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The Effect of Some Insecticides on Parasitized and Non- Parasitized *Spodoptera littoralis* Larvae

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ABSTRACT

Three insecticides, recommended by the Ministry of Agriculture, Egypt, for use against cotton and vegetable pests were tested . These insecticides were methomyl, methamidophos and chlorpyrifos. These insecticides were tested against the third instar of *Spodoptera littoralis*(Boisd.)larvae parasitized by *Microplitis rufiventris* (kok.) and non-parasitized *S.littoralis* larvae of the same age.In the first part which larvae fed oncastor oil leaves contaminated with insecticides.The insecticides can be arranged in the following descending order according to their LC_{50} 's and statisticaly analysis. In larvae, chlorpyrifos,methomyl and methamidophos. In the second part which larvae fed on poisoned semi-artificial died. The tested insecticides can be arranged in the following descending order according to their LC_{50} 's and statistical analysis. In both parasitized and non-parasitized larvae, methomyl, methamidophos, chlorpyrifos.

Keywords: *Spodoptera littoralis*(Boisd.),*Microplitis rufiventris*,(kok.) insecticides

INTRODUCTION

Cotton is considered to be the most important fiber crop grown in the world. This important crop is unfortunately highly susceptible to arthropod infestations, which are reported to attack all parts of the plant through the growing season. The geographical situation of Egypt, its mid climate and fertile soil; make it vulnerable to accidental introduction and spread of exotic pests (Kamal,1951). The most important exotic pests, is the cotton leaf worm *Spedoptera littoralis* (Boisd.). It is apolyphagous and active almost, all the year round.*S.littoralis* is widespread in the tropics and subtropics of the Old World and is also found in the Canary Islands, Madeira and the southern Mediterranean (Khalifa*et al*., 1982)**.**

The chemical control of *S. littoralis* has been extensively reported, especially in relation to cotton in Egypt. Numerous organophosphorus, synthetic pyrethroids and other insecticides have been used, with appearance of resistance and cross resistance in many cases (Issa*et al*., 1984a; 1984b; Abo-El-Ghar*et al*., 1986). However, compulsory limitation of the application of synthetic pyrethroids to one per year on cotton in Egypt has stopped the appearance of new resistance (Sawicki, 1986).

In Egypt, many attempts had been carried out in this respect by Kamal (1951) and Hafez (1951) to control the cotton leaf worm *S.littoralis* by using the exotic larval parasite *Micropolitisdemolitor* introduced from Australia in 1940 and 1946 .*Microplitis rufiventris*, a braconid parasitoid, (recorded for the first time in Egypt by El-Minshawy 1963) proved to be an effective parasite against the first four larval instars of the cotton leafworm *S.littoralis* (Hammad*et al.*,1965, Shalaby. 1968, Hegazi*et al*. 1973). The aim of this study is to evaluate the effect of some recommended insecticides against the cotton leafworm and one of its most important parasitoids; *M.rufiventris*.

MATERIALS AND METHODS

A)Insecticides used:

To study the effect of certain insecticides on parasitized and non-parasitized host larvae of the cotton leafworm by the internal larval parasitoid *M.rufiventris* three insecticides were tested.

1-Tamaron:

Common name : methamidophos.
Chemical name : 0,S-dimethyl phosphoramidothioate.

It was supplied by Bayer Pflanzenschutz, Leverkusen (West Germany) as Tamaron, 60%, SI

2-Dursban:

Common name : Brodan, Chlorpyrifos-ethyl, Detmol UA, Dowco 179, Dursban, Empire, Eradex, Lorsban, Paqeant, Piridane, Scout, Stipend and Tricel.
Chemical name :*O*,*O*-diethyl *O*-(3,5,6-trichloro-2-pyridinyl) phosphorothioate

It was supplied by Dow Chemical Company (U.S.A.) as Dursban, 48%,EC.

3-Lannate:

Common name :Mesomile, Methomex, Nudrin
Chemical name (*E*,*Z*)-methyl*N*-{[(methylamino)carbonyl]oxy}ethanimidothioate.

It was supplied by DuPont De Nemours Company (Switzerland) as Lannat,90%,Sp.

