

EFFICACY OF INSECTICIDES ON COWPEA PODBORER *MARUCA TESTULALIS* GREYER (LEP: PYRALIDAE)

C.M.D. DHARMASENA

Regional Agricultural Research Centre, Maha Illuppallama

ABSTRACT

In a field experiment carried out during maha 1989/90 and maha 1990/91 seven insecticides, ethofenprox, thiodicarb, chlorfuazuron, diflubenzuron, phosalone, profenophos and neem (*Azadirachta indica*) seed extract were evaluated against cowpea podborer (*Maruca testulalis* Greyer) in cowpea cultivar MI 35, with methamidiphos as the standard check. Thiodicarb and ethofenprox were found to be as effective as methamidiphos. All three insecticides increased the yield by over 28%. Thiodicarb recorded the highest increase of about 43% during both seasons. The lowest larvae number per 15 flowers was recorded in plots treated with ethofenprox. Generally, ethofenprox and methamidiphos caused low pod and seed damage.

KEY WORDS: Cowpea, *Maruca testulalis*, *Vigna unguiculata*

INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is one of the major grain legumes grown in Sri Lanka. The protein content of cowpea has been reported to be 24.1% on dry weight basis (Singh and Singh, 1992). It could therefore help to bridge the protein gap in Sri Lanka where animal protein is in short supply. Cowpea is widely cultivated in the dry zone of Sri Lanka because of fewer production constraints and its low water requirement. Duration of the crop is two and half months. However, a severe attack by cowpea podborer (*Maruca testulalis*) is experienced when cowpea is cultivated extensively in the maha season. Peak population of this pest comes in late December and early January (Fellows *et al.*, 1977). The best time of sowing cowpea is in mid-November and therefore it is inevitable that the flowering period coincides with the peak population of the pest. *Maruca testulalis* lay their eggs mostly on flower buds. The emerging larvae enter into flowers and damage the essential parts. Under Nigerian conditions, successful establishment of larvae of *Maruca testulalis* was possible at the flower bud stage and not at the flower primordia stage or open flower stage (Echendu and Akingbhunge, 1989). This phenomenon is true under Sri Lankan conditions also. Apart from that they bore into the developing pods and consume the seeds.

Chemical control is the easiest and most effective method in managing this pest. Monocrotophos, methamidiphos and methomyl are currently recommended for the control of *Maruca testulalis* (Anon, 1990). However, these insecticides fall into class one of the WHO hazard classification (Anon, 1990). Olandiran (1990) reported that the pyrethroid, permethrin was effective against this pest. However, the Sri Lanka Department of Agriculture, resort to a strategy to prolong the useful life of pyrethroid by restricting them to specific pest species. Therefore, the present study was undertaken to select alternate chemical compounds that are effective and safer to use in cowpea cultivation to control *Maruca testulalis*.

MATERIALS AND METHODS

Two organo phosphates (phosalone 35 EC and profenophos 50 EC), two insect growth regulators (chlorfuazuron 5 EC and diflubenzuron 48 EC), one carbamate (thiodicarb 75 WP), one bridge diphenyl compound (ethofenprox 10 EC) and neem (*Azadirachta indica*) seed extract were evaluated against cowpea podborer (*Maruca testulalis* Greyer) in cowpea cultivar MI - 35 with methamidiphos 60 EC as the recommended standard and an untreated control during maha 1989/90 and maha 1990/91 at the Regional Agricultural Research Centre (RARC), Maha Illuppallama.

A field experiment was established in the second week of November so that crop flowering would coincide with the peak population of podborers. The experimental design was randomized complete block design with four replicates. All replicates were sited in one 'liyadde' 1.5 m away from one another. The plot size was 3.6 m x 2.0 m while the net plot size was 3.0 m x 1.7 m. Cowpea seeds were planted on ridges 60 cm apart with 15 cm within row spacing. The plants received 250 kg/ha NPK fertilizer mixture (6:25:18) at planting and 30 kg/ha urea at one month after planting (Nagarajah, 1986). This experiment was conducted under supplementary irrigation. One blanket application of monocrotophos 60 EC was given at the rate of 200 ppm, 3 weeks after planting (WAP) at the branching stage of the crop to control aphids, defoliators and leaffolders.

