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Reducing Pesticides Use for Control of Fruit Fly by Mass Trapping in Oranges

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Abstract: *A trial to produce orange fruits free from pesticides residues was conducted in a private farm in the desert area, where expansion in fruit production is restricted to these areas. In this experiment the farm program of using chemicals to control the fruit fly was examined against using Guava plats with insecticide, poisonous traps and pheromone traps. The results of the first season using guava traps and liquid traps were not promising and as such the pheromone traps and chemical treatment were only applied in the 2nd season. Results of mass trapping showed less numbers of captured fruit flies in the first stages of fruit ripening as the colour of the fruits was still green during October and November. As the season advanced and fruit colour changed to yellow, the number of captured flies increased to its maximum of 10 and 20 flies per trap per week during December and January 2013 & 2014, respectively. The number of captured fruit flies was again reduced during February and March of both seasons. Results also demonstrated that percentage of punctured fruits at harvest was less with mass trapping based on pheromone traps against Dimethoate treatments. This work indicates important reduction of the insect population and a visible decrease of the percentage of fruit damage in the plot with mass trapping comparable to farm treatments using chemical control.*

Keywords: *Mass trapping, Oranges, Chemical control.*

I. Introduction

Consumers all over the world accept perfect fruits and in the recent years this requirement has expanded to perfect oranges which contains no pesticides residues. The main orange varieties in Egypt are Washington Navel and Valencia oranges. These fruits are susceptible to all major pets and diseases throw out the year. To produce perfect oranges that are also free of pesticides residues is a great challenge. Most fruits in Egypt are not produced using integrated pest and disease management except in some few farms. This insures that pesticides use has to be minimized as that residues if present in the harvested crop are below the Maximum Residue Limit (MRL).

Recently, Mediouni *et al*. (2010a) reported the importance of mass trapping technique for the control of Mid fly in citrus orchards compared to the chemical control treatment with Malathion. The purpose of this study was to : a) establish by research the best methods for producing oranges free of pesticides, b) to reduce fruit contamination and environmental pollution resulting from extensive use of pesticides, c) to improve quality of oranges and increase the percentage of marketable ones, and d) to increase the demand of quality fruits by the foreign markets. Effect of trapping and chemical control of *Ceratitis capitata* on citrus had previously studied by Agunloye (1987Russel (1991), Epsky *et* al. (1999), Ortelli (2005), Navarro-Llopis (2008), Lavitt (2009) and Mediouni *et al.* (2010b).

II. Materials And Methods

This experiment was carried out in a private farm located in the Cairo-Alexandria desert road on Valencia oranges. The trees are growing in a sandy soil using drip irrigation system. The experimental trees were 10 years old, uniform in size and vigor and received the normal management programs adopted by the farm for fertilization, irrigation, weed control and pruning of dead shoots.

Trials were conducted in two plots planted with Valencia oranges (*Citrus sinensis*). The fruit plot had 10 acres with tree spacing of 4 x 5 m tending to a density of 200 trees/acre. This plot was used for mass trapping experiment based on pheromone. The second plot was used for chemical treatment with Dimethoate at the rate of 300 cc/acre each 10 days beginning from October up to March. In the first season 3 types of traps were tested; guava traps plats with insecticides, poisonous traps bottles with insecticides and pheromone traps compared with the farm program using Dimethoate as chemical treatment.

Guava traps: Trees of this treatment received the same program of pests management used by the farm except that from October and during November, one plastic plate filled with guava juice mixed with Dimethoate and solar were placed under each tree as a trap for fruit fly.

Poisonous traps: Also trees of this treatment received the same program of pets control used by the farm except that during Oct., Nov. and December. Insecticides were not applied and plastic bottles half filled with Libacid +

Pominal were hanged on the trees at 1.5 m height. The bottles had some holes near the top to allow for insects to be trapped to the poisonous solution.

Pheromone traps: The mass trapping was performed using synthetic feed attractant. Yellow plastic bait stations containing bait-gel based on Pheromone trial. A density of 10 traps/acre was used. Traps were hanged in the trees at a height of 1.5 m and were checked for caught fruit flies at weekly intervals. Specific feed attractant for *Ciratitis capitata* was used.

Trade name Flycap. The composition: Ammonium acetate 42.38%, Trimethylamime Hydrochloride 5.65% and 1,5 Didaminopentane 0.18 %. For mass trapping the trees received the same farm program except that starting from Oct. up to March, the traps were hanged on the trees at the rate of 10 traps/acre.

In the first season of study, the 3 types of traps were examined, namely, pheromone traps, guava plates with insecticides, poisonous liquid traps well as chemical control using Dimethoate. The results of the first season using guava traps and liquid traps were not promising, and as such the pheromone traps and chemical treatment were only applied in the second season.

Fruit damage assessment:

In order to determine the percentage of fruit damage due to the fruit fly, ten orange trees were randomly selected from mass trapping and Dimethoate treated plots. On each tree every fruit was weekly checked for fruit fly punctures and the infected ones were calculated.

Harvesting of the oranges was in mid June 2013 and mid Feb. 2014. Physical and chemical characteristics of the fruits were examined for weight, juice SSC, acidity and SSC/acid ratio. For pesticides residues, representing samples of oranges were collected treatment wise and analyzed at Central laboratory for pesticides residues, Ministry of Agric., Egypt.

The differences between tested treatments were analyzed in completely randomized blocks design according to the methods described by Gomez and Gomez (1984). The treatment means were compared by using LSD at probability of 5%.

