

**TRITROPHIC INTERACTIONS BETWEEN CRUCIFERS,
APHIDS AND HYMENOPTERAN PARASITIDS**

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ABSTRACT

Studies on tritrophic interactions involving three cultivars of common cabbage, *Brassica oleracea* var *capitata*, with varying levels of susceptibility to aphids, cv Minicole, (green-leaved) partially resistant with antibiosis mechanisms, Ruby Ball, (red-leaved) with antixenosis factors, and Derby Day (green-leaved), susceptible, were conducted with two aphid species, *Myzus persicae* (Sulzer), a generalist, and *Brevicoryne brassicae* (L.), a crucifer specialist and two hymenopteran parasitoids, *Aphidius colemani* (Viereck) and *Diaeretiella rapae* (McIntosh).

Investigations on the olfactory response of *A. colemani* in a four-way olfactometer showed that odours influenced *A. colemani* response to varying degrees. The odours of the cabbage cultivar on which the parasitoid had been reared was preferred over the odours of the other cultivars. Parasitoids gave a significant response to the volatiles of the cultivar on which they developed when tested against water. Overall, parasitoid responses increased when plant to plant comparisons were made as compared with plant to water controls, and again the magnitude of parasitoid response to odours depended on cultivar with Derby Day and Minicole preferred over Ruby Ball. However, when provided with a choice between odours of infested plants, parasitoids did not show a significant preference for the cultivar on which they were reared.

Laboratory studies were conducted to determine the effects of plant cultivar and aphid species on the performance of *A. colemani*. Significantly greater aphid populations were found on Derby Day regardless of the presence or absence of parasitoids, compared with Minicole or Ruby Ball. Minicole had the greatest proportion of aphids parasitised and Derby Day the least. A significantly lower percentage of emerged parasitoids was recorded on Minicole for both aphid species compared with Derby Day and Ruby Ball. The total development time of female parasitoids reared on *M. persicae* did not differ significantly between Minicole and Derby Day but was significantly faster on Ruby Ball. Sex ratios, size and longevity of both male and female parasitoids on either host were not significantly influenced by cultivar.

Field studies showed that cultivar and plant growth stage rather than fertiliser influenced aphid infestation and parasitism. In 1998, Ruby Ball was least colonised by aphids in early stage of plant growth, while Minicole had the greatest aphid infestation. Similarly in early season of 1999, Ruby Ball was least colonised but aphid densities were greatest on Derby Day followed by Minicole. In both years, from mid to late stages of plant growth, the lowest aphid infestation and the highest level of parasitism was observed on Minicole. *Brevicoryne brassicae* was the dominant species and had greater rate of parasitism compared with *M. persicae* during the early part of the season. *Diaeretiella rapae* was the major parasitoid and was found earlier than *Aphidius* sp. There was evidence of a beneficial interaction between the degree of plant resistance and biological control at the early and mid stages of plant growth. The implications of the results are discussed in relation to the integrated management of these aphids.