The first application of all the eight compounds consisting of organophosphates, insect growth regulators, carbamates etc was given at 50%

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flowering stage (7 WAP) and the second was given 10 days later based on past observations. A lever-operated knapsack sprayer which has a solid cone type nozzle was used for the insecticide application. The insecticides were applied according to the producer's recommendations. The spray volume needed was 500 l/ha and the amount of spray volume per plot was 360 ml. The rates of application of the different insecticides are as given in Table 1.

Table 1. Rates of application of the insecticides used

<i>Insecticide</i>		<i>Rate of application (ppm)</i>
<i>Common name</i>	<i>Trade name</i>	
Ethofenprox	Trebon 10 EC	125
Thiodicarb	Larvin 75 WP	613
Chlorfuazuron	Atabron 5 EC	56
Diflubenzuron	Dimilin 48 EC	396
Phosalone	Zolon 35 EC	586
Profenophos	Zelecron 50 EC	250
Neem seed extract	-----	150
Methamidiphos	Tamaron 60 EC	200

Neem seed extract was prepared by grinding 150 g of neem seeds coarsely, using a mortar and pestle and soaking them in one litre of water overnight. The extract was separated by straining with a clean cloth and made up to 4 litres with water. Net plot was used to collect the following data:

- * Fifteen flower buds were randomly picked from each plot, 24 h after each insecticide application and the number of larvae were counted. *Maruca* larvae could easily be distinguished from the others because of the whitish colour with dark spots on each body segment, forming dorsal longitudinal row.
- * At 9 WAP, 10 plants were randomly selected from each plot and the total number of pods, and pods damaged by podborers were counted. Damage on seeds caused by *Maruca* larvae is circular and smaller (approximately 2.5 mm) compared to that caused by *Helicoverpa* (approximately 4.0 mm).

- * At harvest 25 pods were randomly selected from each plot to count the total number of seeds, and seeds damaged by this pest.
- * Grain yield from each plot.

RESULTS AND DISCUSSION

Effect of the larvae of *Maruca testulalis*

The effect of insecticides on cowpea podborer is shown in Table 2.

Table 2. Effect of different insecticides on larvae of *Maruca testulalis*

Insecticide	Number of larvae per 15 flowers			
	maha 89/90		maha 90/91	
	(1)	(2)	(1)	(2)
Ethofenprox	12.0 a	1.8 a	12.0 a	1.0 a
Thiodicarb	13.0 a	1.5 a	13.5 a	1.5 ab
Chlorfuazuron	19.8 ab	3.0 ab	20.5 b	3.8 b
Diflubenzuron	20.2 b	2.8 ab	16.0 ab	1.5 ab
Phosalone	23.5 b	2.8 ab	23.5 b	2.5 ab
Profenophos	24.5 b	3.3 b	23.2 b	2.7 ab
Neem seed extract	20.5 b	3.5 b	20.2 b	2.8 ab
Methamidiphos	15.2 a	1.8 a	20.8 b	2.2 ab
Control	25.0 b	3.5 b	19.8 b	3.5 b
CV (%)	19.0	30.5	18.5	22.0

(1) 24 hrs after first application of insecticides; (2) 24 hrs after second application of insecticides; Analysis of variance was done using square root values

Bridge diphenyl compound, ethofenprox performed consistently well compared to control in both seasons in reducing the larvae of *Maruca testulalis*. Efficacy of thiodicarb was similar to ethofenprox. Methamidiphos also performed in a similar manner as ethofenprox and thiodicarb in maha 89/90. Number of podborer larvae/15 flowers were not significantly different in plots treated with phosalone, profenaphos, neem seed extract and untreated control. The two insect

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growth regulators (chlorfuazuron and diflubenzuron) were not as effective as ethofenprox or thiodicarb and their efficacy was also not significantly higher compared to phosalone, profenophos and neem seed extract. Therefore, it is clear that ethofenprox, thiodicarb and methamidiphos performed well in reducing the larvae of *Maruca testulalis*.