III. Results And Discussion

Result of mass trapping showed low numbers of captured Med flies in the first stages of fruit ripening as the color of the fruits was still green during October and November. AS the season advanced, and fruit color changed to yellow, the number of captured Med flies increased to its maximum of 10 and 20 flies per week during December and January 2013 and 2014 respectively. The number of captured Medflyes was again reduced during February and March of both seasons.

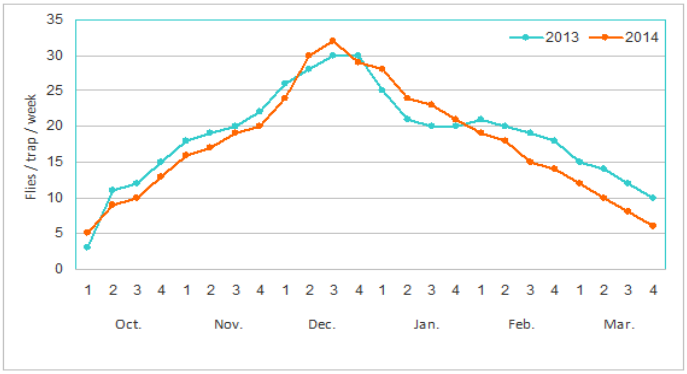

Fig.1. Weekly captured *C. capitata* in mass trapping treatment in 2013 and 2014.

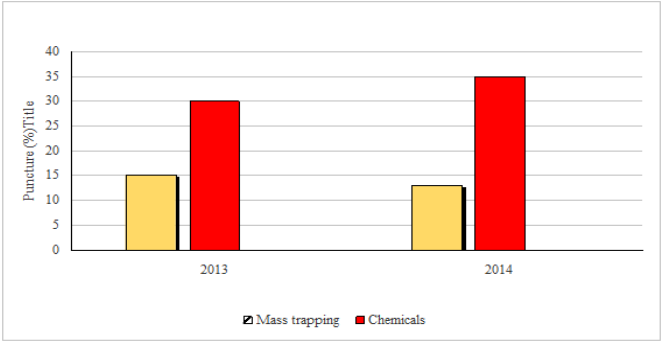

Fig.2. Effect of mass trapping and chemical control on damage fruit % at harvest

Yield and fruit quality of Valencia oranges as affected by the treatments

Treatment	No. fruit/ tree	Fruit wt. (g)	Yield/tree (kg)	SSC %	Acidity %	SSC/Acid ratio
	2013					
Farm program	333	150	49.95	13.2	1.05	12.6
Guava traps	329	158	57.48	13.0	1.08	12.0
Poisonous traps	281	160	44.96	12.9	1.06	11.9
Pheromone Traps	315	165	51.47	13.4	1.03	13.0
L.S.D at 5 %	13.65	4.18	3.66	0.14	N.S	0.27
	2014					
Chemical control	300	148	44.4	13.4	1.06	12.6
Pheromone Traps	320	160	51.2	13.6	1.03	13.2
L.S.D at 5 %	11.44	5.98	4.17	N.S	0.001	0.15

Data in the above table showed that physical and chemical properties of oranges were not greatly affected by the various treatments in both seasons of the study.

This obvious because the farm managements program was the same. The only difference was either in using chemical control or mass trapping.

Pesticide Residues in Oranges (mg/kg) *

(2013)

Compound	Farm program	Guava traps	Poison traps	Pheromone traps	MRL	
					CODEX	EU
Lambada-cyhalothin	0.03	0.03	0.03	Not detected	0.2	0.2
Omethoate	0.01	0.01	0.01	Not detected	---	---
Dimethoate	0.03	0.03	0.03	Not detected	---	0.02
(2014)						
	Farm program (Chemical control)		**Mass trapping (Pheromone traps)**		**MRL**	
					CODEX	**CODEX**
Lambada-cyhalothin	0.03		Not detected		0.2	0.2
Omethoate	0.01		Not detected		0.5	0.02
Dimethoate	0.03		Not detected		0.5	0.02

- Carried at the Pesticides Laboratory, Ministry of Agriculture.

It is clear from the above data about the pesticides residues in orange juice that the three compounds: Lambada, Omethoate and Dimethoate are present in minor quantities for the farm program, Guava traps and Poison traps in both years of study, The MRL amounts are below the CODEX or EU index. In the mean time samples of oranges taken from the plots with Pheromone traps have no pesticides residues and no compounds were detected. This is an important result showing the effectiveness of mass trapping and it could be valuable for producing oranges free from pesticides residues.

This research report explains the importance of mass trapping technique for the control of fruit fly in citrus orchards in Egypt compared with chemical treatments using Diamothoate for instance. This also means less pollution and free oranges from pesticides residues. Nevertheless, the economic costs of such technique must be evaluated and optimized to be used on large scales.

Results demonstrated that percentage of punctured fruits at harvest was significantly different between mass trapping based on Pheromone traps and Dimethoate treatments in both fields. Mean percentages of punctured fruits were lower in the mass trapping plot than in Dimethoate for both seasons.

This work reported important reduction of the insect population and a visible decrease of the percentage of fruit damage in the plot with mass trapping comparable to standard farms treatments using chemical control. In this respect Mc-Quate *et al* (2005) reported that the mass trapping technique was efficient on the reduction of Mediterranean fruit fly population in citrus orchards.

Moreover, Medounii *et al* (2010) reported the importance role of the mass trapping technique on reduction of Mediterranean fruit fly population in citrus orchards in Tunisia. Field trials of using Pheromone traps at the density of 20 traps/ha out performed the Dimethoate spraying in reduction of insect population and decreased fruit damage.

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