

EVALUATION OF THE MATING STIMULANT  
PHEROMONES OF *FANNIA CANICULARIS*, *F. PUSIO*,  
AND *F. FEMORALIS* AS ATTRACTANTS<sup>1,2,3</sup>

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ABSTRACT

The respective mating stimulant pheromones of *Fannia canicularis* (L.), *F. pusio* (Wiedemann), and *F. femoralis* (Stein) were evaluated for their effectiveness in increasing the trap catch of a sugar bait. The pheromones of *F. canicularis* [(Z)-9-pentacosene] and of *F. pusio* [(Z)-11-hentriacontene] produced a slight, but significant increase in capture of males but not of females when compared with an untreated sugar bait. The pheromone of *F. femoralis* [(Z)-11-hentriacontene] did not increase the trap catch of either sex.

Mating stimulant pheromones produced by female flies have been identified for the house fly, *Musca domestica* L. (Carlson et al. 1971, Rogoff et al. 1973, Uebel et al. 1976); the face fly, *Musca autumnalis* De Geer (Uebel et al. 1975b, Sonnet et al. 1975); and the stable fly, *Stomoxys calcitrans* (L.) (Muhammed et al. 1975, Uebel et al. 1975a, Sonnet et al. 1977).

Recently, some of us (Uebel et al. 1977, 1978a, and 1978b) investigated the cuticular lipid constituents of *Fannia* spp. and identified the components that were most active in sexually stimulating male *F. canicularis*, *F. pusio*, and *F. femoralis*. The external lipid of *F. canicularis* females was found to contain a large amount of (Z)-9-pentacosene, which serves as the mating stimulant pheromone for the males of this species. Male *F. canicularis* were found to contain a large amount of an unusual cuticular component that was identified as 8-heneicosanol acetate (Uebel et al. 1977). The monoolefin (Z)-11-hentriacontene was identified as the most active compound in stimulating copulatory responses from males of *F. pusio* and *F. femoralis* (Uebel et al. 1978a, 1978b).

<sup>1</sup> Diptera: Muscidae.

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<sup>3</sup> This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation for use by the U.S. Department of Agriculture nor does it imply registration under FIFRA as amended. Also, mention of a proprietary product in this paper does not constitute a recommendation or an endorsement of this product by the USDA.

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Carlson and Beroza (1973) and Morgan et al. (1974) have reported that the addition of the house fly sex attractant pheromone, (*Z*)-9-tricosene (muscalure), to a trap will significantly increase the catch of both male and female house flies. This paper reports the results of our evaluation of the mating stimulant pheromone of these 3 species of *Fannia* as attractants under simulated field conditions.

#### MATERIALS AND METHODS

Tests with *F. canicularis* and *F. femoralis* were conducted in a 3 × 3 × 3 m-room that contained a battery of 20 White Leghorn hens. Since under similar conditions so few *F. pusio* were captured, the tests reported here were conducted in a screen cage (107 × 81 × 97 cm) in a test room of the Fly Control Laboratory. Attractancy was determined by comparing the catch of a trap baited with sugar with that of a trap baited with sugar plus the test material.

Two traps, constructed from 1.4-liter plastic containers (C-70, Tristate Plastics, Henderson, KY) with inverted entrance cones, were placed at opposite sides of a 71-cm-diam circular platform. They were supported 3 cm above the platform by 3 metal legs. The platform, which was 25 cm above the floor of the test cage and 48 cm above the floor of the test room, was rotated at 2 rpm by a 1/20 hp electric motor (Model 3M125, Dayton Electric Co.).

The baits were prepared by saturating circles of filter paper (127 mm, Grade 617, Easton-Dikeman) with 4 ml of petroleum ether containing the test material or with 4 ml of petroleum ether alone. After the solvent had evaporated, the filter paper was pressed into a petri dish. Then 1.5 g of sucrose was sprinkled onto the filter paper and the dishes were placed beneath the traps. Except that a concentration of 1 mg was omitted from the tests with *F. femoralis*, all test compounds were evaluated at concentrations of 25, 5, and 1 mg/filter paper. In addition, a 1:1 mixture of (*Z*)-11-hentriacontene and tricosane was tested at 10 mg to determine whether this combination, which stimulates mating of *F. femoralis* males, would be effective as an attractant for this species.

Tests were made by releasing ca. 1500 recently eclosed flies from the laboratory colony into the test room or cage every other day. The traps were collected after 24 h, and the captured male and female flies were counted. Then, the traps were washed (also alternated over treated and untreated filter papers), and the petri dishes were replaced with clean ones containing fresh filter paper, sugar, and test material. The numbers of males and females captured during 10 or 15 such trapping periods in the traps with and without test material were individually analyzed by the 2-way analysis of variance.

#### RESULTS

Table 1 shows that the trap over the filter paper treated with (*Z*)-9-pentacosene (25, 5, or 1 mg) captured more *F. canicularis* males than the trap over the untreated filter paper. Also, these traps captured more *F. canicularis* females than the controls though the difference was only significant for a concentration of 5 mg.

