Efficacy of biocontrol against Chrysomelid pests in lab vs field studies: Potential biases of setting and phylogenetic subgroups

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Abstract

The beetle family Chrysomelidae is a speciose group of voracious herbivores with a wide number of ecological implications. While some Chrysomelid species have been introduced or augmented as biological control agents of invasive plants, many other species have found success as economically important pests of field crops and stored grains, leading to severe yield losses in cucurbits, legumes, and other systems. Controlling such pests, especially in the field, is particularly difficult due to the timing of their complex life cycles, the fossorial nature of many species' larvae, and ability to produce multiple generations in a single growing season. This study aimed to assess patterns of efficacy in biocontrol against various Chrysomelid pests by means of meta-analysis, with the principal goal of comparing differences in effect size between lab and field studies to identify any biases when translating said studies to applications. Across 89 biocontrol assessments gathered from 20 studies, there was no significant difference in effect size between lab (n=43) and field studies (n=46). However, there was a significant gap in lab versus field studies and the different clades within Chrysomelidae represented, suggesting data for lower taxonomic groups may be incomplete and thus difficult to elucidate.

Keywords: biological control, Coleoptera, natural enemies, root herbivory, agroecology, applied ecology