Herbivore-Induced Plant Defenses and Biological Control of Invasive Plants

J. B. Runyon and J. L. Birdsall

USDA Forest Service, Rocky Mountain Research Station, 1648 South 7th Avenue, MSU Campus, Bozeman, MT 59717-2780 USA  jrunyon@fs.fed.us  thelegume@hotmail.com

Abstract

Biological control is one of the few tools capable of managing widespread exotic plant invasions, which, at its most successful, can offer long-term solutions to weed problems. However, some biological control agents obtain approval and are released, but fail to impact weed populations. This is troublesome because exploration, testing, and approval for each agent take many years and is estimated to cost several millions of dollars to complete. Moreover, ineffective agents can persist and cause unwanted ecological changes in the communities in which they occur. A better understanding of the interactions between biocontrol agents and their invasive host plants is needed to identify the factors which promote or limit successful biocontrol. Our approach is to apply the chemical ecology of plant-herbivore interactions to classical biological control of weeds – two fields which have largely progressed independently to date. Chemistry plays a central role in determining ecological outcomes between plants and insects, and should provide information that can be used to better predict which potential agents are most likely to be effective. Here we focus on induced plant responses – defenses activated in response to insect feeding – and the potential role these costly chemicals play in determining the success or failure of biocontrol.