

RESEARCH ARTICLE

Plant-mediated vulnerability of an insect herbivore to *Bacillus thuringiensis* in a plant-herbivore-pathogen system

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ABSTRACT

Laboratory studies were performed to explore the effects of host-plant quality on the vulnerability of *Plutella xylostella* to *Bacillus thuringiensis*. *P. xylostella* were kept on different host plants, including *Brassica pekinensis* (Chinese cabbage) cv. Hero, *Brassica oleracea* var. *botrytis* (cauliflower) cv. Royal, and *B. oleracea* var. *capitata* (common cabbage) cv. Globe Master (white cabbage) and cv. Red Dynasty (red cabbage) for at least two generations. These host plants are considered as the high (Chinese cabbage), intermediate (cauliflower and white cabbage) and low-quality (red cabbage) hosts for *P. xylostella*. The vulnerability of the pest larvae was then tested using two formulations of *B. thuringiensis* var. *kurstaki*, including Biolarv[®] and Biolep[®]. The results demonstrated that the susceptibility of *P. xylostella* to *B. thuringiensis* was influenced by host-plant quality. Indeed, *B. thuringiensis* acted better on the pest fed on the low-quality host plant compared with that on the high-quality host plant. The interaction between the pathogen and plant quality/resistance resulted in more mortality of the pest larvae, implying a synergistic effect. From a pest management viewpoint, these findings may be promising for the integration of the pathogen and the low-quality/partially resistant host plants against *P. xylostella* in field studies.

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1. Introduction

Host-plant resistance is a paramount component of sustainable pest management (Andra-hennadi & Gillott, 1998; Sarfraz, Dosdall, & Keddie, 2006). Plant resistance can happen via one factor or a combination of factors, such as antibiosis, antixenosis and tolerance (Sarfraz, Dosdall, & Keddie, 2007). For example, the mechanism of resistance in glossy *Brassica oleracea* to attack by the diamondback moth, *Plutella xylostella* (L.) (Lepidoptera, Plutellidae) is reduced larval survival (Ulmer, Gillott, Woods, & Erlandson, 2002). Growth and reproduction of insect herbivores are affected by plant quality either via nutritional quality or via the effects of plant defensive compounds (Awmack & Leather, 2002). In

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