Effect on pod damage

The effect of insecticides in reducing the pod damage due to podborers at 9 WAP is shown in Table 3. Methamidiphos, thiodicarb, ethofenprox and chlorfuazuron in maha 89/90 and thiodicarb and diflubenzuron in maha 90/91 gave significantly lower pod damage than neem seed extract or untreated control.

Table 3. Effect of different insecticides on podborer damage in cowpea

Insecticide	% pod damage		% seed damage	
	maha 89/90	maha 90/91	maha 89/90	maha 90/91
Ethofenprox	0.9 a	9.2 ab	0.9 a	2.2 ab
Thiodicarb	3.1 a	3.8 a	0.8 a	2.2 ab
Chlorfuazuron	2.0 a	6.0 ab	1.7 ab	1.5 ab
Diflubenzuron	11.4 ab	7.2 a	2.4 ab	2.0 ab
Phosalone	9.5 ab	14.0 b	6.3 b	3.0 ab
Profenophos	14.7 ab	7.8 ab	4.1 ab	4.0 ab
Neem seed extract	16.5 b	11.5 b	4.7 ab	3.8 ab
Methamidiphos	1.8 a	10.0 ab	0.1 a	1.0 a
Control	18.6 b	10.8 b	5.4 b	5.5 b
CV (%)	27	21	42	28

Analysis of variance was done using square root values

Effect on seed damage

Effect of insecticides on seed damage due to podborers is shown in Table 3. Methamidiphos, thiodicarb and ethofenprox were superior to phosalone and

control in reducing seed damage in maha 89/90. Percent seed damage was consistently lower in plots treated with methamidiphos compared to untreated control during both maha seasons. Thiodicarb and ethofenprox were similar to methamidiphos. Chlorfuazuron, diflubenzuron, phosalone, profenophos and neem seed extract were not superior to untreated control. Thus methamidiphos, thiodicarb and ethofenprox can be considered as effective insecticides in minimizing seed damage due to podborer in cowpea.

Effect on yield

During both seasons, thiodicarb, ethofenprox and methamidiphos treatments gave significantly higher cowpea yield than the other insecticides (Table 4).

Table 4. Effect of different insecticides on yield of cowpea.

Insecticide	Yield			
	maha 89/90		maha 90/91	
	t/ha	% yield increase	t/ha	% yield increase
Ethofenprox	1.30 ab	35.5	1.23 ab	28.6
Thiodicarb	1.38 a	43.8	1.36 a	43.2
Chlorfuazuron	1.09 c	13.7	1.07 bc	12.6
Diflubenzuron	1.07 cd	12.4	1.01 c	6.3
Phosalone	1.09 c	13.7	1.06 c	11.6
Profenophos	1.04 d	8.5	1.01 c	6.3
Neem seed extract	0.99 d	3.3	0.96 c	1.0
Methamidiphos	1.28 b	33.3	1.29 a	36.8
Control	0.96 d	---	0.95 c	---
CV (%)	15.0		7.0	

Yield increase in plots treated with chlorfuazuron, diflubenzuron, phosalone, profenophos and neem seed extract were below 14%.

Yields obtained in plots treated with thiodicarb, methamidiphos and ethofenprox during both maha seasons were more than 28% compared to the untreated

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control. Therefore, these insecticides can be considered to be effective in preventing yield losses due to podborers especially *Maruca testulalis*.

Pesticide recommendation

Ethofenprox 10 EC and thiodicarb 75 WP are less hazardous to mammals according to LD₅₀ (dermal) values (i.e. 2140 mg/kg and 2000 mg/kg respectively). Both insecticides belong to the slightly hazardous group according to the FAO classification as far as the dermal toxicity is concerned (Anon, 1991). Ethofenprox belongs to the slightly hazardous group while thiodicarb belongs to the moderately hazardous group with respect to oral toxicity. LD₅₀ (oral) value of ethofenprox 10 EC for rat is 21,440 mg/kg while the same value for thiodicarb 75 WP is 63 mg/kg. Pre-harvest intervals of these two chemicals are 7 and 14 days respectively. Therefore, these insecticides could easily be used in controlling cowpea podborer without much ill effect to the user and the environment.

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