Biogeosciences Discuss., 8, C20–C21, 2011
www.biogeosciences-discuss.net/8/C20/2011/

Biogeosciences Discussions

Interactive comment on "Short term changes in methanol emission and pectin methylesterase activity are not directly affected by light in *Lycopersicon esculentum*" *by* P. Y. Oikawa et al.

T. Sharkey (Referee)

tsharkey@msu.edu

Received and published: 19 January 2011

Oikawa et al. describe three experiments designed to test whether MeOH emission from plants is light sensitive. MeOH emission from plants potentially plays a large role in atmospheric chemistry and predicting emission rates is useful to modeling atmospheric chemistry. One of the more significant effects on emission rate is immature versus mature leaves. This is explained by the fact that MeOH is believed to come from demethylation of pectin during cell wall growth. A second effect that had been proposed was a light effect on the rate of MeOH emission. Testing this is the purpose of the work reported here.

MeOH was measured using PTR MS and a LI-COR 6400. A simple light response curve shows that MeOH emission is greater at high light than at low light. But MeOH emission is not a simple reflection of the rate of MeOH formation because it is so soluble in water. Because stomata open with increasing light intensity it was possible that the light dependence resulted entirely from stomatal opening and thus is an effect of biophysics not biochemistry. Oikawa et al examined this possibility in two ways. First by simply dividing MeOH emission rate by stomatal conductance and second by manipulating stomatal conductance to keep it constant. In both cases the data indicate that the light effect can be accounted for by changes in stomatal conductance.

These results are good indications that there is no immediate light effect on MeOH biochemistry. However, they could be improved by doing the experiment with leaves fed abscisic acid (ABA) to cause the stomata to close. In that case MeOH emission should go down in constant light as the stomata close. Adding one experiment using ABA would strengthen the case that all apparent light responsiveness of MeOH emission is caused by biophysics of diffusion from the leaf.

In the third experiment the authors took leaf samples to measure pectin methylesterase (PME) activity. They found no effect of light on their assays of PME. This rules out modification of PME by light by processes such as phosphorylation or other post-translational modification on the enzyme that might have given rise to a light dependence of PME activity. Other light effects or rapidly reversible post-translational effects would not be detected but this experiment is again consistent with the conclusion that MeOH biosynthesis is independent of light. Other possible effects of light on PME activity may not be picked up in this assay and this should be noted in the manuscript.

This work will contribute to better predictions of MeOH release from vegetation.

Interactive comment on Biogeosciences Discuss., 8, 415, 2011.