

RECAPTURE OF VIRGIN FEMALE CARIBBEAN FRUIT
FLIES¹ FROM TRAPS BAITED WITH MALES²A. J. PERDOMO³, R. M. BARANOWSKI⁴, AND J. L. NATION³

ABSTRACT

Field tests in Homestead, Fla., during spring and summer, 1972, demonstrated that virgin male Caribbean fruit flies, *Anastrepha suspensa* (Loew), caged in sticky board traps attracted virgin females. Apparently much of the attraction was related to release of a volatile sex attractant. More females were trapped in the late afternoon than during other parts of the day.

Traps baited with 10 live males were as effective as the McPhail traps currently used and were substantially more effective when baited with 20 or 40 males. The pure pheromone, when available, may be easy to use in traps and may be a more sensitive survey tool than those presently available.

Five day old male caribflies, *Anastrepha suspensa* (Loew), have been shown to attract female flies in a laboratory bioassay (Nation 1972). Extracts prepared from males indicated that some or possibly all of the attraction was due to 1 or more chemicals released by the males. To establish whether the attraction of virgin females to males was significant under field conditions, we developed a field bioassay at the University of Florida Agricultural Research and Education Center at Homestead, Florida.

MATERIALS AND METHODS

All experiments were conducted in an avocado grove. Avocados are not a host of caribfly and the nearest grove of host trees consisted of guavas approximately 300 m away. No wild flies were observed in the avocado grove, and between the avocado and the guava grove there was only open ground. Survey traps were placed in the avocado grove before and after most of the experiments. The trapping results consistently indicated an absence of wild flies. In 1 test with marked flies, all flies captured were marked.

Cotton boll weevil traps baited with live caribfly males supplied with dry sucrose, yeast hydrolysate paste, and water, and coated with stickem⁵ were used. Control stickem-coated traps contained food only. Males were placed in screen mesh cylinders 16 cm long X 6 cm diam. All flies used in these experiments were laboratory reared. Sexes were segregated before sexual maturity was reached.

A Latin square 4 x 4 design was used for trap location. The avocado trees in the release area were spaced 6 m apart. The traps were suspended from a branch approximately 2 m above the ground in every 4th tree. Virgin females were released at 25 sites, each approximately 13 m from any trap.

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⁵A glue-like trapping agent (Michel Pelton Co., Oakland, California).

Attraction of females to 0, 1, 5, and 10 live males was compared in the first experiment. Both sexes were 8 days old when first put into the field and recaptures were recorded between 2-6 days. The experiment was replicated 4 times in successive weeks; a total of 6,250 females was released. A second experiment was designed to compare the attraction of the McPhail trap with the attraction of 10, 20, and 40 live males in the same traps and release sites as before. The flies were again 8 days old when first put into the field. The aqueous suspension of yeast hydrolysate used in the McPhail traps was always prepared 3 days in advance of the experiment date. This comparison was run 4 times in successive weeks with a total release of 8,650 females. Female flies were always released between 1500 and 1700 h. Captures were recorded over a period of 3-6 days.

Results were transformed to percentage of recovery and evaluated by analysis of variance and Duncan's multiple range test.

RESULTS

Traps without males captured 2.25 females per trap, traps with 1 male attracted 5.31 females per trap, 5 males attracted 14.19 females per trap, and 10 males attracted 43.44 females per trap (Table 1). The recovery of released females in each experiment varied from 6.5 to 28% between replicates. Traps with 10 males attracted significantly more females than traps with 0, 1, or 5 males, and traps with 5 males attracted more than traps containing 0 males. The difference between traps with 0 and 1 male was not significant. Variation in percentages of recovery among replicates may have been caused by variable weather conditions prevailing when replicates were performed. In the test started on 3 May 1972 the low total recovery of 6.45% was possibly related to the fact that females were held in much smaller cages prior to release than used in subsequent replicates. Crowding could have weakened the flies.

TABLE 1. RECAPTURE OF RELEASED *A. suspensa* ADULT VIRGIN FEMALES WITH MALE-BAITED STICKY TRAPS FROM TESTS IN A NON-HOST AVOCADO GROVE AT HOMESTEAD, FLORIDA. A LATIN SQUARE 4 X 4 DESIGN WAS USED IN EACH TEST.

Treatments	Dates				Total no. of females recaptured	Mean no. recaptured trap*
	5-3-72	5-12-72	5-16-72	5-26-72		
0 Male	11	3	9	13	36	2.25a
1 Male	16	13	30	26	85	5.31ab
5 Males	21	51	84	71	227	14.19 b
10 Males	81	204	170	240	695	43.44 c
Total recapture	129	271	293	350	1043	
No. of females released	2000	1000	2000	1250	6250	
% Total recovery	6.45	27.10	14.65	28.00	16.69	

*Values followed by the same letter are not significantly different at 0.01 level.

