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Evaluate Efficacy of Malathion and Spinosad Alone and Mixed with Some Food Attractants Against Cucurbit Fly *Dacus ciliatus*

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ABSTRACT

A field experiment was carried out in the fall growing season of 2022 to evaluate to what extent mixing some food attractants namely Buminal (protein hydrolysate), sugar cane, cane molasses with malathion 57% EC or Spinosad 48% SC could increase the efficacy of these insecticides. Malathion and Spinosad against cucurbit fly *Dacus ciliatus* on squash plant. The treatments included Spinosad 48% SC, Spinosad 48% SC plus sugar cane, Spinosad 48%plus cane molasses and Spinosad 48% SC plus Buminal, malathion 57% EC, Malathion 57% EC plus sugar cane, malathion 57% EC plus molasses and Malathion 57% EC plus Buminal. The treatments sprayed thrice at weekly interval when fruit infestation ranged between 6.6-40%. The results showed effective treatment in reducing the fruit infestation by cucurbit was Malathion 57% EC plus Buminal (3.3%), the results also showed that mixing the aforementioned food attractants to the insecticides improves its effectiveness against the pest.

Keywords: efficacy, food attractants, insecticides, cucurbit fly, *Dacus ciliatus*

1. Introduction

Dacus ciliatus Leow is a polyphagous fly that damage crops in the Cucurbitaceae (Vayssieres *et al.,* 2002). Larvae of *D. ciliatus* develop in fruits of a wide range of cucurbit crops and wild Cucurbitaceae but it also reported from several other plant families (McQuate *et al.,* 2018). It has several common names, Ethiopian fruit fly, cucurbit fly, lesser melon fly and lesser pumpkin fly (Eppo.). In Egypt it was recorded as a serious pest on Cucurbitaceae since 1947 by Azab and Kira (1954). Dhillon *et al*. (2005) mentioned that, the extent of losses vary between 30 to 100% depending on the cucurbit species and season. The female *D. ciliatus* deposit her eggs into the cucurbit fruit where the larvae develop inside the fruit leading to fruit deformation and rotting (El-Nahal *et al.,* 1970). Once mature the third instar larvae will leave the fruit, dig down into the soil and turn into a pupae enclosed in a puparium (Vayssières *et al*., 2008).

Therefore, chemical control of this pest is difficult because both larvae and pupae in fruit and soil are protected from surface applied insecticides; consequently the control is usually aimed against the adult (Bateman 1972; Roessler 1989).

Insecticidal protection from this pest is possible by using a cover spray or bait spray (Eppo, 2018). Although there have been many studies on the efficacy of bait spray in control *Ceratits capitata* and *Bactrocera spp*., few studies have been done on its efficiency on cucurbit fly *D. ciliatus* so the objective of this study was to evaluate to what extent mixing some food attractants namely Buminal (protein hydrolysate), can sugar and can molasses with malathion 57% and Spinosad 48% could increase the efficacy of the two insecticides against Cucurbita fly *Dacus ciliatus* under field conditions.

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2. Martials and Methods

A field experiment was carried out in the fall growing season of 2022 at farmer field at El-Santa distract, Gharbia Governorate, Egypt. An area of about one feddan (4200m^2) was divided into 27 equal plots, each of 14.5X 12m. Each plot consisted of 6 row, the trial plots were arranged in a randomized complete block design with three replicates for each treatment. Seeds of squash (*Cucurbita pepo L.*) var. Galaxy were sown in raised beds during the second week of July. Irrigation and manuring were practiced according to usual manner. When percent fruit infestation ranged between 6.6-40%, three consecutive sprays were done at 7 days interval by using knapsack sprayer. Sprays were carried out 15 days after sowing and second and third spray at 83 and 89 days after sowing respectively, the following treatment were made:

1. Spinosad (Green tech SC 48%) at 40 cm/100 liters water
2. Spinosad 48% SC + Molasses (100cm/10 liters water)
3. Spinosad 48% SC + Buminal (500cm /10 liters water)
4. Spinosad 48% SC + Sugar cane (50 gm/10 liters water)
5. Malathion 57% EC (25cm/ 10-liter water)
6. Malathion 57% EC + Molasses (100cm/10 liters water)
7. Malathion 57% EC+ Buminal (500cm /10 liters water)
8. Malathion 57% EC+ Sugar cane (50 gm/10 liters water)
9. Control

The observations were taken directly before first spray and at 7 days after each spray by investigation 15 fruits collected randomly from each plot. These fruits were carefully examined to determine the infested on the base of presence/ absence of exit holes made by full grown larvae. The percentage of fruit infestation was calculated using the formula:

$$\text{Percent fruit infestation} = \frac{\textit{No. of infested fruits}}{\textit{Total No. fruits}} \text{ x } 100$$

The data of this experiment was analyzed using computer program SAS (2003): SAS institute version 9.3.1, USA.

