

**MALE ATTRACTION TO A NATURAL SPIDER
MITE SEX PHEROMONE
(ACARI: TETRANYCHIDAE)
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Abstract

In a laboratory experiment, males of *Tetranychus cucurbitacearum* Sayed were attracted to crude ether extract of about 2000 quiescent female deutonymphs. Male attraction varied over the range of concentrations tested (100, 10, 1.0, 0.1 and 0.01 deutonymph equivalents (DE) / ml). Tests were conducted on sweet potato leaf discs placed upon moist absorbent cotton wool. Several tested materials (pink cardboard, filter paper, cotton wool, sponge and plant leaf tissue) were used as substrates for the crude extract. Males were examined after 0.5, 1, 1.5, 2, 12, 24, 36 and 48 hours from emergence. Male attraction was measured as a percent of responses to treated sites and corrected for occasional visits to untreated check sites. Strongest attraction (35.62 %) occurred at 1.0 DE / ml. Decreased attraction occurred, however, at the higher and lower concentrations.

Introduction

The red spider mite *Tetranychus cucurbitacearum* Sayed is a serious pest of many field and truck crops. Its control measures are difficult due to several reasons: (1) under hot and dry conditions the generation period lasts 5-7 days, (2) its reproductive potential is very high, (3) populations soon acquire resistance or tolerance to most acaricides, and (4) small numbers of acaricides are used and fewer new acaricides are being developed and registered. Therefore, new approaches for control are being explored including irradiation, chemosterilants and use of beneficial arthropods. The use of insect pheromones is being investigated for control of several major insect pests. However, little work on similar naturally occurring sex-attractants has been reported for the Acarina (Cone et al., 1971).

Adult males of spider mites are attracted to quiescent female deutonymphs. Ewing (1914) described the behavior of a male attending a resting female deutonymph prior to the final molt. Lehr and Smith (1957), reported similar observations in which the male would "stand guard" beside the last quiescent stage.

The objectives of this investigation were to demonstrate that an attractive substance produced by *T. cucurbitacearum* female quiescent deutonymph was extractable in a solvent, and male mites would respond to the crude extract when deposited on a suitable substrate.

Materials and Methods

Mites were reared on detached sweet potato-leaf discs placed upside down on moist absorbent cotton wool in Petri dishes at 25 ° C. Ovipositing *T. cucurbitacearum* females were placed on each leaf disc and removed after 24 hours. Deposited eggs hatched and resulting larvae developed to reach quiescent deutonymphal stage. Newly emerged males were collected and retained for bioassay tests. Approximately 2000 quiescent female deutonymphs were then collected from the cultures, placed in ether and crushed in a tissue grinder. Crude ether extract which contained ca. 100 deutonymph equivalents (DE) /ml was diluted by a factor of 10 to produce extracts containing 100, 10, 1.0, 0.1 and 0.01 DE / ml.

Techniques for introducing the crude ether extract to males included: dropping the extract on the leaf disc surface; saturating 1 mm² pieces of Watman no.1 filter paper (fp) and pink cardboard (pc); and treating small balls of cotton thread (ct) and small cubes of sponge with the ether extract. The last four substrates were air dried and then placed on the leaf disc.

Some sites were treated with ether extract (+) and others were treated with ether only (-). Each disc had 3 (+) sites on the right half and 3 (-) sites on the left half, followed by introducing 3 males on the mid line of the disc. Every concentration was replicated 4 times. Observations of male response were made with a binocular dissecting microscope after intervals of 0.5, 1.0, 1.5, 2.0, 12, 24, 36 and 48 hours. Attraction as hovering, guarding and mating (Cone et al., 1971) to a (+) site was expressed as a percentage corrected for incidental attraction to (-) sites according to the following formula:

$$\% \text{ Attractancy} = \frac{\text{No. of (+) attractions} - \text{no. of (-) attractions}}{\text{Total possible attractions} - \text{no. of (-) attractions}}$$

The total possible attractions are the number of male mites multiplied by the number of observations made for each test.

Results and Discussion

The obtained data of corrected percent response of males to crude ether extract of quiescent deutonymphs are recorded in table 1 and illustrated in figure 1. Five concentrations of crude ether extract of quiescent deutonymphs were tested with five different substrates as carriers. However, the middle concentration (1.0 DE / ml) had greater attraction (35.62 %) than either the higher (100 and 10 DE / ml) or lower (0.1 and 0.01 DE / ml) concentrations.

The observational periods ranged between 0.5 to 48 hours; the percent attractancy of all concentrations was slightly fluctuated during these periods.

Concerning the substrates, it was found that the pink cardboard was the most favorite as a carrier for the extract, but the opposite was found with the filter paper, while the rest substrates were moderate.

