



## FINAL REPORT OF THE CO-ORDINATED RESEARCH PROGRAMME ON MEDFLY FEMALE ATTRACTANTS

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### Abstract

Experiments were conducted to find the most effective combination of traps and lures for use in two different climates - the coastal and the desert regions of Israel. Three trials were conducted following the IAEA CRP- phase 4 protocol. Two simultaneous trials were carried out around June 1997. One was in a citrus grove in Tsrifin, the coastal region, and the other in a mango grove in Hatseva, the Arava Valley, a desert region where there has been an ongoing SIT program since January 1998. A third trial was also conducted in Tsrifin, at the same location as the first trial, but during February 1998. In all trials, the International Pheromone's McPhail Trap (IPMT) with NuLure + borax (NU+B) was the standard trap. The FA-3 attractants (ammonium acetate, putrescine, and trimethylamine) were used with water and surfactant Triton-X (wet version) or without water but with DDVP (dry version) in IPMT and Tephri traps. Treatments and traps included in the trials were: IPMT, FA-3, wet; IPMT, FA-3, dry; Tephri, FA-3, dry; Tephri, FA-3, wet. The results of these trials indicated that, at both locations, medfly populations differed greatly - 153 versus 82,500 flies at Hatseva and Tsrifin, respectively. All traps caught more females than males. At Tsrifin, the Tephri, FA-3 traps outperformed the IPMT, NU+B, capturing 4 to 5 times more than standard (IPMT, NU+B). The addition of water to the traps at this location resulted in a slight decrease in captures. At Hatseva, the addition of water improved capturing in both IPMT and Tephri traps. Replacing the water with ethylene glycol resulted in the highest capture level indicating the importance of humidity to the trap performance.

### 1. INTRODUCTION

We joined the efforts of the "Development of Female Medfly Attractant System for Trapping and Sterility Assessment" in 1996 - when the third phase of the project was just about to terminate. The results of the Co-ordinated Research Programme (CRP) and of our earlier studies carried out during 1996 have clearly indicated that the three component female attractants, FA-3 (ammonium acetate, putrescine and trimethylamine) lured more medflies than other food-based attractants such as the NuLure and Naziman (Tamugan, Israel). More females were attracted to the FA-3 than males. The superiority of the FA-3 was shown in every trap type studied.

Therefore, we used the FA-3 in all of our studies. Our objectives were to compare the synthetic female attractants with our local food-based baits in several traps including two local traps - an improvisation of a locally used bait station 'Ga'aton' and the commercial trap, 'Frutect' (Ronpal, Israel). The latter was one of the traps studied by the Co-ordinated Research Programme in the third phase.

In these studies, we found the efficacy of the traps baited with FA-3 (total number of medflies and % females) was as follows: International Pheromone's McPhail trap (IPMT) > Frutect > cylindrical green trap >> Ga'aton trap. This indicated that the design of the trap (color, size, shape, and openings) are important in terms of the overall captivity and female preference.

The CRP studies pointed out two traps which caught the highest number of medflies: the plastic IPMT and the Tephri trap. Both consist of a yellow container with clear top and an opening in the bottom. Some results have indicated a decrease in efficacy of the FA-3 lures in dry climates. Since a large area of Israel is desert, we concentrated on optimizing a trapping system for these environmental conditions.

## 2. MATERIALS AND METHODS

The main objective of the experiments was to find the most effective combination of trap and lure in two different climates - the coastal and the desert regions of Israel. We conducted three trials following the CRP- phase 4 protocol. Two simultaneous trials were carried out around June 1997. One was in a citrus grove in Tsrifin, the coastal region, and the other in a mango grove in Hatseva, the Arava Valley, a desert region. There has been a SIT program in the Arava Valley since January 1998. A third trial was conducted also in Tsrifin, at the same location as the first trial, but during a different season - February 1998. In all trials the IPMT with NuLure + borax (NU+B) was the standard trap. The FA-3 were used with water/ triton-X (wet version) or without water (dry version) in IPMT and Tephri traps.

