COMPETITIVE ABILITY OF *AILANTHUS ALTISSIMA* AND AN OVERVIEW OF OTHER RWU-4557 INVASIVE PLANT STUDIES

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Abstract

The theme of this year's invasive plant session is invasive plant research conducted by Northeastern Research Station scientists and their collaborators. This theme originated in part from the formation of the Northeastern Research Station Invasive Plant Species Research Network, which currently has 14 members. The mission of this network is to provide a forum where NE research scientists can exchange information, collaborate, and progress more efficiently in their invasive plant research efforts.

My research goals within the RWU-4557 are divided among three broad areas; 1) the genetics, organismal, and population biology of known forest exotic invaders, with an initial focus on *Ailanthus altissima* and *Microstegium vimineum*; 2) defining community vulnerability to invasion; and 3) determining impacts of forest plant invasions on forest communities and ecosystem processes. I am currently working on several questions associated with these goals including:

1) Why are so many exotic invasive plants dioecious?
2) What environmental conditions stimulate root suckering in *A. altissima*
3) Does *A. altissima* have mycorrhizae
4) What environmental conditions are required for germination of *A. altissima* and *M. vimineum*
5) How are *M. vimineum* seed dispersed into forests and what is the rate of spread?
6) What sampling methods best detect early invaders?
7) What environmental and disturbance factors define forest community invasibility?
8) Which forest strata are most susceptible to invasion?
9) How well does *A. altissima* compete with native species under different environmental conditions?
10) Are successful invasions dependent on a seed bank?
11) How are the understories of Eastern hemlock forests responding to hemlock woolly adelgid outbreaks in terms of invasions by exotic plants?

I will now focus on the competitive ability of *A. altissima* question, but first should state that this research is very much a simplified, reductionist approach to a complex problem. The purpose of this research is to evaluate the competitive ability of *A. altissima* in a simulated closed-canopy environment and an open environment against an early-successional species, *Rhus typhina*. *Ailanthus altsimma* invades both open areas as well as closed canopy forests, though it appears to have a higher growth rate in open areas, suggesting that high light is optimal for this species. *Rhus typhina* also prefers open areas and like *A. altissima* is dioecious and can spread vegetatively via root suckering. Both intra- and interspecific competition were studied in a controlled greenhouse setting. *Ailanthus altissima* and *Rhus typhina* were grown under a de Wit replacement series experimental design using ample water and nutrients at a total density of 100 seeds per plot in both high light and low light treatments. Allelopathic effects were controlled using activated carbon and none were found. While *R. typhina* had significantly fewer germinants in both high and low light treatments, its root to shoot ratio per individual and average height were significantly greater than that of *A. altissima* in high light. *Ailanthus altissima* appeared to benefit from its negative density effects in low light with regards to competition with *R. typhina*; the fewer germinants appeared to compete better, but did not outperform *R. typhina*. The relative yield results indicate that *R. typhina* is a better competitor than *A. altissima* under high light conditions, but could coexist with *A. altissima* in shaded environments. These results also suggest that *A. altissima* is not inherently better at capturing resources than *R. typhina*, which may provide support for the enemy release hypothesis. Similar experiments are being conducted with the shade-tolerant *Acer rubrum* showing a pattern where the native species is the better competitor in its optimal environment. Future tests varying stressful environmental conditions, mimicking herbivory and pathogens, and ultimately conducting these same tests under field situations are planned.