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HOST PLANT SELECTION IN A PENTATOMID BUG *EURYDEMA PULCHRUM* WESTWOOD

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Abstract: Observations on host plant selection in a pentatomid bug, *Eurydema pulchrum* Westwood were made using olfactometer techniques. The response of the bug to different plant species such as *Brassica oleracea*, *Raphanus sativus* and *Solanum lycopersium* in different forms (intact plant/macerated) and different varieties of *B. oleracea* (*B. o. capitata*/*B. o. botrytis*) has been shown. The results indicated that secondary metabolites present in *B. oleracea* play an important role in selection of host plant by the bug.

Key words: host plant selection, pentatomid bug, *Eurydema pulchrum*

INTRODUCTION

A special association between the insect pest and its host plant has attracted the attention of the chemical ecologists. Almost all of them are of the view that some secondary metabolites present in a specific plant species are responsible for such intimate relationship. Finch (1978) found that mixtures of volatiles are produced in cruciferous plants mainly by hydrolysis of non-volatile glucosinolates to volatile isothiocyanates, thiocyanates and nitriles, which are used by the cabbage root fly to select the host plant. Chew (1980) observed the food preference in cabbage buuterfly larvae, whereas Pivnick *et al*. (1990) investigated the role of volatile compounds in selection of host plant by diamondback moth. Another aspect of chemical interaction was put forward by Pickett *et al*. (2003), who postulated that when plants are attacked by insects volatile chemicals delebs signals are released, not only from the damaged part, but also systematically from other parts of the plant. These signals are perceived both by herbivorous insects and their natural parasites.

In the present study an attempt has been made to observe the behaviour of *Eurydema pulchrum* Westwood in response to different plant species (host/non host) such as *Brassica oleracea*, *Raphanus sativus* and *Solanum lycopersium* in different forms, intact/macerated plant and different varieties of *B. oleracea* (*B. o. capitata*/*B. o. botrytis*) The response of the bug to each species/form/varieties is shown in the table 1.

MATERIALS AND METHODS

Olfactometry technique

The techniques of Vuorinen *et al*. (2004a, b) were used to observe the response/preference of the bugs to the odour source of the plant in two way choice method. The Y-tube olfactometer was made in the blowing section of the Department of Chemistry, University of Kashmir, Srinagar. The main arm of the tube was 10.5 cm long and other two side arms were 10 cm long each. Diameter of the whole Y-tube was 1.6 cm and the angle between two arms was approximately 90°. Both side arms were connected through the Teflon tubing with wash bottles (containing sample plants) tightly closed with Teflon sealed lids. Each wash bottle was connected through Teflon tubing with another wash bottle containing activated charcoal for purification of air. The pressure of air flow was adjusted with the help of control knob of the aerator.

Rearing of bugs

The bugs of *E. pulchrum* were reared in the research laboratory of P.G. Department of Zoology, University of Kashmir, Srinagar to get the maximum number of insects for the experiments.

Sample plants and their cultivation

Sample plants were grown in nurseries to keep the stock easily available for experimentation all the time. The sample plants used in the experiments include of *B. o. capitata*, *B. o. botrytis*, *R. sativus* and *S. lycopersium*. Plant samples of appropriate were randomly selected from the 4–5 week old seedlings and washed thoroughly before the use.

Designing of the experiment

The whole plant was enclosed in a 1.5 litre wash bottle tightly closed with Teflon sealed lid, air filtered through charcoal passed through the wash bottle containing one sample plant and connected with a short arm of Y-tube.

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The other wash bottle containing other plant sample was similarly connected with the second arm of Y-tube. Then, the bugs were collected from rearing cages and introduced into the main arm of olfactometer, the movement of bugs towards the plant odour was recorded as positive response, if they crossed the marked-line (decision line) and remained there for at least 30 seconds or so. A total of twenty replications of each experiment were performed using different bugs. In each experiment 5 minutes were given to the bugs to make the final choice. If the bugs did not respond and did not cross the marked-line within the stipulated time it was recorded as negative response.

A total of six experiments were conducted and twenty replications of each experiments were performed, using different insects each time. Errors were minimized rotating the olfactometer by 180° after each replication. Pressurized and purified air was also allowed to pass through both arms of the Y-tube olfactomoter for about 5 minutes after every replication so that the effect (odour) of the previous replication could be removed. The whole experimental material was rinsed thoroughly with acetone or ethanol and dried completely after every five replications. Results of the experiments are shown in the following table and figures (Table 1, Fig. 1, 2).

