J. Plant Prot. and Path., Mansoura Univ., Vol.8 (7), 325– 327, 2017

Comparative Toxicity and Droplet Spread Rate of Emamectin Benzoate and Lambdacyhalothrin at Different Types on Cotton Leafworm *Spodoptera littoralis* (Boisd.)

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ABSTRACT

The comparative toxicity of two Emamectin benzoate [(Speedo5.7% WG) and (Basha 1.9% EC)], two Lambdacyhalothrin [(Bestend 10% WP) and (Max sped 5% EC)] were examined against the cotton leafworm *Spodoptera littoralis* (Boisd.) 4th larval stage on castor bean leaves. The effect of rate spreading droplets on the toxicity of Emamectin benzoate and Lambdacyhalothrin formulations were investigated under laboratory conditions. The results showed that Lambdacyhalothrin (Max sped 5%Ec) exhibited the highest toxicity against the fourth larval stage of *S. littoralis* with LC_{50} values of 0.007 ppm. In contrast, Lambdacyhalothrin,(Bestend 10% WP) had the lowest toxicity with LC_{50} values of 0.033 ppm. On the other hand, the Emamectin benzoate (Speedo5.7% WG) was given the lowest LC_{50} value of 0.0061 ppm followed by (Basha 1.9% EC) LC_{50} value of 0.0097 ppm. The results of joint toxic effect between rate spreading droplets and insecticides indicated that Emulsifiable concentrate of Lambdacyhalothrin and Emamectin benzoate formulation was the highest both rate spreading droplets and the mortality rates

Keywords: formulation types**,** Emamectin benzoate, Lambdacyhalothrin, Cotton Leafworm, Droplet spread.

INTRODUCTION

Cotton leaf worm, S littoralis (Lepidoptera: Noctuidae) is a highly polyphagous insect attacking many vegetable and crop plants in Egypt causing serious damage on the yield (Magd El-Din and El- Gengaihi, 2000; Shonouda and Osmam, 2000; El-Khawas and Abd El-Gawad, 2002). Controlling of this insect relies mainly on using synthetic insecticides such as organophosphate and pyrethroid insecticides (Lobna *et al*., 2013 and Heidi *et al*., 2015).

Recently, number of formulation types such as water dispersible granules (WG), wattable powder (WP), suspoemulsions (SE), and emulsifiable concentrate (EC) have been established to meet the needs of growers and environmental health requirements (Alan Knowles 2008).

Emamectin benzoate is semi-synthetic from the avermectin insecticide abamectin. Avermectins are produced by soil inhibiting *Streptomycete* bacteria, have a considerable pesticidal activity against a number of pests such as insects, mites and nematode (Putter *et al.,* 1981). This epi-methyl amino derivative have more effect against a broad spectrum of lepidopterus insects with excellent efficacy in field and reduction of cross-resistance with other commercially pesticides (White *et al*.,1997).

Lambda-Cyhalothrin is a non-systemic belongs to the pyrethroid chemical class. Its axonic toxins affect on the nerve fiber by binding to a protein that organize the voltage-gated sodium channel. The channels are passage through which ions are permitted to enter the axon and cause irritation (Heidi *et al.,* 2015).

Studies on the spread and deposit patterns were conducted on a representative cotton leaf surface because, deposit physiology is often a!ected by the morphological characteristics of the leaf surface (Hall *et al*., 1995).

The main objective of this study was to effects of Different formulations for each of the Emamectin *benzoate (Speedo 5.7% WG and Pasha 1.9% EC)* Lambdacyhalothrin (Best end 10% WP and Max sped 5% EC) against 4th larvae of cotton leaf worm, S. littoralis, at different concentrations and The effect of rate spreading droplets on the toxicity of *Emamectin benzoate* and Lambdacyhalothrin formulations were investigated under laboratory conditions.

MATERIALS AND METHODS

Insect: Larvae of *S. littoralis*, were reared under laboratory conditions of 25+2oC and 65+5% R.H on castor bean leaves. for many years avoiding exposure to any type of pesticides according to (El-Defrawi *et al.*, 1964).

Tested insecticides

Avermectin: Emamectin benzoate (Speedo 5.7% WG and Pasha 1.9% EC).

Pyrethroid : Lambdacyhalothrin (Bestend 10% WP and Max sped 5% EC).

Bioassays. A number of concentrations (in water) for each insecticide, stock solution of each insecticide was made from the formulation with different concentrations (Emamectin benzoate and Lambdacihalothrin). leaves of Castor bean were dipped in every concentration for 30 s and then left to dry for one hour. Test also included a non treated control in which leaves were dipped in water . Five replications (each of 10 larvae) were examined for every concentration. Daily inspection was carried out for all treatments and mortality percentages were recorded after 120 hr. The average of mortality percentage was corrected by using Abbott's formula (1925). The mortality percentage of each compound was statistically computed according to Finney (1971), from which the corresponding concentration probit lines were estimated in addition to determining 50% mortalities; slope values of the tested compounds were also estimated.

