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Response of the oilseed rape pests, *Ceutorhynchus assimilis* and *Psylliodes chrysocephala*, to a mixture of isothiocyanates

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Key words: Attraction, *Brassica napus*, cabbage seed weevil, cabbage stem flea beetle, traps, volatiles

Ceutorhynchus assimilis Payk., the cabbage seed weevil, and *Psylliodes chrysocephala* L., the cabbage stem flea beetle, are both important pests of oilseed rape (*Brassica napus* L.) in the UK. In electrophysiological experiments their antennae perceived 3-butenyl, 4-pentenyl and phenylethyl isothiocyanate (NCS), volatile metabolites of glucosinolates present in rape (Blight *et al.*, 1989). This study investigated the behavioural responses of the insects to a mixture of these three NCSs.

***Responses of* C. assimilis.** The chemotactic responses of the seed weevil were tested in a linear track olfactometer. This olfactometer was designed by Sakumi and Fukami (1985) and adapted for testing the responses of the pea and bean weevil *Sitona lineatus* L. by Blight *et al.* (unpubl.). It has two chambers. Test material is put into one chamber and the other chamber acts as a control. Insects move out of a holding pot and along a wire to a T-junction. At the T-junction the insects can turn one way, into an airstream carrying odour from the test material or the other way, into the control airstream. The response of an insect to an odour is assessed by noting the number of insects turning towards it at the T-junction. For each replicate, the responsiveness of the weevils was first assessed by testing their reaction to 5 g of flowering rape (*cv.* Willi). The response to an equal (by weight) mixture of the three NCSs in pentane was then tested. The mixture was released into one of the chambers of the olfactometer by an automatic microapplicator at a rate of 1.7 µl/min. Twenty weevils were put into the holding pot each time. Turning responses were observed for ten minutes. Eight replicates of 20 weevils each were used. Statistical analyses used a generalized linear model (Blight *et al.*, unpubl.). Pentane alone was unattractive to the weevils (Table 1). Weevils were optimally attracted by a release rate of 15 µg total NCS over ten minutes. The odour of flowering rape was more attractive to the weevils than the NCS mixture.

***Responses of* P. chrysocephala.** The responses of the cabbage stem flea beetle were investigated using field cages containing baited water traps. Nine field cages (2.74 x 2.74 x 1.83 m) each contained a seed tray (215 x 360 x 55 mm) filled with water. Water traps were either; unbaited, baited with 50 rape seedlings, *cv.* Topas, growth stage 1.2 (Sylvester-Bradley, 1985) or baited with an NCS mixture. An equal (by weight) mixture of the three NCSs in nonane was released from a glass vial with a polythene cap via a pipe cleaner wick. Initially 5 mg of each NCS in 3 ml of nonane was used giving a release rate of 1.6 mg total NCS/day. The three treatments were arranged in a latin square. On 18 September '91, 100 field collected cabbage stem flea beetles were released at each corner of every field cage. The number of beetles in each water trap was counted one week later.

retained by leaves for at least several hours (Fig. 1). Since females only release pheromone

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Table 1. Movement of cabbage seed weevils towards NCS and towards flowering rape, tested in an olfactometer

Test material released over 10 minutes	% of weevils turning towards the odour	
	Test material	Flowering rape
pentane	56.9	85.6 ***
150 µg total NCS	62.4 *	86.0 ***
15 µg total NCS	73.8 **	74.4 ***
1.5 µg total NCS	65.9 *	82.3 **
0.15 µg total NCS	50.9	78.7 ***

Attraction significant at: * P < 0.05, ** P < 0.005, *** P < 0.001

The traps baited with seedlings caught more beetles than either the traps baited with N or the unbaited traps, although there was some evidence that the NCS mixture attractive (Table 2). The baits were renewed on 27 September '91 and this time NCS released at approximately 16 mg/day. One week later both the traps baited v seedlings and the traps baited with NCS were found to have caught more beetles than control.

Table 2. Capture of cabbage stem flea beetles in baited water traps

Release rate (mg/day) total NCS	Mean no. of beetles caught (± SE)		
	Seedling traps	NCS traps	Control traps
1.6	22.0 ± 5.6	5.7 ± 1.8	2.3 ± 0.7
16.0	13.7 ± 4.6	13.0 ± 5.8	0.3 ± 0.3

Conclusions

These results show that both the seed weevil and the cabbage stem flea beetle attracted by the NCS mixture. NCSs may assist the orientation of these insects to tl host plant.

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