Transport and Fixation of Methyljasmonate in Tabacco Plants

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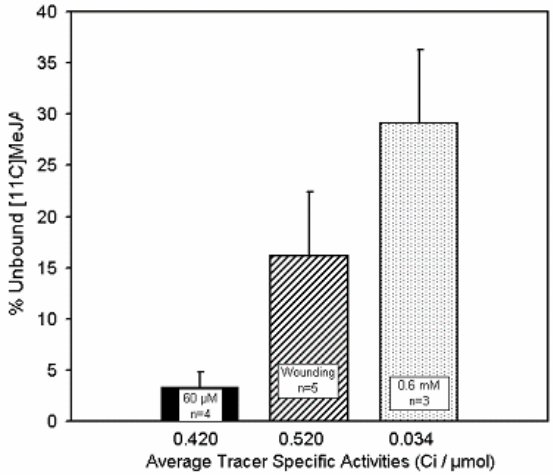
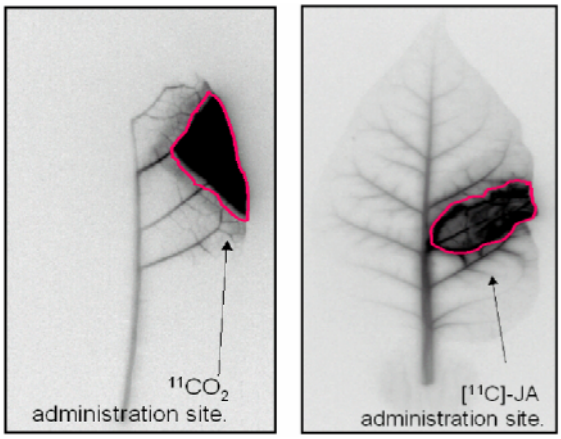
Introduction: Jasmonates, a class of plant hormones, has been shown to increase production of defensive secondary chemicals after exposure to biological stress.[1] Those defense responses can be observed at the administration site as well as on other plant regions. But it is totally unclear if jasmonates, by themselves, or other messenger molecules are responsible for those systemic effects. Besides, we have shown that jasmonates will increase leaf ^{11}C-sugar intermediates,[2] with subsequent increase in phloem loading and ^{11}C-sucrose partitioning to roots. Hence, we believe a role of jasmonates in resource partitioning and chemical fractionation may come from their regulation of sugar-transport proteins that mediate the long-distance transport of carbohydrates within the plant vasculature. Recently, we developed a rapid method for introducing carbon-11 (t½ 20.4 min) into methyl jasmonate (MeJA).[3] This is a key advantage because it enables us to quantify the distribution of MeJA in vivo.

Results and Discussion: Transport of (±)-[^{11}C]Methyl jasmonate in Tabacco plants was determined by phosphor plate images 90 min after treatment. The radiographic images showed evidence of heavy tracer fixation within vascular tissue of administration site even though unbound tracer averaged 2.4 ± 1.6% (n =4). Wounding or treating the leaves with unlabeled MeJA prior to the administration increased the amount of unbound tracer.



Treatment with unlabeled MeJA 90 min after tracer administration also increased the total amount of unbound tracer. The results suggest a reversible binding of MeJA to receptors. Recently, we have shown that jasmonates will increase leaf ^{11}C-sugar intermediates,[2] with subsequent increase in phloem loading and ^{11}C-sucrose partitioning to roots. Therefore MeJA could interact with sucrose transporters. A pretreatment with MeJA prevents the inhibition of sucrose transporters by pcmbs ((p-Chloromercuribenzene)-Sulfonic Acid) and underpin the former statement. In a further study we determined the binding affinity of MeJA for sucrose transporters to 2,5 µM.

However, the distribution of MeJA is fundamentally different from that of sucrose. Sucrose is exclusively transported by the phloem whereas a xylem-phloem exchange could be observed from MeJA transport.



[^{11}C]-sucrose: phloem transport

[^{11}C]-jasmonate: phloem & xylem exchange

Conclusions: We have shown heavy reversible fixation , phloem- xylem exchange and a prevention of sucrose transporters inhibition by pcmbs that suggests an interaction of MeJa with those transporters.

References:

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3. Herth M., Thorpe M., Ferrieri R. – Journal of labelled compounds, (in press)

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