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COMPARISON OF MEXICAN FRUIT FLY (DIPTERA: TEPHRITIDAE) CAPTURE BETWEEN MCPHAIL TRAPS WITH TORULA AND MULTILURE TRAPS WITH BIOLURES IN SOUTH TEXAS

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One of the key components in the Mexican fruit fly, *Anastrepha ludens* (Loew), eradication program in the Lower Rio Grande Valley is the surveillance and trapping program with a uniform grid distribution of 1.6 traps per square kilometer (5 per square mile) to monitor wild Mexican fruit flies. The McPhail trap baited with an aqueous slurry of torula yeast has been the industry standard for fruit fly surveillance programs (Burditt 1982; Cunningham 1989). In 2006, the eradication program began switching to a Multilure trap (Better World Manufacturing, Inc., Miami, FL) baited with the 2-component Biolure Mexican fruit fly (MFF) lure (Suterra LLC, Inc., Bend, OR) with the attractants ammonium acetate and putrescine. Many of the trappers reported a reduction in number of captured Mexican fruit fly after switching to the Multilure trap with Biolure.

Concerned about the potential risk to the eradication project, we conducted an 8-week comparison trap test from early May to Jul 2006 in an isolated citrus orchard near McCook, Texas. The orchard contained about 360 trees per hectare (~146 trees per acre) with a mixture of grapefruit, *Citrus paradise* Macfadyen, and sweet orange, *Citrus sinensis* (L.) Osbeck. Newly emerged, dyed, sterile Mexican fruit flies were placed in bags, approximately 2,500 per bag, and released at 20 equally spaced locations in the orchard. At each release point, twenty squirts of water from a plant mister were applied to citrus foliage to provide a source of moisture before releasing the flies during hot dry summer days in south Texas. A total of 50,000 flies were released weekly.

A complete block design with 7-row spacing between trap rows provided a minimum of 50 m separation between traps. A glass McPhail trap baited with 4 torula yeast and borax tablets in 300 mL of 10% antifreeze (Prestone Low Tox Antifreeze) solution or a Multilure trap with Biolure and 300 mL of 10% antifreeze (Prestone Low Tox Antifreeze) solution was positioned on the eighth citrus tree from either row end with marking flags in the row and with tape on the tree. Altogether 16 traps (8 each type) were used in this test with 1 trap of each type per row. The initial positions for the McPhail and Multilure traps were alternated by test row with the first test row McPhail and the next Multilure. Weekly, the positions of the traps in each row were rotated, and the traps were serviced with the yeast tablets in 10% antifreeze solution replaced in the McPhail traps and 10% antifreeze solution replaced in the Multilure traps.

Mexican fruit fly capture data were converted to percent catch with proportions transformed by arcsine transform per trap by trap type per week and analyzed by *t*-tests and analysis of variance (ANOVA) with means separation by ALL-Pairs Tukey HSD ($P = 0.05$) (SAS 2003). Comparisons of sex ratio of Mexican fruit flies captured by trap type were analyzed by Matched Pairs (male female) with Wilcoxon Sign-Rank (SAS 2003). Observation during the first few weeks of the trap test indicated a difference in the number of green lacewings, *Chrysoperla* sp. and *Chrysopa* sp., caught in the different trap types. During the last 4 weeks, the number of green lace wings captured per trap by trap type was analyzed by *t*-tests and ANOVA with means separation by ALL-Pairs Tukey HSD ($P = 0.05$) (SAS 2003).

Significantly more Mexican fruit flies per trap were captured in the glass McPhail than in the Multilure traps during weeks 2, 6, 7, and overall (Table 1). McPhail traps caught slightly more females (80.1 ± 6.7 (SEM)) than males (75.0 ± 7.2 per trap) with 51.6% females of 9,922 flies ($t = 1.20$, $df = 1, 63$, $P = 0.23$). Multilure traps caught significantly more females (70.4 ± 7.6) than males (51.2 ± 4.7 per trap) with 57.9% females of 7,783 flies captured ($t = 4.78$, $df = 1, 63$, $P = 0.001$).