Table 1. Results of experiments on the feeding response of *E. pulchrum* Westwood to different plant species/forms/varieties

Experiment No.	Odour source	No. of bugs [20]	Percentage
1	*B. o. capitata*	19	95
	water	1	5
2	*B. o. capitata* (intact)	2	10
	B. o. capitata (macerated)	18	90
3	*B. o. capitata* (intact)	10	50
	B. o. botrytis (intact)	10	50
4	*B. o. capitata* (macerated)	11	55
	B. o. botrytis (macerated)	9	45
5	*B. o. capitata* (macerated)	15	75
	R. sativus (macerated)	5	25
6	*B. o. capitata* (macerated)	17	85
	S. lyzopersium (macerated)	3	15

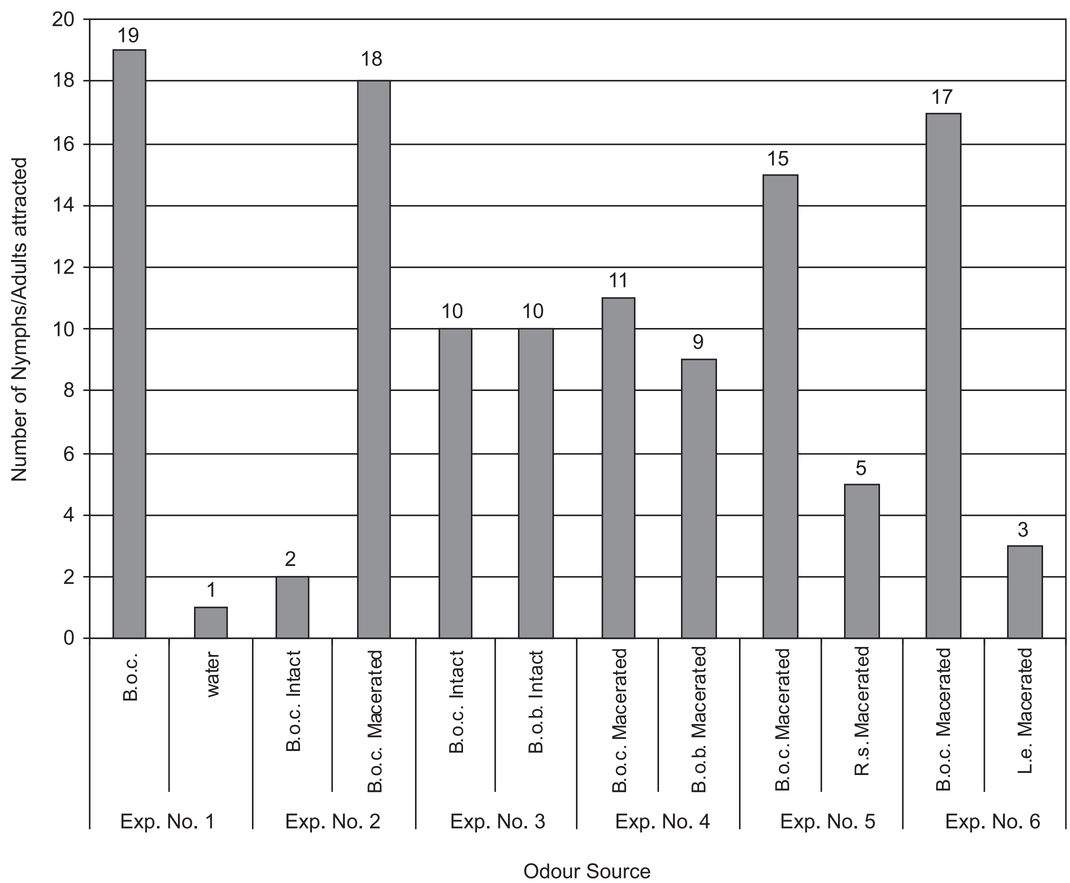

Fig. 1. Graphical presentation of the behavioural bioassay of *E. pulchrum* in relation to odour source of different plant species, varieties and preparations of the plant

Explanations: B.o.c. = *B. o. capitata*; B.o.b. = *B. o. botrytis*; R.s. = *R. sativus*; S.l. = *S. lyzopersium*

