

## Indirect Interactions between Rust (*Melampsora epitea*) and Leaf Beetle (*Phratora vulgatissima*) Damage on *Salix*

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Willows (*Salix* spp.) are beneficial as a potential source of renewable energy, riparian barriers and riverbank control, yet are considered invasive weeds when they clog watercourses and lead to erosion and flooding. Interactions between willow rust *Melampsora epitea* (Thüm.) (Uredinales: Melampsoraceae) and leaf beetle *Phratora* spp. (Coleoptera: Chrysomelidae) feeding damage have an impact on effective pest management and biological control. The present study investigated the effects of (a) prior mechanical leaf damage on rust development, and (b) rust infection on beetle feeding under laboratory conditions for different time intervals and levels of damage. Willow rust infection significantly reduced the amount of leaf area consumed by beetles. The result was similar when a compatible or an incompatible rust pathotype was sprayed onto *Salix viminalis* (L.) 'Mullatin' plants. There were no overall significant effects of mechanical damage on rust development, although the lowest level of rust infection was found with the incremental damage treatment. There were, however, differences of significance for leaf position and damage status, with damaged leaves at all positions having fewer pustules and a smaller pustule area than the corresponding undamaged leaves. There was no detectable effect of possible volatile emissions from crushed willow leaves on rust infection and development, although the volatile compound *cis*-3-hexenyl acetate significantly reduced pustule diameter and overall pustule area. The results are discussed in terms of the implications for pest management and biological control.

KEY WORDS: Chrysomelidae; induced response; insect–fungus interactions; rust; short-rotation coppice; willow.

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