3. Results

The efficacy of malathion and Spinosad alone and combined with some food attractants viz protein hydrolysate, sugar cane and cane molasses is shown in Table (1) observation on fruit infestation of squash under field conditions one day before the first spray revealed that all treatment including untreated control had mean fruit infestation varied from 6.6 to 40 percent and was statistically different from each other indicating irregular distribution of the pest in all plots. On the seventh day after first spray fruit infestation ranged from 0 to 23 percent in all experimental plots. Significantly lowest fruit of zero percent was rerecorded in malathion 57% EC plus Buminal (protein hydrolysate). Nevertheless, this effectiveness did not differ significantly from those plots treated with Malathion 57%EC plus cane molasses (3.3%) and Malathion 57% EC plus sugar cane (6.6%). Malathion 57% EC alone and Spinosad plus Buminal had moderate efficacy against the pest causing 10 percent fruit for both insecticides and were on par with Spinosad 48% plus Cane molasses and Spinosad 48% plus sugar cane. The untreated control recorded the highest fruit infestation of 23.3 percent. At 7 days after second spray all treatments revealed significantly lower percentage of fruit infestation than control. Among the all-treatments malathion 57%EC plus sugar and Malathion plus Buminal revealed statistically identical causing 3.3 percent fruit infestation for each insecticide whereas treatments viz Spinosad plus Buminal, Spinosad plus sugar cane and malathion 57% EC plus molasses recorded 6.6, 3.3, 6.6 percent fruit infestation respectively, and were differ significantly from those plots sprayed with malathion57% EC plus Buminal and malathion 57% EC plus sugar cane, the observation recorded on seventh day after the third spray revealed that minimum fruit infestation was 3.3percent in malathion 57% EC plus cane molasses. The next best treatment were Spinosad plus Buminal, Spinosad plus sugar cane, malathion 57% EC

plus cane molasses and malathion 57% EC plus sugar cane recorded 6.6percent in fruit infestation for each insecticide and were on par with malathion 57% EC plus molasses.

The remaining treatment Spinosad 48 %SC and Spinosad 48% SC plus molasses also showed good effectiveness in reducing fruit infestation with 13.3and 10 percent respectively.

The untreated control recorded the highest fruit infestation of 23.3percent, based on overall mean of three sprays revealed that out of the eight treatment malathion57%EC plus Buminal was found most effective in the control cucurbit *fly D. cilliatus* followed by Spinosad plus cane molasses, Malathion 57%EC plus sugar cane, Spinosad 48%SC plus Buminal, Spinosad 48%SC plus sugar cane and Malathion 57% EC.

Table 1: Effect of Malathion and Spinosad alone or mixed with some food attractants against cucurbit fly on squash (2022/2023)

Treatments	Percent fruit damage at 7 days after				
	Pre-treatment	First spray	Second spray	Third-spray	Over all mean of fruit damage
Spinosad	26.66% c	13.3% B	20% B	13.3% B	15.5% B
S.+ Sugar cane	40% c	13.3% B	3.3% C	6.6 CB	7.73% B
S.+ Buminal	30% B	10% CB	6.6% DC	6.6% CD	7.73%CB
S. + Molasses	26.66% A	13.3% B	10%DC	10% CD	11.1%CB
Malathion	10% D	3.3% CB	10% c	6.6% CD	6.63%CB
M. + Sugar cane	33.3% D	6.66% D	3.3% DC	6.6% CD	5.5%cB
M. + Buminal	6.66% D	0 D	6.6% D	3.3% D	3.3%D
M. + Molasses	6.66% AB	3.3% CD	6.6% D	6.6% CD	5.5%CB
Control	23.3% C	23.3% A	26.6% A	23.3% A	24.4% A