When 8-heneicosanol acetate, a cuticular component of male *F. canicularis*, was tested at 1 or 5 mg on filter paper, the numbers did not significantly differ from those captured in the trap without this material.

TABLE 1. NUMBERS OF *F. canicularis* CAPTURED IN 2 TRAPS, 1 BAITED WITH SUGAR PLUS (Z)-9-PENTACOSENE AND THE OTHER WITH SUGAR ALONE.\*

Amount of (Z)-9-pentacosene on filter paper	Mean number captured		Catch ratio: treated/ untreated	Level of significance
	Trap with treated filter paper	Trap with untreated filter paper		
MALES				
1 mg	70.4	40.2	1.8	1%
5 mg	53.6	28.4	1.9	1%
25 mg	53.3	32.1	1.7	1%
FEMALES				
1 mg	37.8	25.8	1.5	N.S.
5 mg	27.8	17.7	1.6	5%
25 mg	22.2	18.9	1.2	N.S.

\*Means are for ten 24-h collections at each concentration.

Catches of *F. pusio* males (Table 2) were greater in traps baited with sugar plus 25, 5, or 1 mg (Z)-11-hentriacontene than in traps baited with sugar only. However, (Z)-11-hentriacontene had no apparent effect on the catches of *F. pusio* females.

There were no significant differences between the numbers of *F. femoralis* males captured in traps baited with sugar plus 25 or 5 mg of (Z)-11-hentriacontene and in traps baited with sugar alone (Table 3). Also, there was no significant difference between the catches of *F. femoralis* females in traps over the untreated filter paper or filter papers treated with 5 mg. In the test with 25 mg of (Z)-11-hentriacontene, the traps over the untreated paper captured more *F. femoralis* females, an indication that the females were repelled by this concentration of the monoolefin.

Table 3 shows that the alkane plus monoolefin combination had little effect: ca. the same numbers of male and female *F. femoralis* were captured in the trap over the sugar and test mixture as over the sugar bait alone.

#### DISCUSSION

Our present study demonstrates that male *F. canicularis* and *F. pusio* are moderately attracted by their respective mating stimulant pheromones, while both (Z)-9-pentacosene and (Z)-11-hentriacontene are essentially ineffective in attracting females. Interestingly, Carlson et al. (1971) also found that (Z)-9-tricosene attracted male house flies in laboratory tests, though in field tests (Carlson and Beroza 1973), nearly equal numbers of the sexes were attracted.

We feel that the main function of the mating stimulant pheromones borne by female flies is to initiate sexual or courtship responses from conspecific males. Thus, the attraction they demonstrate is probably a secondary effect. Since these pheromones were effective in only slightly increasing the trap catch of the males of 2 of the *Fannia* species, their use as an attractant for the control of these pest flies remains doubtful.

TABLE 2. NUMBERS OF *F. pusio* CAPTURED IN 2 TRAPS, 1 BAITED WITH SUGAR PLUS (Z)-11-HENTRIACONTENE AND THE OTHER WITH SUGAR ALONE.\*

Amount of (Z)-11-hentriacontene on filter paper	Mean number captured		Catch ratio: treated/untreated	Level of significance
	Trap with treated filter paper	Trap with untreated filter paper		
MALES				
1 mg	60.9	52.5	1.16	5%
5 mg	24.9	19.4	1.29	2.5%
25 mg	16.9	13.9	1.22	5%
FEMALES				
1 mg	52.7	47.7	1.10	N.S.
5 mg	31.1	31.3	0.99	N.S.
25 mg	16.3	15.2	1.07	N.S.

\*Means are for fifteen 24-h collections at each concentration.

TABLE 3. NUMBERS OF *F. femoralis* CAPTURED IN 2 TRAPS, 1 BAITED WITH SUGAR PLUS (Z)-11-HENTRIACONTENE OR WITH (Z)-11-HENTRIACONTENE COMBINED WITH TRICOSANE, AND THE OTHER WITH SUGAR ALONE.\*

Amount of test material on filter paper	Mean number captured		Catch ratio: treated/untreated	Level of significance
	Trap with treated filter paper	Trap with untreated filter paper		
MALES				
5 mg (Z)-11-C <sub>31</sub>	59.7	53.5	1.12	N.S.
25 mg (Z)-11-C <sub>31</sub>	45.0	46.1	0.98	N.S.
5 mg (Z)-11-C <sub>31</sub> plus 5 mg tricosane	51.5	50.6	1.02	N.S.
FEMALES				
5 mg (Z)-11-C <sub>31</sub>	35.2	39.5	0.89	N.S.
25 mg (Z)-11-C <sub>31</sub>	26.5	34.5	.77	2.5%
5 mg (Z)-11-C <sub>31</sub> plus 5 mg tricosane	43.7	44.4	.98	N.S.

\*Means are for fifteen 24-h collections at each concentration.

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