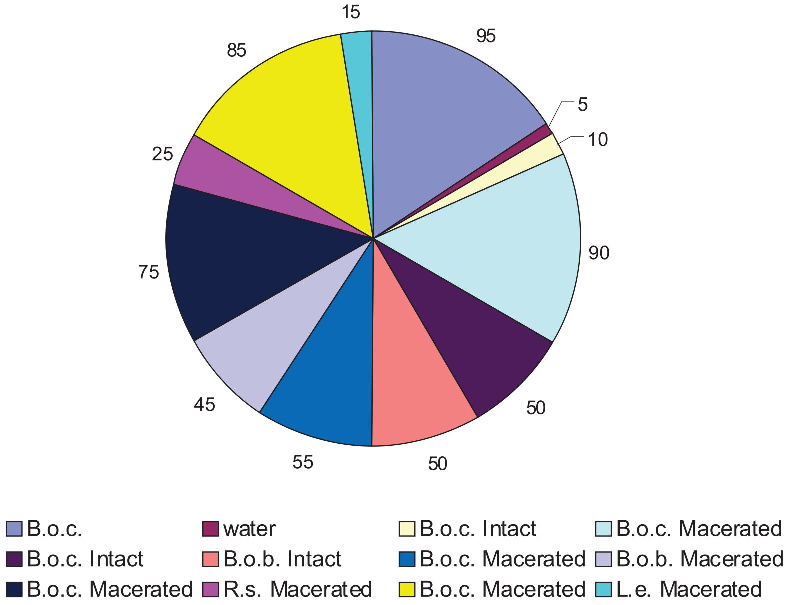

Fig. 2. Percent distribution of attraction of *E. pulchrum* to odour source of different plant species, varieties and preparations of the plants

Explanations: B.o.c. = *B. o. capitata*; B.o.b. = *B. o. botrytis*; R.s. = *R. sativus*; S.l. = *S. lyzopersium*

DISCUSSION

In the first experiment 95% of bugs moved towards *B. oleracea capitata* and 5% moved towards the other arm of olfactometer containing water. The fact that only one adult moved towards water can be taken as accidental movement and it had nothing to do with the feeding of the bug.

In the second experiment where *B. o. capitata* was used in different forms (macerated/intact plant), there was a distinct preference by the bugs for macerated form as compared to intact plant. It confirmed findings of other workers that the concentration of volatile coumpounds increases many fold when plant cells are crushed or injured.

In the third and fourth experiments two varieties of *B. oleracea* viz., (*capitata* and *botrytis*) were compared in different forms (macerated/intact plants) separately. When intact plant was used there was no significant difference in the chemoattractant potential of the two varieties, but when the macerated forms of two varieties were compared the results were slightly different about 55% bugs moved towards *B. o. capitata* and 45% moved towards *B. o. botrytis*.

In the fifth experiment *B. o. capitata* and *R. sativus* were compared. The result showed that 75% of bugs moved towards *B. o. capitata* and only 25% bugs moved towards *R. sativus*. It shows the oligophagous nature of *E. pulchrum* Westwood, a pest of Cruciferous crops.

In the sixth experiment where *B. o. capitata* and *S. lycopersium* were compared, it was found that 85% of bugs moved towards *B. o. capitata* as compared to 15% towards *S. lycopersium*. The result suggests that *E. pulchrum* Westwood is crucifer specialist. The movement of 15% bugs towards *S. lycopersium* can be accidental and not related to feeding.

Statistical analysis

The results were compared using chi square test to find out a significant difference (if any) in the potential of volatile compounds of different plant species/varieties and forms.

The different forms (macerated/ intact plant) of *B. o. capitata* and *B. o. botrytis* showed no significant difference in their chemoattractant potential for the bug. The statistical values obtained for intact plant (experiment No. 3) were chi sq. = 0.000, df = 1, p = 1.000 and for macerated form (experiment no. 4) were: chi sq. = 0.133, df = 1, p = 0.715 indicating that both the forms have the same attractant potential. In contrast, when intact and macerated forms of *B. o. capitata* were put together for trial (experiment no. 2) the difference was found highly significant chi sq. = 9.187, df = 1, p = 0.002 confirming that macerated forms have more chemoattractant potential than intact plant.

The statistical values obtained for *B. oleracea capitata* (macerated) and *R. sativus* (macerated) showed a quite significant difference in their chemoattractant potentials chi sq. = 3.429, df = 1, p = 0.064, similarly high significant difference of 0.009 was obtained when macerated forms of *B. o. capitata* and *S. lycopersium* were compared chi sq. = 6.910, df = 1, p = 0.009.

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POLISH SUMMARY

WYBÓR ROŚLINY ŻYWICIELSKIEJ PRZEZ PLUSKWIAKA *EURYDEMA PULCHRUM* WESTWOOD

Badania nad wyborem rośliny żywicielskiej przez pluskwiaka *Eurydema pulchrum* Westwood prowadzono przy użyciu metod olfaktorycznych. Badano reakcję szkodnika na wybrane gatunki roślin takie jak: *Brassica oleracea, Raphanus dativus* i *Solanum lycopersium* (zarówno w postaci nienaruszonej, jak i zmacerowanych roślin) oraz różnych odmian *B. oleracea* (*B. o. capitata*/*B. o. botrytis*). Wyniki przeprowadzonych badań wykazały, że wtórne metabolity wytwarzane przez rośliny z gatunku *B. oleracea* odgrywały istotną rolę przy wyborze rośliny żywicielskiej przez szkodnika.