The McPhail trap captured an average of 14 females per trap, traps with 10 males captured an average of 17 females per trap, and traps with 20 and 40 males captured an average of 32 and 60 females per trap, respectively (Table 2). In this series of experiments the total percentage recovery of released females varied from 12 to 38% between replicates.

TABLE 2. RECAPTURE OF RELEASED *A. suspensa* ADULT VIRGIN FEMALE FLIES WITH STICKY TRAPS BAITED WITH 10, 20, AND 40 LIVE MALES AS COMPARED WITH RECAPTURE BY THE MCPHAIL TRAP FROM TESTS IN A NON-HOST AVOCADO GROVE AT HOMESTEAD, FLORIDA. A LATIN SQUARE 4 × 4 DESIGN WAS USED IN EACH TEST.

Treatments	Dates				Total no. of females recaptured	Mean no. recaptured trap*
	5-30-72	6-7-72	6-13-72	6-20-72		
McPhail	97	71	26	31	225	14.06a
10 Males	75	52	57	95	279	17.44ab
20 Males	155	108	63	186	512	32.00 b
40 Males	356	170	93	349	968	60.50 c
Total recapture No. of females released	683	401	239	661	1984	
% Total recovery	23.55	20.00	11.95	37.77	22.94	

*Treatments followed by the same letter were not significantly different at the 0.01 level.

Statistical analysis shows that traps with 40 males attracted significantly more females than McPhail traps or traps with 10 or 20 males. Traps with 20 males attracted more females than McPhail traps; but traps with 10 males were not significantly different from the McPhail traps. On 2 occasions traps with 10 males captured fewer females than McPhail traps.

Recapture of females at intervals of time after release was recorded for the test of 26 May (Fig. 1). Most of the females recaptured were caught during the first 48 h and during the daylight hours. From 1945 h of 26 May to 0615 h of 27 May only 24 flies were recaptured which represents only 0.29 flies per trap per hour, but during the daylight hours on 27 May substantially more females were recaptured (though not as many as during the daylight hours of 26 May) indicating that caribflies are not particularly active at night.

The recapture percentages at the end of 48 h, and the total recapture percentage for 6 experiments are shown in Fig. 2. Data from 2 experiments are not included because no observations were made at 48 h. Almost all flies recaptured were caught during the first 48 h following release.

DISCUSSION

We conclude from these experiments with *A. suspensa* that virgin males attract virgin females under field conditions. It seems reasonable to con-

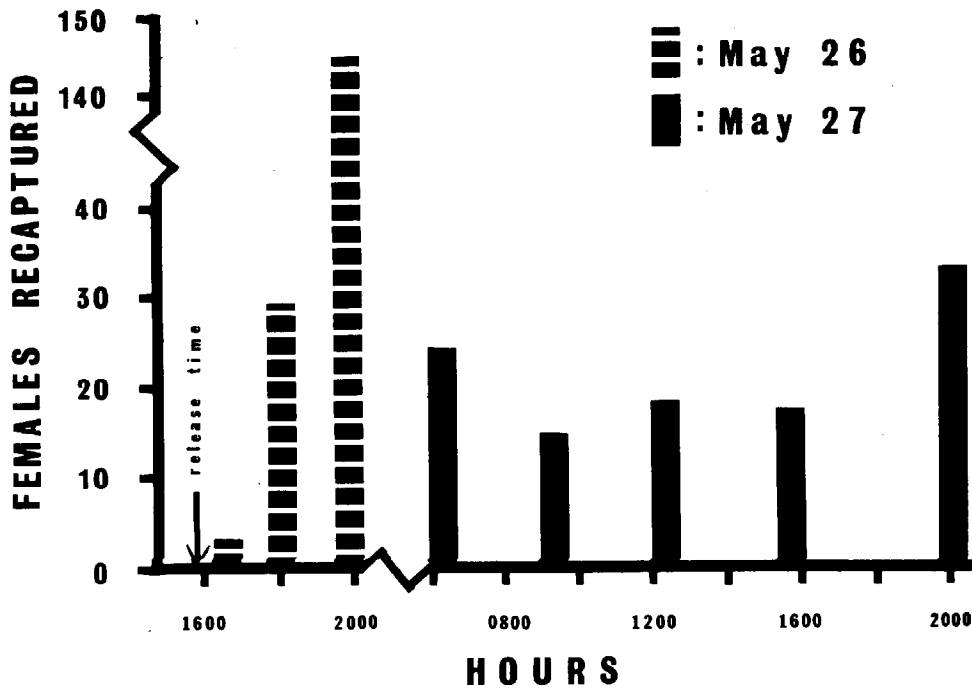


Fig. 1. Number of *A. suspensa* adult virgin females recaptured at intervals of time with 4 sticky traps with 5 males and 4 with 10 males each in a non-host avocado grove.

