Carbon allocation to defense, storage, and growth in seedlings of two temperate broad-leaved tree species (Biological Interactions in Arable Land-Grassland-Forest Continuums and their Impact on the Ecosystem Functions, 7th International Symposium on Integrated Field Science)

著者	IMAJI A., SEIWA K.
journal or publication title	Journal of Integrated Field Science
volume	7
page range	98-98
year	2010-03
URL	http://hdl.handle.net/10097/48844

Carbon allocation to defense, storage, and growth in seedlings of two temperate broad-leaved tree species.

A. IMAJI[1] and K. SEIWA[2]

[1]Nara Forest Research Institute; [2]Graduate School of Agricultural Science, Tohoku University

Optimal carbon allocation to growth, defense, or storage is a critical trait in determining the shade tolerance of tree species. Thus, examining interspecific differences in carbon allocation patterns is useful when evaluating niche partitioning in forest communities. However, very few studies have examined carbon allocation to all three fundamental traits (i.e., growth, defense, storage) simultaneously. In gaps and forest understory, we measured relative growth rates (RGR), carbon-based defensive compounds (condensed tannin, total phenolics), and storage compounds (total non-structural carbohydrate, TNC) in seedlings of two tree species differing in shade tolerance. We found that RGR was greater in the shade-intolerant species, *Castanea crenata*, than in the shade-tolerant species, *Quercus mongolica* var. *grosseserrata*, in gaps, whereas concentrations of condensed tannin and total phenolics were greater in *Quercus* than in *Castanea* at both sites and TNC pool sizes did not differ between the species. We found also condensed tannin concentrations increased with increasing growth rate of structural biomass (GRstr) in *Quercus* but not in *Castanea*, and TNC pool sizes increased with increasing GRstr in both species, but the rate of increase did not differ between the species. These results suggest that *Quercus* preferentially invested more carbon in defense than in storage. Such a great carbon allocation to defense would be advantageous for a shadetolerant species, allowing *Quercus* to persist in the forest understory where damage from herbivores and pathogens is costly. In contrast, the shade-intolerant *Castanea* preferentially invested more carbon in growth rather than defense (and similar amounts in storage as *Quercus*), ensuring establishment success in gaps, where severe competition occurs for light among neighboring plants. In conclusion, these contrasting carbon allocation patterns are closely associated with strategies for persistence in their respective habitats.