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Evolutionary insights from comparing within- and among-population correlations between plant growth and defense against insect herbivores

Authors: Philip G Hahn (U Montana), John L Maron (U Montana), Ken Keefover-Ring (??)

Abstract:

A paradigm in the plant defense literature is that defending against insect herbivores comes at a cost to growth, thereby resulting in negative correlations between growth and defense. Although growth-defense trade-offs are common across plant species, there is less support for growth-defense trade-offs within species. Several mechanisms can account for this, but teasing them apart requires explicit comparisons of growth and defense relationships within *and* among populations, an approach seldom employed. Here we evaluate genetically-based growth-defense correlations within- and among-populations of a native perennial plant that originate from divergent resource environments. Insect herbivore (Lepidoptera and Coleoptera) abundance increased across the resource gradient, indicating selection for higher levels of defense is likely favored in higher resource environments. However, we also found greater genetically-based growth rates for plants from high vs. low resource environments. We found little evidence for ubiquitous growth-defense trade-offs and instead document divergent correlations among various growth and defense traits when examined within versus among populations. We discuss our results in the broader context of what is known about energetic and/or genetic constraints on the joint evolution of these traits, and discuss scenarios where growth-defense trade-offs may not be found within species.