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COS 86-2: A gall forming mite drives drastic declines in in canopy tree photosynthesis

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Background/Question/Methods
Mature forest canopies sustain an enormous diversity of herbivorous arthropods; however, with the exception of species that exhibit massive outbreaks, canopy arthropods are thought to have relatively little influence on overall forest productivity. Diminutive gall-forming mites (Acari; Eriophyoidae) are ubiquitous in forest canopies and are almost always highly host specific, but in spite of their pervasive occurrence, the impacts of these obligate parasites on canopy physiology have not been previously examined. Here we measure gas-exchange processes in galled and ungalled leaves from two distinct ontogenetic stages: canopy trees and understorey saplings. In addition, we examine galling intensity across a range of tree size classes. Finally, we examine the relation between galling intensity and (recent) radial increment growth in mature trees.

Results/Conclusions

We find large declines in photosynthetic capacity (~ 60%), stomatal conductance (~50%) and water use efficiency (~ 30%) in canopy leaves of mature sugar maple (*Acer saccharum*) trees frequently infected by galls of the maple spindle gall mite *Vasates aceriscrumena*. Remarkably, such large impacts occurred at very low levels of galling, with the presence of only a few galls (occupying < 1% of leaf area) compromising gas-exchange across the entire leaf. In contrast to these extreme impacts on leaves of adult trees, galls had no detectible effect on gas-exchange of maple saplings, implying large ontogenetic differences in host tolerance to mite galling. Further, we found a significant negative correlation between canopy tree radial increment growth and levels of mite galling. Increased galling levels and higher physiological susceptibility in older canopy trees suggests that gall-forming mites may be major drivers of “age-dependent” reductions in physiological performance and growth of older trees.

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