B)Testing insecticides on the host larvae:

1-Residual film method:

This method was carried out by dipping castor oil leaves into the insecticide concentration for 30 seconds and then left to dry. Ten of the parasitized and non-parasitized larvae were confined in each container with the treated leaves. Larvae of the same age offered untreated castor-leaves to serve as control.

The average percentage of mortality resulting from the treatment with each concentration were plotted against the concentration on log-probit paper and the concentration mortality regression lines were fitted by eye,LC_{50} values were calculated, and statistically analyzed was applied according to Litchfield and Wilcoxon (1949).

2-Poisoned semi-artificial diet method:

Semi-artificial diet was prepared according to Hegazi*et al.*(1977). Nine grams of this media was thoroughly mixed with one gram of the tested insecticide concentration. The host larvae at their 3^{rd} instar (5 days-old) were subjected individually to *M.rufiventris* females for parasitism. Parasitized larvae were reared for 6 days, then , they were used as test organisms. Normal non-parasitized larvae of the same age (11-days-old were subjected to the insecticide treatment and served for comparing the reactions of the parasitized and non-parasitized larvae to the tested insecticides. Every treatment was represented with ten larvae for each replicate, and three replicates were made for each treatment. Larvae of the same age were fed with untreated semi-artificial diet to serve as control. Mortality counts were taken after 24 hours.

RESULTS AND DISCUSSION

Effect of tested insecticides on parasitized and non-parasitized *S.littoralis* larvae:

1-Insecticide residual-film on castor oil leaves:

a) Effect of chlorpyrifos

The effect of chlorpyrifos on the parasitized and non-parasitized *S.littoralis* larvaeis shown in Fig.(1.A).In parasitized larvae, the tested concentrations gave mortality percentage between 20 and 100% , while the recorded data among non-parasitized larvae showed mortality percentages between 16.6 and 100 %. Calculated values LC_{50} showed that , this incecticide gave LC_{50}=28 ppm on the parasitized larvae while on non-parasitized larvae the LC_{50} = 96 ppm. This means that, chlorpyrifos was more toxic to parasitized larvae than non-parasitized larvae.

b)Effect of methamidophos:

The effect of methamidophos on the parasitized and non-parasitized *S.littoralis* larvaeis illustrated in Fig.(1.B). The used concentrations gave mortality percentage in parasitized larvae between 13.30 and 86.66% , while the mortality percentage on non parasitized larvae ranging also between 13.33 and 86.66% . Calculated value LC_{50} was 385 ppm for parasitized larvae, while for the non-parasitized larvae the value was 290 ppm. This means that methamidophos was less toxic to parasitized larvae than non-parasitized larvae.

c) Effect of methomyl:

Concerning the effect of the selected series of concentrations of methomyl on parasitized and non-parasitized *S.littoralis* larvae. The recorded concentrations inFig.(1.C) gave percentages morality between 6.6% and 86.6% for parasitized larvae,and gave mortality percentages between 23.3% and 80.0% for non-parasitized larvae. The calculated LC50 values for this insecticide was 152 ppm for parasitized larvae and 104 ppm for non-parasitized ones. These results indicate that methomyl is more toxic to the non-parasitized larvae than parasitized larvae.

The corresponding arrangement for the relative toxicity of the tested materials on non-parasitized larvae was as follows: Chlorpyrifos,methomyl and methamidophos.

Parasitized larvae were less sensitive to the insecticides, methamidophos and methomyl , however, with chlorpyrifos , the parasitized larvae were more sensitive than non-parasitized ones.

2- Poisoned semi-artificial diet:

The results of feeding of late 3rd instar of parasitized and non-parasitized *S.littoralis* larvae on insecticide treated semi-artificial diet are illustrated in Fig. 2.

a)Effect of chlorpyrifos:

The effects of chlorpyrifos on parasitized and non-parasitized *S.littoralis* larvae are given in Fig.(2A). The series of concentrations of chlorpyrifos on parasitized larvae gave percentages of mortality ranging from 6.66 % to 100 %, while the series of concentrations on non-parasitized larvae (Fig.2A) gave mortality percentages between 20 ant 100 %. The calculated LC_{50} values were 61 ppm and 55 ppm for parasitized and non-parasitized larvae, respectively.

b) Effect of methamidophos:

The effects of methamidophos on parasitized and non-parasitized *S.littoralis* larvae are graphically illustrated in (Fig.2B). The series of concentrations of methamidophos gave mortalities between 6.66 % and 96.66% for parasitzed larvae, 10%and 100% for non-parastized larvae. The recorded LC_{50} values for methamidophos were 36 ppm for both parasitized and non-parasitized larvae.

c) Effect of methomyl:

Concerning the effect of methomyl (Fig.2C), the concentrations of this insecticide gave percentage mortalities of 3.33% to 66.36% and 10% to 90% for parasitized larvae and non-parasitized laravae, respectively. The recorded LC_{50} values for methomyl were 20 ppm for parasitized larvae and 17 ppm for non-parasitized larvae.

From the previous results, it can be arrange, the toxicity of these insectdies on parasitized as well as none parasitized larvae according to their LC_{50} values and the statistical analyses, in a descending order as follows: methomyl ,methamidophos , chlorpyrifos.

By comparing the LC_{50} values on parasitized and non –parasitized larvae it is obvious that, confidence limits of LC_{50} values of methomyl on non-parasitized larvae (22.3-12.9) lie between the confidence limits of LC_{50} value of the same insecticides on parasitized larvae (27.2-14.7). The confidence limits of LC_{50} values of methamidophos and chlorpyrifos, either on parasitized larvae, showed the same previous trend. These results mean that to no difference exists in the effects of methomyl, methamidophos and chlorpyrifos on parasitized or non-parasitized *S.littoralis* larvae.

By comparing the two methods of bioassay techniques (Figures 1,2) all the tested insecticides showed high toxic effect with poisoned semi-artificial diet than treated castor-oil bean leaves, except chlorpyrifos, which showed more toxicity to parasitized larvae when fed on treated castor-oil bean leaves compared to poisoned diet. These results are in good agreement with the results of Hegazi*et al.* (1981) who found that toxicity of methyl parathion, ethyl parathion and decamethrin, (either micro-encapsulated or emulsifiable concentrate formulations) was higher when the parasitized or non-parasitized larvae were fed on poisoned semi-artificial diet than those fed on treated castor-oil leaves. This fact is due to that semi-artificial diet was in complete contact with the whole body of larvae, whereas, the treated castor-oil leaves were in partial contact with the body of larvae.

It is clear from Figures 1,2 thatmethomyl and methamidophos were more effective on non-parasitized larvae than parasitized ones, whether the larvae were fed on treated castor-oil bean leaves or on poisoned semi-artificial diet. These results agree with the results of Hegazi*et al.* (1981). They found that parasitized *S.littoralis* larvae were less susceptible to all tested insecticides than non-parasitized larvae. Results further agree with the findings of those obtained by Hegazi *et al*. (1978). They found that a decrease in appetite of parasitized *S.littoralis* larvae led to a decrease the amount of toxicant ingested by the parasitized larvae. Also, the last observation has the same trend for treated –castor-oil leaves by chlorpyrifos.

