PHEROMONE MONITORING OF BRASSICA POD MIDGE (*Dasineura brassicae* Winn.)

Ingrid H. Williams

Rothamsted Experimental Station, Harpenden, Hertfordshire, U.K.

There is at present no monitoring system for brassica pod midge on oilseed rape crops in the United Kingdom. The time of emergence of the pest is variable from year to year (Williams, Martin & Kelm, 1987), and individuals are small and difficult to find and identify in the field. It is therefore difficult for growers to decide whether or to what extent their crops are at risk from this pest.

Water and sticky traps have been used to catch adults on winter rape (Williams *et al.*, 1987) but such non-attractant traps are difficult to use and laborious to sort. A pheromone trap selective for brassica pod midge that was easy to use, could prove useful for monitoring.

A Y-tube olfactometer has now been used to determine whether females produce a sex pheromone to attract males, and delta traps baited with live virgin female brassica pod midge, empty delta traps and sticky traps have been compared for their effectiveness in monitoring infestations.

Olfactometer tests

The method used is fully described in Williams & Martin (1986). Males were attracted to live virgin females, to crushed virgin females and to hexane washes of females (Table 1), suggesting that the virgin female produces a sex pheromone that attracts males. Males were attracted to washes of the ovipositors but not to the bodies of females from which the ovipositors had been removed, suggesting that the pheromone is probably produced or released by the ovipositor. Virgin females frequently extend their ovipositors before mating and wave their tips back and forth. Males appear to be attracted during this behaviour and mating follows. The ovipositor is retracted during copulation and not re-extended after mating. Live mated females were not attractive to males presumably because they no longer extended their ovipositors to release pheromone, but pheromone could be obtained from them by crushing or hexane washing their ovipositors.

Pheromone monitoring in the field

Traps were placed at three sites in Hertfordshire, two in fields in which winter rape and spring rape infested by brassica pod midge, respectively, had been grown the previous year and the third a field of winter rape, on 9 May. At each site there were 15 traps i.e. 5 sticky traps (as described by Williams *et al.*, 1987), 5 empty delta traps (Oecos Ltd., Kimpton, Herts.) and 5 delta traps baited with live virgin

female brassica pod midge, at 5 m intervals along a transect 5 m in from the edge of each field. Traps were examined and renewed three times a week until removal on 30 July.

The catches in all three trap types indicated a similar phenology of adult flight activity to that described by Williams *et al.* (1987). However, the delta traps baited with virgin females caught midges a few days earlier at one site than the non-attractant traps. At emergence sites, adults (predominantly males) were caught from late May to mid-July with peak numbers during mid- to late-June. On the rape crop, the first adults were caught simultaneously with those at the nearby emergence site. The non-attractant traps caught mainly females from mid-May until the end of June and mainly males (second generation) thereafter, whereas the virgin female baited traps selectively caught males throughout the trapping period.

Overall, delta traps baited with virgin females caught 39 times more brassica pod midge than empty delta traps and 5 times more midges per unit of sticky catching area than the sticky traps. 58% of the insects caught in the virgin female delta traps, 3% of those in the empty delta traps and 11% of those in the sticky traps were brassica pod midge. Because they caught brassica pod midge selectively, the virgin female trap catches were easier and quicker to sort than the catches from the non-attractant traps.

Traps at one emergence site caught about twice as many midges as those at the other site closely reflecting the site's respective overwintering cocoon populations. This correlation may enable pheromone traps to be used not only to detect the presence of brassica pod midge but also its density.

Conclusion

If the sex pheromone produced by the virgin female brassica pod midge could be identified and synthesised, to provide a continuously attractive lure for males, it could prove a powerful tool for early detection of this pest and lead to more efficient control.

References

Williams, Ingrid, H. and A.P. Martin (1986) Evidence for a female sex pheromone in the brassica pod midge *Dasineura brassicae*. Physiological Entomology 11, 353-356.

Williams, Ingrid, H., Martin, A.P. and Maria Kelm (1987) The phenology of the emergence of brassica pod midge (*Dasineura brassicae* Winn.) and its infestation of winter oil-seed rape (*Brassica napus* L.). Journal of Agricultural Science, Cambridge, 108 (accepted for publication).

TABLE 1 Responses of *Dasineura brassicae* to live midges, dead (crushed) midges and hexane washes of midges in a Y-tube olfactometer.

Sex of midge	Test material	Percentage reacting to test Material
Male	20 virgin females	60*
Male	20 mated females	54
Male	20 males	52
Male	3 crushed virgin females	63**
Male	3 crushed mated females	46
Male	30 crushed mated females	61*
Male	Hexane wash of 10 females	62**
Male	Hexane wash of ovipositors of 25 females	64**
Male	Hexane wash of bodies without ovipositors of 25 females	52
Male	20 males	52
Virgin female	20 males	54
Mated female	20 males	53
Mated female	20 mated females	53

*$P < 0.05$, ** $P < 0.01$ determined by X^2 tests