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Influence of Bacterial Secondary Symbionts (BSS) on *Sitobion Avenae* (F.) Mortality and Fecundity Caused by Isolates of *Beauveria Bassiana* and *Metarhizium Brunneum*

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Abstract

Symbiotic associations are ubiquitous in nature and have played a vital role in the evolution of life on earth. The importance of bacterial secondary symbionts (BSS) contributing to protection of aphids against their natural enemies is progressively being recognised. Historical evidences reveal that entomopathogenic fungi have played a critical role in insect control and are, therefore, regarded as good candidates for biological control. Here, we explored whether the bacterial secondary symbionts *Hamiltonella defensa* or *Regiella insecticola* provide protection to the wheat aphid (*Sitobion avenae* F.) against different isolates of entomopathogenic fungi *Beauveria bassiana* and *Metarhizium brunneum*. *H. defensa* and *R. insecticola* conferred protection to wheat aphids when exposed to *B. bassiana* strains (Bb1022 and EABb 04/01-Tip) and *M. brunneum* strains (ART 2825 and Bipesco-5) by significantly enhancing their survival as compared to wheat aphids lacking these bacterial secondary symbionts. *M. brunneum* strain Bipesco-5 was found the most lethal to wheat aphid clones lacking the bacterial secondary symbionts as compared to other fungal strains. Fungal strains typically needed five days for successful infection and fungal pathogenicity to wheat aphids without *H. defensa* and *R. insecticola* was much faster as compared to wheat aphids harbouring bacterial symbionts. Bacterial secondary endosymbionts also positively influenced the fecundity of their host wheat aphids as compared to aphids lacking symbionts when treated with the fungal pathogens. Providing protection to their insect hosts is a way for secondary endosymbionts to boost their frequency within host community and has a prominent influence on the evolution of their hosts.

Keywords: Biological control, entomopathogenic fungi, secondary symbionts, sitobion avenae