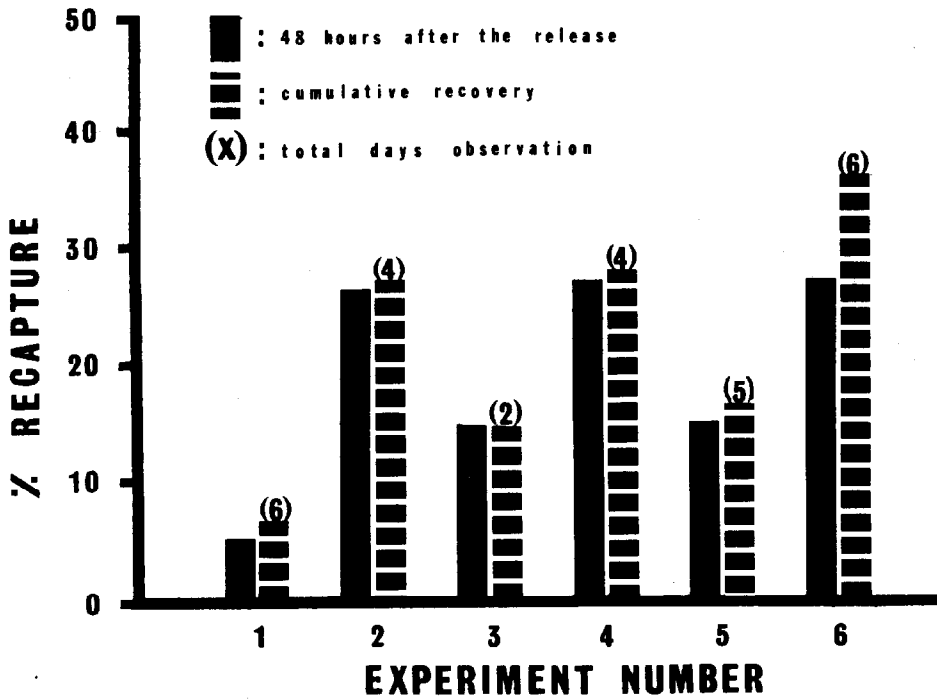


Fig. 2. Recapture of virgin female *A. suspensa* adults in 48 h, and cumulative recovery for total observation period with sticky traps baited with males.

clude that much of the field attraction is related to release of a volatile sex attractant. Although extracts of male bodies have not been field tested, such extracts do attract females in laboratory bioassays (Nation 1972). The field data show that more females are trapped in the later afternoon than during other intervals of the day.

Preliminary data on observations of the behavior of wild flies in the field indicate that mating occurs during the afternoon hours. No mating has been observed in the morning. A related paper will be prepared detailing this information.

AliNiazee (1971) showed that about 80-90% of the omnivorous leaf roller, *Platynota stultana* Walsingham (Lepidoptera), males caught were attracted between 1800 h-2000 h and no males were trapped between midnight and 1800 h. AliNiazee attributed this to a rhythm of sexual behavior in the males or as a response to a rhythm of a female pheromone release or a combination of both factors. Very little, however, is known about the behavior of *A. suspensa* in the field.

Although sticky traps with 20 or 40 males were substantially more effective than McPhail traps, the use of these traps is more cumbersome and time consuming than use of McPhail traps, and probably could not replace McPhail traps in practice. Possibly the pure pheromone, when available, would be easier to use and be a more sensitive survey tool than those presently available.

Good recoveries of released virgin females in some experiments suggest that substantial population reduction might be possible with pheromone baited traps. Much more data are needed, however, on the effectiveness of pheromone baited traps in host areas. The avocado grove was selected for these experiments because avocado is a non-host fruit and the grove was isolated from host fruit groves. In a host grove we would expect competition from wild males and oviposition odors. Nakagawa et al. (1970) showed that when males were scarce or absent, sperm-deficient, sexually mature female Mediterranean fruit flies were attracted by trimedlure, medlure, and angelica seed oil, but when sexually mature males were introduced into field populations, virgin females stopped their response to the lures.

The effect of age and mating of the flies in influencing attraction in the field also must be evaluated. Since females begin producing fertile eggs when they are 7 days old (Baranowski 1968) a pheromone trap likely would have to attract younger females than those used in these experiments and also non-virgin females in order to provide satisfactory control.

LITERATURE CITED

- ALINIAZEE, M. T., AND E. M. STAFFORD. 1971. Evidence of a sex pheromone in the omnivorous leaf roller, *Platynota stultana* (Lepidoptera: Tortricidae); laboratory and field testing of male attraction to virgin females. *J. Econ. Ent.* 64:1330-5.
- BARANOWSKI, R. M. 1968. Research on the Caribbean fruit fly at the Subtropical Station (Homestead, Florida). *Nurserymen's Buyer's Guide and Bulletin* 13:7-8.
- NAKAGAWA, S., G. J. FARIAS, AND L. F. STEINER. 1970. Response of female Mediterranean fruit flies to male lures in the relative absence of males. *J. Econ. Ent.* 63:227-9.
- NATION, J. L. 1972. Courtship behavior and evidence for a sex attractant in the male Caribbean fruit fly, *Anastrepha suspensa*. *Ann. Ent. Soc. Am.* 65:1364-7.