During the last 4 weeks of the test, there were significantly more lacewings captured in the Multilure traps (2.0 ± 0.4 per trap) than in McPhail traps (0.91 ± 0.3 per trap) ($t = 2.03$, $df = 1, 63$, $P = 0.035$). There were slightly more nontarget flies (3.1 ± 0.6 per trap) captured in the McPhail traps than in the Multilure traps (2.8 ± 0.5 per trap) ($F = 1.13$, $df = 1, 63$, $P = 0.14$).

A number of factors can affect the number and sex ratio of fruit flies captured in trapping programs. Cunningham et al. (1978) found that weather conditions and rainfall influence fruit fly capture. Houston (1981) found that fruit fly capture changed depending on time of the year trapping was conducted with higher numbers of wild flies caught when mature fruit was present in a citrus orchard. Aluja et al. (1996) found a correlation between capture numbers and surrounding habitat with more wild flies caught when host plants were present in habitat near the orchard. Robacker et al. (1990) found that position within the tree makes a difference in capture results with traps on the north side of the tree at 1 to 2 m above the ground capturing more Mexican fruit flies. By experimenting in an isolated citrus orchard, rotating the traps weekly, and using tape

TABLE 1. COMPARISON OF MEAN PERCENT CAPTURE ± SEM OF MEXICAN FRUIT FLIES PER TRAP BETWEEN MCPHAIL TRAPS WITH TORULA YEAST AND MULTILURE TRAPS WITH BIOLURE DURING AN 8-WEEK TRAP TEST FROM MAY TO JUL 2006 IN A CITRUS ORCHARD NEAR MCCOOK, TX.

Week	Glass McPhail with yeast	Multilure with Biolure	F	P
1	8.05 ± 2.94[a*]	4.52 ± 2.02[a]	0.98	0.339
2	9.02 ± 1.72[a]	3.50 ± 0.87[b]	8.21	0.012
3	8.14 ± 1.45[a]	4.38 ± 1.02[a]	4.50	0.051
4	5.38 ± 1.18[a]	7.01 ± 1.30[a]	0.86	0.369
5	5.50 ± 0.68[a]	7.14 ± 1.57[a]	0.91	0.356
6	8.01 ± 0.95[a]	4.25 ± 0.62[b]	11.00	0.005
7	7.63 ± 0.83[a]	4.63 ± 0.60[b]	8.72	0.011
8	5.50 ± 0.98[a]	7.01 ± 1.21[a]	0.93	0.352
Total	7.16 ± 0.53[a]	5.30 ± 0.45[b]	7.12	0.009

[*]Means across a row followed by the same letter are not significantly different (LSD, P=0.05).
Values for *df* is 1, 15 for week 1-8 and 1, 127 for Total.

to consistently position the traps, we minimized outside effects on trap capture except for weather conditions which varied from week to week.

Significantly more Mexican fruit flies were captured by the McPhail than the Multilure traps. The Multilure traps captured fewer nontarget flies than the McPhail saving time when sorting weekly catches. Conversely, the Multilure traps captured over twice as many beneficial lacewings than the McPhail traps. Additionally, numerous ants were found in the Multilure traps. Based on the number of loose wings in solution, the ants seemed to be attracted by the lures emitted from the traps and once inside, the ants ate the flies leaving only wings resulting in a potential underestimation of trap catch. For the eradication program, the intact fly is needed to distinguish between wild and sterile flies.

The design of the Multilure trap is more user friendly than the McPhail trap with an easy to use central hook for hanging. The cylinder shaped plastic Multilure trap can be separated allowing the trap to be easily serviced and re-baited. The contrast between the transparent upper part and the yellow invaginated base enhances the trap's ability to attract *A. ludens*, which are attracted to yellow to orange color (Robacker 1992). Conversely, the two lure components in the Multi-Lure were hard to put in place. On some traps, either one or the other of the components slid free falling into the 10% antifreeze solution located in the base. Additionally, the ammonium acetate attractant was initially strong, and seemed to negatively affect fly capture during the first 2 weeks of the test.

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SUMMARY

The success of the Mexican fruit fly eradication program across the Rio Grand Valley in south Texas depends on the ability to accurately locate and identify wild type flies. Based on our test, a significantly higher number of Mexican fruit flies was captured in the McPhail traps with torula yeast than in Multilure traps with Biolure. Additionally, the Multilure traps with Biolure caught twice as many beneficial lacewings and ants attracted into the Multilure traps ate many of the flies.

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