S.: Spinosad, **M.:** Malathion

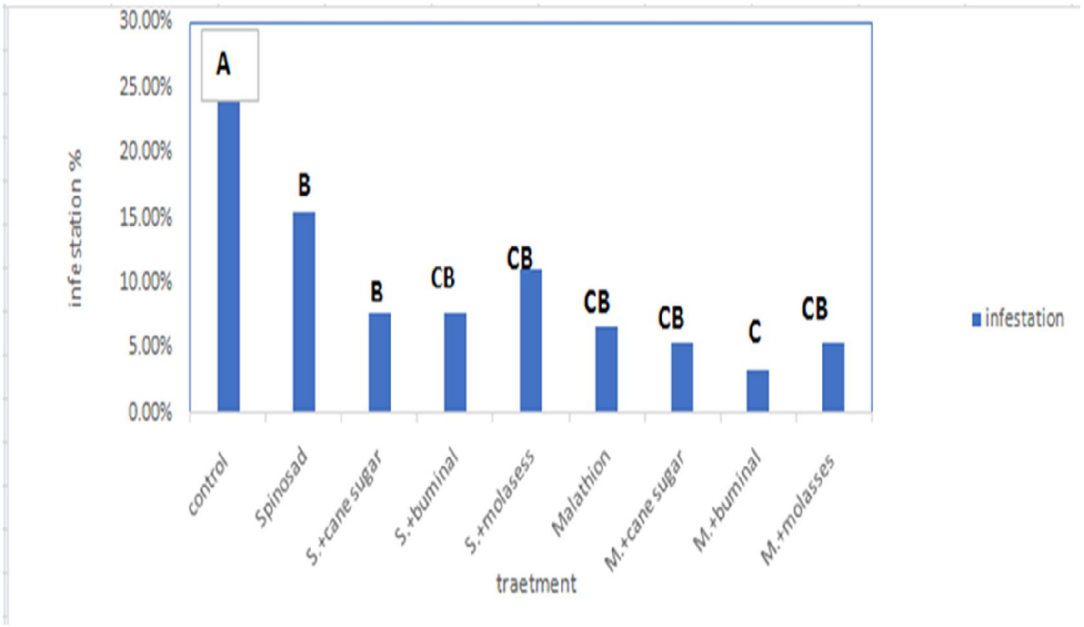

Fig 1: Percent infestation after application of different treatments
Mean sharing the same letters are not significantly different at p=0.05

All of these treatments were at par with each other and were found effective in the control of the pest compared to treatment control. The precent results are in agreement with those recorded by Said mirkhan and Shams Reham Khattak (2000) mentioned that Dipterex with molasses was found most effective against melon fly *Bactorcera cucurbitae* followed by malathion with molasses. Abdul Latif *et*

al. (2002) evaluated the efficacy of bait (protein hydrolysate and molasse) and dust formulation of carbaryl with various concentrations against fruit infesting musk melon under semi-arid and water stress area and found that protein hydrolysate caused least fruit infestation (12%) as compared to molasses (15%). In Hawaii (Steiner *et al*., 1988) controlled fruit fly by a poisoned bait spray containing malathion and protein hydrolysate, Zain-Ul-Aabdin *et al.* (2017) evaluated three food attractants as Nu-lure, protein hydrolysate and prima against *Bactrocera cucurbitae* infesting bottle ground and bitter ground and found that significantly higher reduction in *Bacrocera cucurbitae* infestations were recorded with protein hydrolysate followed by Nu-Lura as compared to untreated plots. Bait spray containing Spinosad as toxicant have been found to be effective in the area wide management of melon fruit in Hawaii (Prokofy *et al*., 2003). Knight *et al.* (2013) mentioned that, the additional of brown sugar cane and the yeast *Saccharomyces cerevisiae* to Spinosad was shown to be more effective in killing the adult of *Drosophila suzakii* and reducing the number of eggs laid on cherry than the use of a Spinosad laced protein bait spray. With the same trend. Cowles *et al*. (2015) indicated that the addition of 1.2-2.4% sucrose alone was shown to improve the efficacy of a number of insecticides including Spinosad applied in high bush blue berry and strawberry.

Based on our results, it could be concluded that mixed protein hydrolysate, cane molasses or sugar cane with malathion 57% EC or Spinosad 48% SC improve their effectiveness against cucurbit fly Dacus ciliatus and could be recommended to squash growers for effective control of this pest.

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