EASY-TO-HANDLE STICKY TRAP FOR FRUIT FLIES (DIPTERA: TEPHRITIDAE)

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Heath et al. (1996, 1997) described a cylindrical sticky trap for tephritid fruit flies constructed with fruit fly adhesive paper (FFAP) (Atlantic Paste and Glue Co., Inc., Brooklyn, NY) which has an extremely tacky but non-messy adhesive. Capture rates with this trap were twice those of McPhail traps baited with the same lure. Unfortunately, the traps were difficult for users because they stick fast to almost everything they contact, including small birds in some field tests. In this work we describe a sticky trap made with the same paper but which avoids many of these problems.

Experimental traps were constructed from fluorescent light green (E.I.C.MWG 17089) or yellow (fluorescent chartreuse, E.I.C.MWY 16823) FFAP. Green and yellow were chosen because they were the most attractive colors in previous experiments with many species of Tephritidae including the Mexican fruit fly (Katsoyannos 1989; Robacker et al. 1990). Except for the controls, all traps had black plastic mesh (Co-Polymer Gutter Guard, Amerimax Home Products, Lancaster, PA) stapled over the sticky surfaces.

The FFAP was cut into 23 × 14 cm rectangles to equal the size of the Pherocon AM trap (Trece, Inc., Salinas, CA) that was used as the standard trap for this work. Plastic mesh was also cut into 23 × 14 cm rectangles. Mesh size (distance between plastic strands) initially was 0.7 × 0.7 cm. Mesh size was cut to 1.5 × 1.5 or 2.2 × 2.2 cm to test the effect of mesh size on trap efficacy. Thickness of the plastic strands was approximately 1.1-1.4 mm. Two FFAP rectangles placed back to back with sticky surfaces outward, each with a mesh rectangle on its sticky surface, were stapled together as a unit (Fig. 1). Trap lures were AMPu vials (2 ml) containing an agar mixture of ammonium carbonate, methylamine HCl, and putrescine, described previously (Robacker 1995).

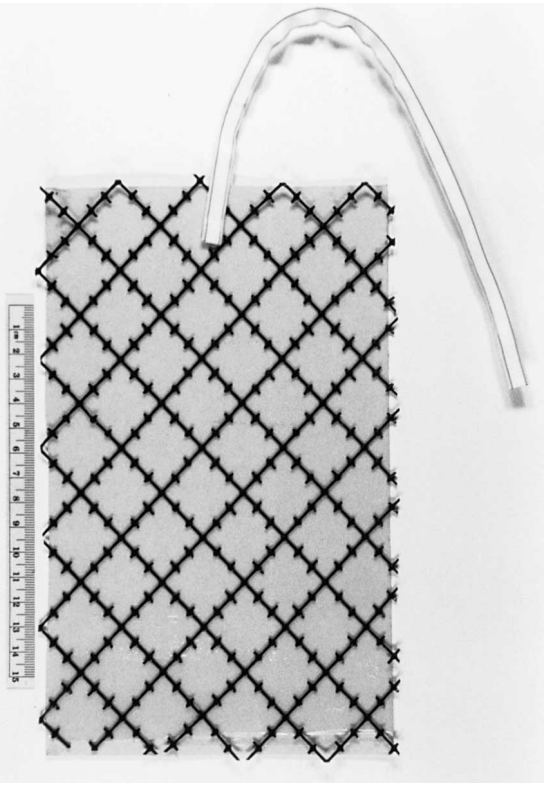

Fig. 1. Sticky trap (23 × 14 cm) for fruit flies constructed with yellow or green fruit fly adhesive paper covered with plastic mesh (2.2 × 2.2 cm mesh).

Mexican fruit fly (*Anastrepha ludens* Loew) was used to evaluate the effectiveness of the trap. Flies were from a laboratory culture that originated in Nuevo Leon, Mexico, in 1987. Flies were irradiated with 70-92 Grays (Cobalt 60) before adult eclosion. Mixed-sex groups of 200 flies were kept in 473 ml cardboard cartons with sugar and water until released in test plots 3 to 8 days after eclosion.

Trap tests were conducted in one row of Ruby Red Grapefruit (*Citrus paradisi* MacFadyen) and one row of Dancy Tangerine (*C. reticulata* Blanco) in a citrus orchard in Weslaco, TX. Two blocks of 8 consecutive trees were used in each row. AMPu vials were attached to the tops of traps. Traps were hung one to a tree, north of center, at 1-2 m height. Traps were placed in the orchard during the morning and removed for fly counts on the following day. Approximately 2000 flies were distributed equally among the test trees on the day before a test.