Geographical and climatological data for the experiments at Tsrifin are summarized in Tables I and II. At this site was a 2 ha of citrus collection, mostly oranges, grapefruit, and pumello. During the May - June 1997 study, daily temperatures varied from 19 - 29 °C with 53 - 72% RH. A few trees were left unpicked, many fruits were decaying on the ground and the medfly population was very high (52 F/T/D in the Jackson traps). However, during the February - March 1998 studies, daily temperatures varied from 8 - 20 °C, with 54 - 80% RH. Most of trees were bearing ripe fruits (judged by their color). Under some trees, there were fruits on the ground. Due to a very mild January, the fly population was low (although higher than usual with 0.81 F/T/D in the Jackson traps).

Geographical and climatological data for the experiments at Hatseva are summarized in Table III. There are 10 ha of mango. From May - July 1997, there were few immature fruits on most of the trees. Daily temperatures varied from 22 - 38 °C with 15 - 38% RH. The fly population was low (0.77 F/T/D in the Jackson traps).

In the first two trials our cooperative choice trap was the wet IPMT in which ethylene glycol (antifreeze additive for car radiators) replaced the water/ triton to achieve high humidity with a reduced evaporation rate.

## 3. RESULTS

### 3.1. CRP experiments

The results of these trials indicated that:

- At both locations, medfly populations differed greatly - 153 versus 82,500 flies in Hatseva and Tsrifin, respectively. All traps caught more females than males.
- At Tsrifin, the Tephri, FA-3 traps outperformed the IPMT, NU+B (4 to 5 times more than standard). The additional of water in that location resulted in a slight decrease in captures.
- At Hatseva, the addition of water improved capturing in IPMT and Tephri traps and replacing the water with ethylene glycol resulted in the highest capture level indicating the importance of humidity to the trap performance.

### 3.2. Side experiment

The rapid water evaporation rate (1 cm/ day) in the Arava Valley, which caused FA-3 traps to lose water within 2-3 days, required a solution for retaining water in the traps. In two separate trials we have found that ethylene glycol, which is toxic, can be replaced with non-

toxic propylene glycol/ water (1:1 solution) without decreasing performance. The Tephri trap with propylene glycol outperformed the IPMT with ethylene glycol (twice the number of females). From these results, we decided to use this version of Tephri, FA-3, propylene glycol in the Arava Valley for both female monitoring and population suppression in urban areas

NOTE!!! Recent trapping results in the Arava Valley have indicated that some sterile flies were losing the DayGlow marker in the propylene glycol solution within few days. The addition of of propylene glycol is not recommended when sterile flies released.

TABLE I. TRAPPING DATA FROM THE JUNE 5 - JULY 6, 1997 TRIAL - TSRIFIN, ISRAEL

Country:	ISRAEL
Site of study:	Tsrifin
Host:	Citrus
Altitude:	+ 60 m
Avg. Temp, Min. - Max.:	19.05 ± 0.36 to 29.23 ± 0.39 °C
Avg. RH, Min. - Max.	53.51 ± 1.34 to 72.70 ± 1.11%
Trapping period (dates):	25.5.97 - 6.7.97
No of trap days (#trap per treatment x #days):	210
Jackson trap capture (#F/T/D):	51.99
%Females in Jackson trap (#females/ #total):	We didn't record any
Number of Jackson trap days (#traps x #days)	84
Average number of larvae per kg of fruit (total 43.2 kg):	5.81

Trap/ Lure Treatment			Flies per Trap (F/T/D)						Relative Trap Efficiency			%Females/ trap
Trap	Lure/ retention	Trap days	Males	Females	M+F	#Total medfly	Males <sup>1</sup>	Females <sup>1</sup>	%Male	%Female	%Total	(#Fem x 100 /#Total)
IPMT	NU+B	210	8.19	9.65	17.84	22.89	10.50	12.38	6.22	5.39	5.75	54.11
IPMT	FA-3, water	210	13.42	16.05	29.47	46.94	21.38	25.56	12.67	11.13	11.79	54.45
IPMT, dry	FA-3, DDVP	210	17.49	23.90	41.40	63.60	26.87	36.73	15.93	16.00	15.97	57.75
Tephri, dry	FA-3, DDVP	204	15.49	21.96	37.44	91.01	37.64	53.37	22.31	23.25	22.85	58.64
Tephri, wet	FA-3, water	203	15.75	22.91	38.66	85.33	34.76	50.57	20.60	22.03	21.42	59.26
IPMT, ethylene	FA-3, antifreeze	210	21.16	28.71	49.87	88.55	37.56	50.98	22.26	22.21	22.23	57.58
					<b>TOTAL</b>	<b>398.32</b>	<b>168.72</b>	<b>229.59</b>	100.00	100.00	100.00	

