

## ***Interactive comment on “Symbiosis revisited: phosphorus and acid buffering stimulate N<sub>2</sub> fixation but not *Sphagnum* growth” by Eva van den Elzen et al.***

### **Anonymous Referee #1**

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**General comments** This is an interesting contribution in which the authors demonstrate that nitrogen fixation and plant growth are not affected in the same way by phosphorus or bicarbonate. Their expectation was that increased N fixation, especially when coupled with additional phosphorus, would stimulate sphagnum performance. However, while both phosphorus and bicarbonate increased N fixation, they had neutral or negative effects on sphagnum photosynthesis, respectively. Based on this discrepancy between expected result and the actual result, the authors question the concept of a “direct mutualism”.

I am not sure what a “direct mutualism” is. This should be defined.

I wonder whether the effect of P on plant performance is determinable in the time

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frame of this study. If, in response to P addition, N fixation increases, if this added N is retained by the microbes, they would have to turn over before the plant could have access to it. Thus, some more time may be necessary to see a P effect on plant performance.

**Specific comments** The timing of events is not clear. How long were the treatments administered? How much time elapsed between treatment initiation and photosynthesis measurement or nutrient analysis?

The device used to measure photosynthesis is not designed specifically for measuring photosynthesis. One question is whether it is accurate and stable enough to actually detect small but significant differences in photosynthesis between treatments. Also, were the light levels used (not specified) representative of those expected in the field (as opposed to the mesocosm)? If not, the results from this measurement could be irrelevant.

The natural conditions of the site where the mosses were collected should be indicated (pH, bicarbonate concentration, phosphate concentration, etc.) in order to place in context the experimental treatments.

There appears to be a significant interaction between bicarbonate and P with respect to photosynthesis. That is P did not have a significant effect in the absence of bicarbonate, but it did in the presence of bicarbonate. So, when bicarbonate is present, P may be beneficial.

**Technical corrections** None

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