Spread behavior

Spreading measurements were performed on leaves of Castor bean. Four concentrations of every formulation were used One microliter droplets were placed on leaves of Castor bean and the droplets area were measured upon contact with the leaf surface and after one min. The Spread measurements were conducted using an image analysis system consisting of captured a digital microscope/camera (Micro Capture Digital Engineering, model 9.016) that was positioned over the surface where the drops were deposited. The camera had a Magnification Range 500X and The wetted area of droplet on the leaf surface following deposition, was measured using the Image J program (version 1.50i, Wayne Ras band National Institutes of Health, USA).

RESULTS

1-Toxicity of Emamectin benzoate (Speedo 5.7% WG and Basha 1.9% EC) against the 4th instar of *S. littoralis* larvae:

Susceptibility of 4th instar larvae of *S. littoralis* to emamectin benzoate, after 144 hrs of exposure presented in Table (1) and Fig.1. Emamectin benzoate (Speedo5.7% WG) was gave the lowest LC_{50} value (LC_{50} = 0.0061 ppm) followed by Pasha 1.9% EC LC_{50} = 0.0097 ppm and LC25 values after 144hrs of exposure were 0.0008 ppm for Speedo5.7% WG, 0.0012 ppm Pasha 1.9% EC

Table 1. Toxicity of emamectin benzoate (Speedo 5.7% WG and Pasha 1.9%, 4th instar of *S. littoralis* larvae after 96 hrs of exposure.

Treatment	LC50 (ppm) confidence limits	LC25 (ppm) confidence limits	Slope ±SE
Speedo5.7% WG	0.0061 (0.004-0.0091)	0.0008 (0.0003-0.0015)	0.761±0.105
Pasha 1.9% EC	0.0097 (0.0065-0.015)	0.0012 (0.0005-0.0021)	0.737±0.105

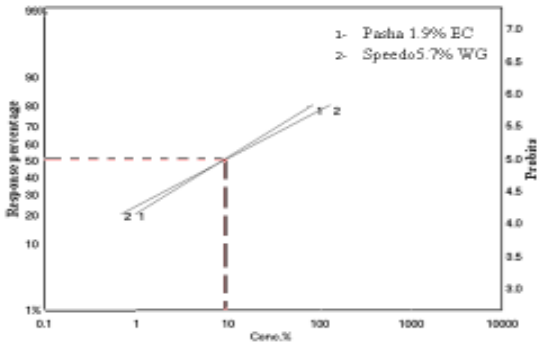

Fig. 1. LC-p lines of Emamectin benzoate (Speedo 5.7% WG and Pasha 1.9% EC) against the 4th instar of *S. littoralis* larvae.

2- Toxicity of lambdacyhalothrin (pestend 10% WP and Max sped 5% EC) against the4th instar larvae of *S. littoralis*:

The results presented in Table (2) and Fig.(2), showed that the Max sped 5% EC was the most effective insecticide against the 4th larval instar of *S. littoralis* , followed by pestend 10% WP, showing the medium lethal concentration (LC_{50} and LC_{25}) values of 0.007,0.033 , 0.002 and 0.004 ppm , respectively.

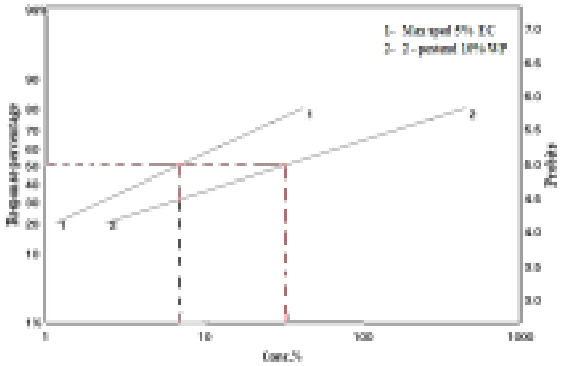

Fig. 2. LC-p lines of of lambdacyhalothrin (pestend 10% WP and Max sped 5% EC) against the4th instar of *S. littoralis* larvae

Table 2. Toxicity of lambdacyhalothrin (pestend 10% WP and Max sped 5% EC) against the 4th instar of *S. littoralis* larvae.

Treatment	LC50 (ppm) confidence limits	LC25 (ppm) confidence limits	Slope ±SE
pestend 10% WP	0.033 (0.022-0.056)	0.004 (0.002-0.007)	0.742±0.111
Max sped 5% EC	0.007 (0.005-0.009)	0.002 (0.001-0.003)	1.077±0.137

3- Spread behavior

Fig. (3), showed that the images the spread of 1 µl droplets of the control and the Emamectin benzoate (Speedo5.7% WG and Pasha 1.9% EC) lambdacyhalothrin (pestend 10% WP and Max sped 5% EC) formulations on castor- bean leaves. However, for EC formulation the final deposit size was less than its initial deposit size.