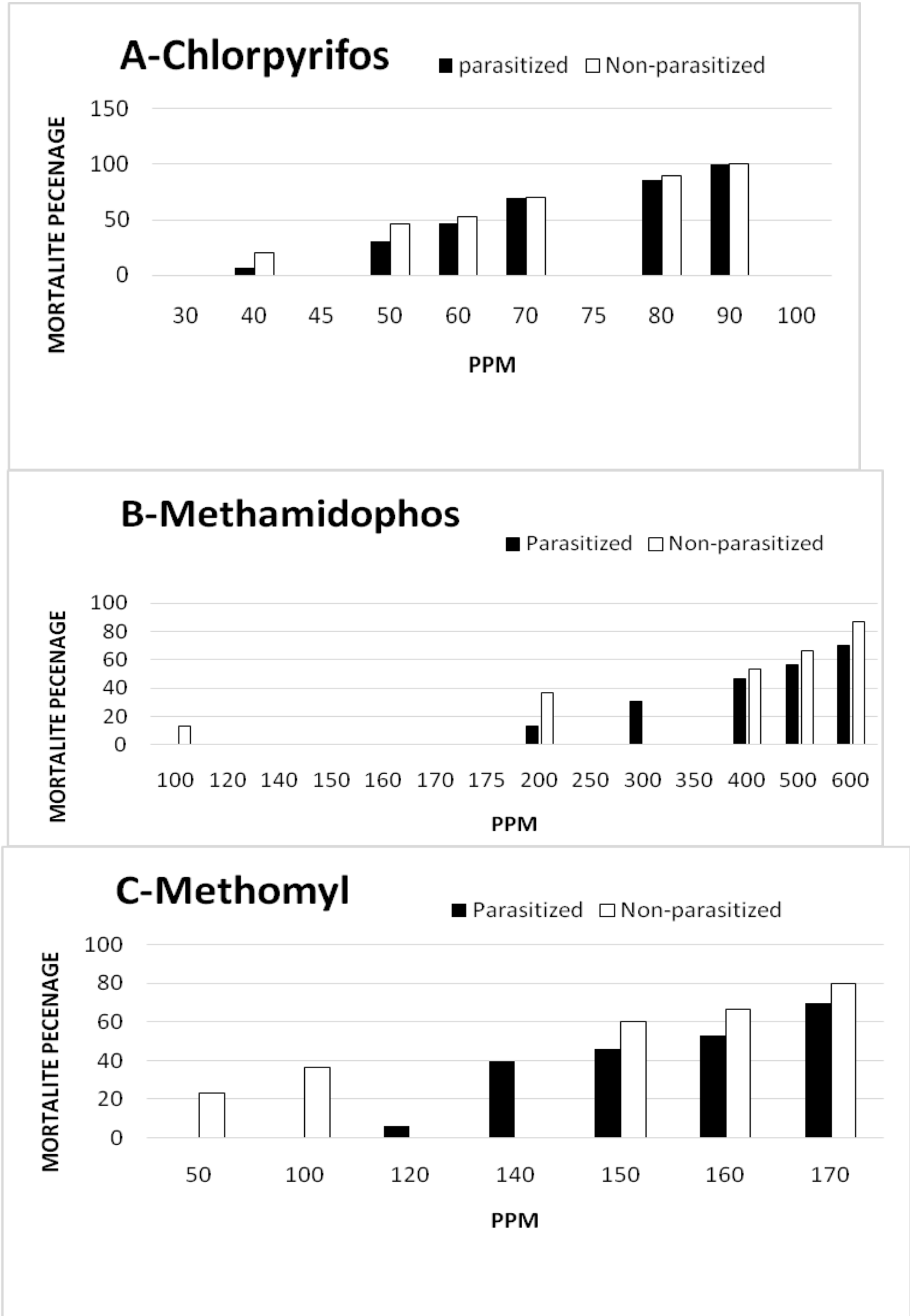

Fig. 1 : Effect of chlorpyrifos (A), methamidophos (B) and methomyl (C) on parasitized and non-parasitized *S.littoralis* larvae fed on castor- oil leaves.