The first experiment was a test of the 8 possible trap types made from the 2 colors with the 3 mesh sizes plus no mesh (Table 1). The 8 trap types were randomized in each block. Four repli-

TABLE 1. NUMBERS OF MEXICAN FRUIT FLIES CAPTURED ON STICKY TRAPS WITH VARIOUS MESH SIZES COMPARED WITH TRAPS WITHOUT MESH.[1,2]

Test trap	Males	Females	Total
Yellow, no mesh	12.0 c	17.9 d	29.9 d
Yellow, 0.7 × 0.7 cm mesh	0.2 a	0.4 a	0.6 a
Yellow, 1.5 × 1.5 cm mesh	1.2 ab	1.1 a	2.3 ab
Yellow, 2.2 × 2.2 cm mesh	2.2 ab	2.9 ab	5.2 abc
Green, no mesh	9.8 c	17.4 d	27.1 d
Green, 0.7 × 0.7 cm mesh	2.2 ab	5.1 bc	7.3 bc
Green, 1.5 × 1.5 cm mesh	2.8 b	5.8 bc	8.6 c
Green, 2.2 × 2.2 cm mesh	3.5 b	6.6 c	10.1 c

[1]All traps were baited with an AMPu vial.
[2]Means in the same column followed by the same letter are not significantly different by Fishers protected LSD test ($P < 0.05$).

cations of the experiment over time were conducted for a total of 16 tests (4 blocks × 4 replications) of each trap type. Replications over time (test days) were treated like replications over space (blocks of trees) for statistical analyses. Data were subjected to analysis of variance using SuperANOVA (Abacus Concepts 1989).

One experimental trap type was compared with the Pherocon AM (no bait) trap in each of 4 additional experiments (Table 2). Experimental traps and Pherocon AM traps were alternated within blocks. Replications of the 4 experiments were conducted over time for a total of at least 24 tests of each trap type. Data were analyzed by t-tests.

In the first experiment, traps without plastic mesh were much more effective than any traps with mesh (Table 1). This was especially true for yellow traps in which the traps without mesh captured 6× more flies than the most effective trap with mesh. Green traps without mesh captured about 3× more flies than the most effective traps with mesh. Thus, mesh greatly reduced the effectiveness of the FFAP. Observations in flight cages showed equal attraction to traps with or without mesh. Thus, the black mesh was not repellent. However, flies often escaped from the mesh traps by using the plastic mesh to pull themselves from the sticky surface.

Results of experiments to evaluate FFAP traps with different color/mesh combinations against Pherocon AM traps are shown in Table 2. All 4 of the experimental traps were competitive with the Pherocon AM traps.

Unlike Pherocon traps, FFAP traps with mesh are easy-to-handle. Unlike FFAP traps without mesh, they do not trap birds because the mesh prevents feathers from laying across the panel surface. Traps with mesh are also easy to stack into a box because they do not adhere to each other. Also, FFAP is stickier than Tangletrap but the adhesive does not run and leaves very little residue on the skin, much like contacting cellophane tape. Disadvantages of these traps are much reduced efficacy compared with FFAP traps without mesh, and severe damage to FFAP by rain. Further research is needed to optimize trap and mesh colors and sizes for different fruit flies, and to reduce rain damage.

We thank Maura Rodriguez and Jose Garcia for technical assistance. Mention of a proprietary product does not constitute an endorsement or recommendation for its use by the USDA.

TABLE 2. NUMBERS OF MEXICAN FRUIT FLIES CAPTURED ON STICKY TRAPS WITH MESH COMPARED WITH PHEROCON AM TRAPS IN CITRUS ORCHARD EXPERIMENTS.[1,2]

		Test trap			Pherocon trap		
Experiment	Test trap	Males	Females	Total	Males	Females	Total
1	Yellow, 1.5 cm	1.7	3.0	4.7	2.3	4.3	6.6
2	Yellow, 2.2 cm	4.3*	4.6	8.9	2.5	4.3	6.8
3	Green, 1.5 cm	2.7	4.4	7.2	2.2	4.5	6.7
4	Green, 2.2 cm	1.6	2.8	4.4	1.8	1.8	3.6

[1]All traps were baited with an AMPu vial.
[2]Within each experiment, means with an * are significantly different from Pherocon trap means at the 5% level by *t* tests.

SUMMARY

A sticky trap for fruit flies made from fruit fly adhesive paper (FFAP) covered with a plastic mesh of either 1.5 × 1.5 or 2.2 × 2.2 cm mesh size was as effective as Pherocon AM traps in capturing Mexican fruit flies. FFAP traps without mesh captured 3× more flies than the best traps with mesh. However, mesh eliminates many problems associated FFAP traps. The mesh-covered traps are simple, compact, easy to pack, and do not capture birds or leave residue on users' hands.

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