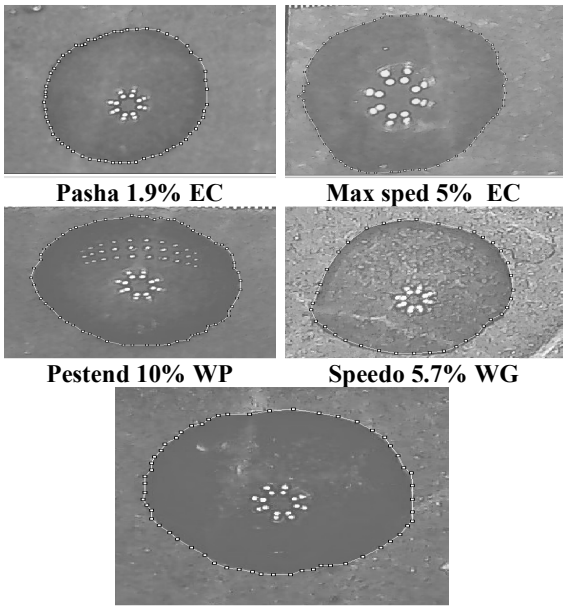

Fig. 3. Spread of 1 µl droplet of control and WG, EC, and wp formulations on castor- bean leaves.

DISCUSSION

Strategies of Insect management must be directed towards none or less toxic insecticides to all environmental components including the beneficial arthropods. The obtained resutls agreed with (Ahmad *et al.,* 2006)emamectin benzoate have an effect in terms of dose and time factor against, *S.litura* but These results disagree with Gupta *et al.,* (2004) examined the toxicity of a certain conventional and novel insecticides against the 5 day old larvae of *S. litura* to test their susceptibility. LC50 results appear that emamectin benzoate (6.93) have a maximum mortality followed by fenvalerate, indoxacarb, cypermethrin, abamectin, quinalphos, bifenthrin, spinosad, endosulfan and betacyfluthrin with LC50 values 1.83, 1.63, 1.00, 0.95, 0.68, 0.52, 0.45, 0.29 and 0.24 respectively. Also,Khan *et al.* (2011) found that emamectin benzoate was the most toxic insecticide with 100% mortality of *S. litura* larvae. El-Sheikh (2015) showed that emamectin

benzoate is the most vigorous insecticide with chronic LC90 values of 0.31.

Pick *et al*. (1984) noticed that EC formulations were the best retained on the leaf surface than WP formulations. Young *et al*.(1996) examined three insecticides formulations EC, WP, and SC and resulted that EC had the greatest retention on cabbage leaves surface.

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مقارنه سمية ومعدل انتشارالصور المختلفه لكل من مبيد ايمامكتنين بنزوات ولامباداسيهالوثرين علي دوده ورق القطن

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تم تقدير سميه و تأثير صورتين مختلفين لكل من مبيد ايمامكتين بنزوات (سبيدو ٥.٧% أقراص قابله الانتشار في الماء و الباشا ١.٩% مركز قابل للاستحلاب) والامباداسيهالوثرين (بيست إند ١٠% مسحوق قابل للبلل وماكس سبيد ٥% مركز قابل للإستحلاب) ضد العمر اليرقي الرابع لدودة ورق القطن تحت الظروف المعملية ،ودراسة تاثير معدل إنتشار قطرات المبيدعلي سطح ورقه النبات . أظهرت النتائج أن مبيد الامباداسيهالوثرين في صوره مركز قابل للإستحلاب كان الأعلي في السميه وكان التركيز الازم لقتل ٥٠% = ٠.٠٠٧ جزء في المليون بينما كانت الصوره الاخري من المبيد مسحوق قابلل للبلل كان اقل سميه وكان التركيز الازم لقتل ٥٠% = ٠.٠٣٣ جزء في المليون .أظهرت النتائج لمبيد الايمامكتين بنزوات في صورته مركز قابل للبلل كان الاقل في التركيز الازم لقتل ٥٠% = ٠.٠٠٦١جزء في المليون بينما كان الاقراص القابلة للإنتشار في الماء فكانت قيمة التركيز الازم لقتل ٥٠% = ٠.٠٠٩٧جزء في المليون .اما بالنسبة للعلاقه ما بين تأثير السميه للمبيدات ومدي إنتشار القطرات المبيد علي سطح الورقة فكانت المبيدات التي في صورة مركزات قابله للإستحلاب لكل من مبيد الإيمامكتين والامباداسيهالوثرين كانوا أعلي معدل إنتشار علي سطح الورقة وأيضا أعلي سميه ضد اليرقات .