Similar results were recorded before by Cone et al. (1971) on *Tetranychus urticae* Koch since they showed that the strongest attraction (37.2 %) occurred at 1.0 DE / ml with decreased attraction at higher and lower concentrations. The same authors added that the size and color of the substrate seemed to be important for attraction.

It appears that *T. cucurbitacearum* quiescent female deutonymphs produce a chemical which has sex-attracting capabilities for males of the same species, and that it may be extracted in ether.

Further refinement in bioassay procedure is highly needed. Chemical identification of the sex attractant component existing in the female quiescent deutonymphs is also important. Other solvents and substrates should be tested.

References

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Table 1. Percent response of *T. cucurbitacearum* males to crude ether extract of female quiescent deutonymphs.

Concentration *	Substrate**	% Attractancy after test duration (hours) of:								Average
		0.5	1	1.5	2	12	24	36	48	
100	1	33.22	16.66	8.33	27.27	16.66	8.33	36.36	25.00	16.61
	2	8.33	8.33	41.66	0.00	9.09	0.00	8.33	36.36	
	3	9.09	16.66	16.66	16.66	5.00	25.00	18.18	0.00	
	4	8.33	27.20	18.18	0.00	0.33	8.33	27.27	27.27	
	5	50.00	25.00	18.18	36.36	0.00	16.66	10.00	0.00	
10	1	40.33	58.33	60.00	60.00	60.00	60.00	30.00	20.00	27.97
	2	0.00	12.50	30.00	28.57	0.00	0.00	0.00	0.00	
	3	35.00	40.00	40.00	40.00	40.00	40.00	41.66	30.00	
	4	0.00	0.00	20.00	28.00	28.57	28.57	50.00	33.33	
	5	40.44	33.33	25.00	20.00	20.00	25.00	0.00	0.00	
1.0	1	35.00	33.33	60.00	65.00	70.00	70.00	42.85	44.44	35.62
	2	25.00	25.00	15.00	10.00	0.00	0.00	50.00	16.66	
	3	22.00	22.20	30.00	30.00	36.36	36.36	40.00	20.00	
	4	55.00	54.54	55.50	55.50	57.14	62.50	28.57	37.50	
	5	20.00	20.00	30.00	35.00	37.50	50.00	12.50	14.28	
0.1	1	18.18	8.33	54.54	16.66	9.09	60.00	66.66	66.66	29.68
	2	0.00	9.09	9.09	0.00	0.00	0.00	0.00	10.00	
	3	9.09	27.27	41.66	33.33	50.00	70.00	70.00	55.55	
	4	33.33	50.00	54.54	58.33	33.33	33.33	33.33	40.00	
	5	10.00	16.66	16.66	33.33	0.00	14.28	37.50	37.50	
0.01	1	25.00	25.00	27.27	25.00	33.33	41.66	40.00	36.36	18.06
	2	0.00	0.00	0.00	0.00	10.00	0.00	11.11	18.18	
	3	40.00	35.00	40.00	33.33	44.44	28.57	0.00	33.33	
	4	11.11	11.11	11.11	0.00	12.50	16.66	0.00	0.00	
	5	0.00	0.00	0.00	25.00	37.50	16.66	33.33	0.00	

* Deutonymph equivalent / ml

** (1) Pink cardboard, (2) Filter paper, (3) Cotton wool, (4) Sponge, (5) Plant leaf tissue.

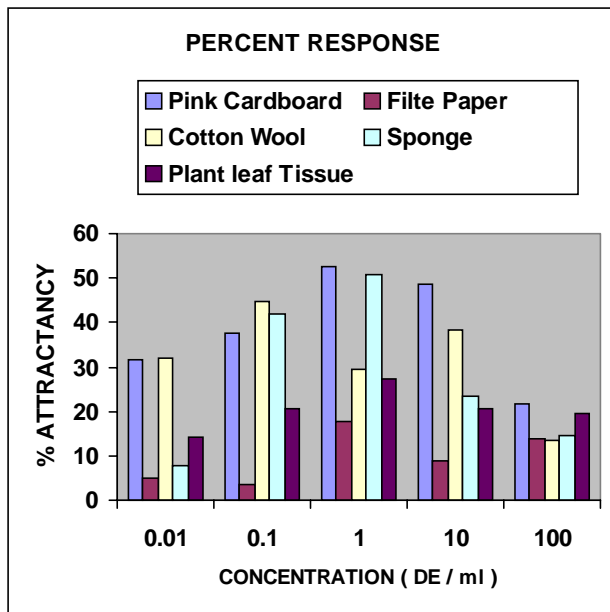


Figure 1. Percent response of *T. cucurbitacearum* Sayed males to crude ether extract of female quiescent deutonymphs on different substrates.