<sup>1</sup> Since we took samples to determine the sex ratio, calculations were made by multiplying the ratio by the total number. Data do not include traps with ants

TABLE II. TRAPPING DATA FROM THE FEBRUARY 1 - MARCH 15, 1998 TRIAL - TSRIFIN, ISRAEL

Country: ISRAEL  
 Site of study: Tsrifin  
 Host: Citrus  
 Altitude: + 60 m  
 Avg. Temp, Min. - Max.: 8.63 ± 0.37 to 20.26 ± 0.51 °C  
 Avg. RH Min. - Max.: 53.79 ± 2.26 to 80.44 ± 1.53%  
 Trapping period (dates): 1.2.98 - 15.3.98  
 No of trap days (#trap per treatment x #days): 210  
 Jackson trap capture (#F/T/D): 0.81  
 %Females in Jackson trap (#females/ #total): We didn't record any  
 Number of Jackson trap days (#traps x #days) 84  
 Average number of larvae per kg of fruit (total 43.2 kg): 0.74

Trap/ Lure/ Treatment		Retention	Flies per 5 Traps				Relative Trap Efficiency		
Trap	Lure		# Males	# Females	M+F	Others	% Male	% Female	% medfly
IPMT	NU+B	lure	119	251	370	764	32.16	67.84	32.63
IPMT	FA-3	water	296	485	781	910	37.90	62.10	46.19
IPMT	FA-3	DDVP	218	419	637	1416	34.22	65.78	31.03
Tephri	Fa-3	water	164	364	528	488	31.06	68.94	51.97
Tephri	FA-3	DDVP	216	510	726	557	29.75	70.25	56.59
IPMT	FA-3	propylene glycol	225	473	698	771	32.23	67.77	47.52
TOTAL			1238	2502	3740	4906			

TABLE III. TRAPPING DATA FROM THE MAY 26 - JULY 7, 1997 TRIAL - HATSEVA, ISRAEL

Country:	ISRAEL
Site of study:	Hatseva
Host:	Mango
Altitude:	-160 m
Avg. Temp, Min. - Max.:	22.2 - 37.9°C
Avg. RH, Min. - Max.	14.8 - 37.7%
Trapping period (dates):	26/5 - 7/7/97
No of trap days (#trap per treatment x #days):	210
Jackson trap capture (#F/T/D):	0.77
%Females in Jackson trap (#females/ #total):	not recorded
Number of Jackson trap days (#traps x #days)	84
Average number of larvae per 300 fruits:	2

Trap/ Lure/ Treatment			Flies per Trap per Day (F/T/D)			Relative Trap Efficiency			%Females/ trap
Trap	Lure/retention	Trap days	Males	Females	# Total medfly	% Male	% Female	% Total	(#Fem x 100 /#Total)
IPMT	NU+B	210	0.02	0.08	0.10	13.81	14.43	14.29	77.27
IPMT, wet	FA-3, water	210	0.04	0.12	0.16	24.86	21.23	22.08	73.53
IPMT, dry	FA-3, DDVP	210	0.00	0.05	0.05	0.00	9.34	7.14	100.00
Tephri, dry	FA-3, DDVP	204	0.00	0.04	0.05	2.84	7.87	6.69	90.00
Tephri, wet	FA-3, water	203	0.02	0.07	0.10	14.29	13.17	13.44	75.00
IPMT, ethylene	FA-3, antifreeze	210	0.08	0.19	0.27	44.20	33.96	36.37	71.43
TOTAL			0.17	0.56	0.73	100.00	100.00	100.00	