
Tritrophic interactions between host plant, phytophagous and entomophagous insects: the case of the invasive species, *Drosophila suzukii*.

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Abstract

Understanding, controlling, and preventing biological invasions represent both an economic and a scientific challenge. However, the factors explaining the success of invasive species are still poorly understood. Among these factors, two of the best-studied are related to the resource hypothesis (colonization can be facilitated by a high resource availability) and the enemy release hypothesis (the success of an exotic species is due to the absence or the reduced efficiency of natural enemies). These two mechanisms are not independent and can interact through a process called animal medication, i.e. a behavioral immunity based on the use of substances found in the diet/environment to combat or protect against natural enemies.

Drosophila suzukii is an invasive pest native from Asia, successfully spreading in Europe and in North-America since 2008. Regarding its natural enemies, while pupal parasitoids development is possible, this species is particularly resistant to European larval parasitoids, thanks to a highly efficient cellular immune system. Furthermore, *in natura*, *D. suzukii* larvae can develop in the fruits of *Atropa belladonna*, a Solanacea known for its high content of atropine, a tropan alkaloid with entomototoxic properties. The objective of this study is to investigate the possible effects of the *D. suzukii* consumption of atropine on its interaction with parasitoids.

We show that *D. suzukii* larvae reared on an atropine-supplemented medium increased their resistance to parasitoids and that females preferentially laid their eggs on a medium supplemented with atropine in presence of parasitoids.

Our results constitute a nice example of a trans-generational prophylactic medication.

Keywords: Tritrophic interactions, Biological invasions, *Drosophila suzukii*

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