in a mesocosm experiment with *Zea mays* colonized by arbuscular mycorrhizal fungi" by Melanie S. Verlinden et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-168-RC1>, 2021

I have made numerous comments in the PDF I read, and refer to that file for details, rather than repeating all comments here. I restrict myself to the main points.

I was a bit surprised that this manuscript was submitted to Biogeosciences, as I would have thought that a straight physiology or ecophysiology journal would have been more appropriate. However, I will leave that aspect of my feedback to the Editor.

The authors quickly jumped to the conclusion that P effects must all be direct effects on photosynthesis, and appear rather dismissive of the idea that P might effect leaf growth, and the change in sink demand would then affect photosynthetic activity. Even though they cite some of the papers highlighting P effects on sink activity, with effects of photosynthesis being indirect, the message in those papers appears not to have been taken on board. Tools exist to assess feedback inhibition of photosynthesis, but the literature dealing with that aspect wasn't discussed at all. For example:

Sharkey T D, Stitt M, Heineke D, Gerhardt R, Raschke K and Heldt H W 1986 Limitation of photosynthesis by carbon metabolism: II. O₂-insensitive CO₂ uptake results from limitation of triose phosphate utilization. *Plant Physiol.* 81, 1123-1129.

Sage R F and Sharkey T D 1987 The effect of temperature on the occurrence of O₂ and CO₂ insensitive photosynthesis in field grown plants. *Plant Physiol.* 84, 658-664. [10.1104/pp.84.3.658](https://doi.org/10.1104/pp.84.3.658).

Plaut Z, Mayoral M L and Reinhold L 1987 Effect of altered sink: source ratio on

photosynthetic metabolism of source leaves. *Plant Physiol.* 85, 786-791.
10.1104/pp.85.3.786.

The authors need to consult a recent textbook to check where different reactions related to carbon metabolism in C4 plants occur, because it is not correct that synthesis of starch and sucrose occur in different cell types. Both require Rubisco, which only occurs in the bundle-sheath cells, and not in mesophyll cells.

It is true that mycorrhizas may mobilise organic P or sorbed P, but when it comes to arbuscular mycorrhizas (AM), the cited textbook (Smith & Read) points out that AM are unlikely to do that. Their role is to enhance the volume of soil that can be explored. So, the text needs to be tweaked a bit to acknowledge that.

SLA is not a simple measure of leaf thickness, but of both leaf thickness and leaf density. Leaf density is affected by carbohydrate concentrations and amount of cell walls.

'Content' is generally used when amounts are expressed per plant (part); when amounts are expressed per unit mass or area, 'concentration' is recommended.

Please also note the supplement to this comment:

<https://bg.copernicus.org/preprints/bg-2021-168/bg-2021-168-RC1-supplement.pdf>