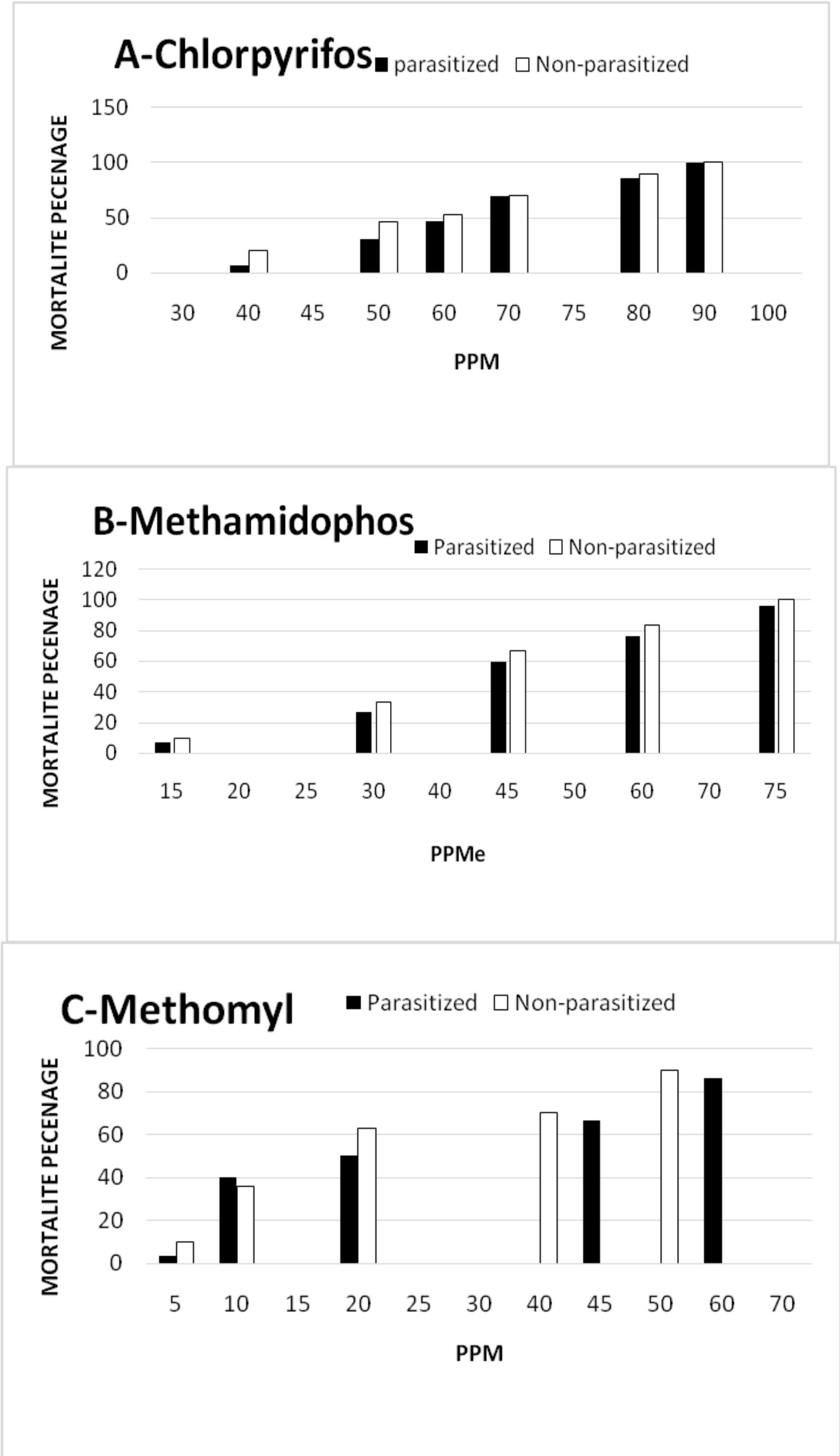

Fig. 2 : Effect of chlorpyrifos (A), methamidophos (B) and methomyl (C)on parasitized and non-parasitized *S.littoralis* larvae fed on semi-artificial diet.

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تأثير بعض المبيدات الحشرية على يرقات دودة ورق القطن سبودبترا ليتولارز المتطفل عليها والغير متطفل عليها

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تم اختبار ثلاثة مبيدات حشرية ،النـي أوصت بها وزارة الزراعة مصر،لاستخدامها ضد آفات القطن والخضروات. وكانت هذه المبيدات الحشرية ميثوميل وميثاميدوفوس والكلوربيريفوس. تم اختبارهذه المبيدات الحشرية ضد العمر الثالث من يرقات دودة ورق القطن المتطفل عليها بطفيل ميكروبليتسروفيفينتريس ويرقات غير متطفل عليها فى نفس العمر. ويمكن ترتيب المبيدات الحشرية فى ترتيب تنازلى وفقا للتحليل الاحصائى وتركيز المبيد الذى يقتل ٥٠% من أفراد العينه. بالنسبة لليرقات المتطفل عليها وغير المتطفل عليها كان الترتيب : الكلوربيريفوس ثم ميثوميل ثم ميثاميدوفوس. هذا بالنسبه للتغذية على اوراق الخروع المعامله وفى الجزء الثانى حيث التغذية على بيئة شبه صناعية مسممه بالمبيدات فكان ترتيب المبيدات الحشرية المختبرة وفقا للتحليل الاحصائى وتركيز المبيد اللازم لقتل ٥٠ % من افراد العينه. لليرقات المتطفل عليها : ميثوميل, ميثاميدوفوس الكلوربيريفوس وهو نفس الترتيب بالنسبة لليرقات غير متطفل عليها.