RESPONSES OF Dasineura brassicae AND ITS PARASITOIDS Platygaster subuliformis AND Omphale clypealis TO FIELD TRAPS BAITED WITH ORGANIC ISOTHIOCYANATES

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Abstract—The responses of Dasineura brassicae and its parasitoids Platygaster subuliformis and Omphale clypealis to allyl and 2-phenylethyl isothiocyanates have been investigated using a new design of trap in winter oilseed rape. Traps baited with allyl isothiocyanate caught more male and female D. brassicae and more female O. clypealis than traps baited with 2-phenylethyl isothiocyanate or unbaited traps, whereas traps baited with 2-phenylethyl isothiocyanate caught more male and female Platygaster subuliformis than traps baited with allyl isothiocyanate or unbaited traps. The implications of these results for host-plant and oviposition-site location by D. brassicae and for host habitat and host location by the parasitoids are discussed, as is the potential for using these responses in integrated pest management strategies.

Key Words—Dasineura brassicae, Platygaster subuliformis, Omphale clypealis, parasitoids, pest management, oilseed rape, Brassica napus, Brassicaceae, glucosinolates, isothiocyanates, 2-phenylethyl isothiocyanate, allyl isothiocyanate, host location.

INTRODUCTION

Dasineura brassicae Winnertz (Diptera: Cecidomyiidae), the brassica pod midge, is an important summer pest of crops belonging to the family Brassicaceae (=

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Cruciferae), such as oilseed rape (*Brassica napus* L.), in Europe (Bromand, 1990; Alford et al., 1991). It is cited as being attacked by over 20 species of hymenopteran parasitoids, among them species of the genus *Platygaster* (Hymenoptera: Platygastridae) and *Omphale clypealis* (Thomson) (Hymenoptera: Eulophidae) (Williams and Walton, 1990; Alford et al., 1995).

Host location in phytophagous insects is mediated by a combination of visual and olfactory cues (Visser, 1986) and secondary plant chemicals provide orientation and feeding cues for specialized insect feeders, which are often specific to a restricted range of plants (Feeny, 1983). Parasitoids also often use plant-derived chemicals to locate host habitats (Vinson, 1981). The family Brassicaceae is characterized by secondary plant chemicals called glucosinolates (GS), which are stored in parenchymous tissues (Larsen, 1981); at least 16 aliphatic, aromatic, and indolylglucosinolates commonly occur in oilseed rape (Fieldsend and Milford, 1994). In damaged tissue, the enzyme myrosinase (a thioglucosidase) initiates catabolism of many glucosinolates to isothiocyanates (NCS) and sometimes to other compounds such as nitriles, oxazolinidethiones, thiocyanates, or cyanoepithioalkanes, depending on glucosinolate type and conditions (Fenwick et al., 1983). At least 20 species of specialist crucifer-feeding insects utilize glucosinolates or their volatile metabolites in host-plant location or recognition (Feeny, 1983; Bartlet, 1995).

This study investigated the responses of *Dasineura brassicae* and its parasitoids, *P. subuliformis* and *O. clypealis*, to allyl NCS, which is a catabolite of allyl GS (2-propenyl), and 2-phenylethyl NCS, which is a catabolite of 2-phenylethyl GS (gluconasturtiin), using a new design of trap.

The 2-phenylethyl GS is present in the vegetative tissues of oilseed rape (Fieldsend and Milford, 1994), and 2-phenylethyl NCS is a component of the volatile profile from the plant and is perceived by a number of oilseed rape pests (Blight et al., 1992, 1995a). 2-allyl GS, although present in many Brassicaceae and in older cultivars of oilseed rape, is not present in the newer double-low cultivars (Milford et al., 1989) and consequently allyl NCS is not released from them. *Dasineura brassicae* has been reported to respond to 2-allyl GS in an olfactometer (Pettersson, 1976), which is surprising as glucosinolates are not very volatile, and males but not females are attracted to traps releasing allyl NCS (Lerin, 1984; Evans, 1991). The responses of the parasitoids of *D. brassicae* to isothiocyanates have not been investigated previously although allyl NCS is known to elicit responses from the parasitoids of other cruciferous pests (Read et al., 1970; Titayavan and Altieri, 1990; Pickett et al., 1991; Pivnick, 1993).

**METHODS AND MATERIALS**

*Experimental Design.* Traps, baited with allyl NCS or 2-phenylethyl NCS, at either a high or low release rate, or unbaited, were placed in winter oilseed