



## TOXICITY EVALUATION OF EMAMECTIN BENZOATE AGAINST TOBACCO CATERPILLAR *SPODOPTERA LITURA* FABRICIUS

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### ABSTRACT

Toxicity of emamectin benzoate, an evermectin semi synthetic insecticide, was evaluated in the laboratory to determine its performance on 7–days old larvae of tobacco caterpillar, *Spodoptera litura* during 2009–10. Leaf dip bioassay method was used. Emamectin benzoate (5% WG) was compared with standard treatments, ethion and triazophos, against the test–insect. Median lethal concentration (LC<sub>50</sub>) of the emamectin benzoate (5% WG) 5.6 g a.i / ha, triazophos (40% EC) @ 250gai/ ha and ethion (50% EC) @ 750gai/ ha against 7–day–old larvae were recorded as 0.6 ppm, 229 ppm and 1271 ppm respectively.

**Key words:** *Spodoptera litura*, Emamectin benzoate, leaf dip.

### INTRODUCTION

*Spodoptera litura* is polyphagous in nature and causes considerable damage to soybean, pulses, oilseed, cotton and vegetables (Bhattacharya and Rathore, 1977; Seema Rani *et al.*, 2002). Contribution made by chemical pesticides to control this insect is well known however, problems posed by these chemicals *viz.*, buildup of pest resistance to insecticide, outbreak of secondary pests, harm to non target organisms, health hazards and those related to environmental pollution, are major limiting factors in their use. Therefore, present investigation was undertaken to evaluate the toxicity of sub–lethal concentration of emamectin benzoate, which is selective in action, less hazardous and does not contaminate the food chain in the environment.

### MATERIALS AND METHODS

Adults of test insects *S. litura* were collected from Norman E. Borlaug Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar. Adults were transferred separately to glass jars (dia. 20 cm, height 15 cm) having an inner lining of white paper for oviposition. Cotton soaked with 5% sucrose solution was kept in the jar for adult feeding. The top of the jar was covered with muslin cloth. The eggs laid by female adult were kept in plastic boxes (10 cm × 10 cm × 14 cm). In order to provide proper humidity, a lining of wet filter paper was kept at the bottom. Eggs were incubated at 28 ± 1°C and 80 ± 5% relative humidity. The neonate larvae were transferred to plastic containers (dia. 36 cm, ht approx. 14 cm) with the

help of fine brush containing fresh and soft leaves of castor *Ricinus communis* (Linn.). Fresh food was supplied daily and proper hygienic conditions were maintained. A wet piece of cotton swab was used to wrap the petiole to protect it from drying.

The efficacy of insecticidal toxicity was studied in IPM laboratory against 7–day–old larvae of *S. litura*. The different concentrations were decided on the basis of preliminary experiment. Three concentrations of each of the insecticide *viz.*, emamectin benzoate (0.3, 0.5, 1.0, 3.0, 5.0, and 10 ppm), triazophos (50, 100, 300, 500, 1000, 2000 ppm), Ethion (250, 500, 1000, 1500, 2000, 3000 ppm) were tested against 7d old larvae of *S. litura*. The observation recorded at 6, 12, 24, 48 and 72h after exposure led to the selection of dosage range from the final testing.

The final dosage of the five insecticides selected for the study emamectin benzoate (5, 3, 1, 0.5, 0.3 ppm), triazophos (2000, 500, 300, 100 ppm) and ethion (3000, 2000, 1500, 1000, 500 ppm). The 7d old larvae of *S. litura* were given fresh insecticide treated castor leaves. The observations on larval mortality due to feeding were recorded at 6, 12, 24, 48 and 72h exposure.

Leaf dip method was followed wherein the full grown mature castor leaves were dipped in required concentration (1 min.) of different insecticides. Excess liquid was shaken from the foliage. This was then allowed to dry at room temperature. The treated leaf was then transferred to clean plastic boxes (size 22 × 14 × 8 cm). In each box ten larvae were placed and each treatment was replicated thrice. In control the leaf discs were dipped in tap water containing

no toxicant. The observations on mortality were recorded at 6, 18, 24, 48, 72h after contact and feeding exposure of insecticides. Moribund larvae were counted as dead. The

data thus obtained were subjected to Abbott's formula for the correction of mortality.  $LC_{50}$  values were determined by using probit analysis.

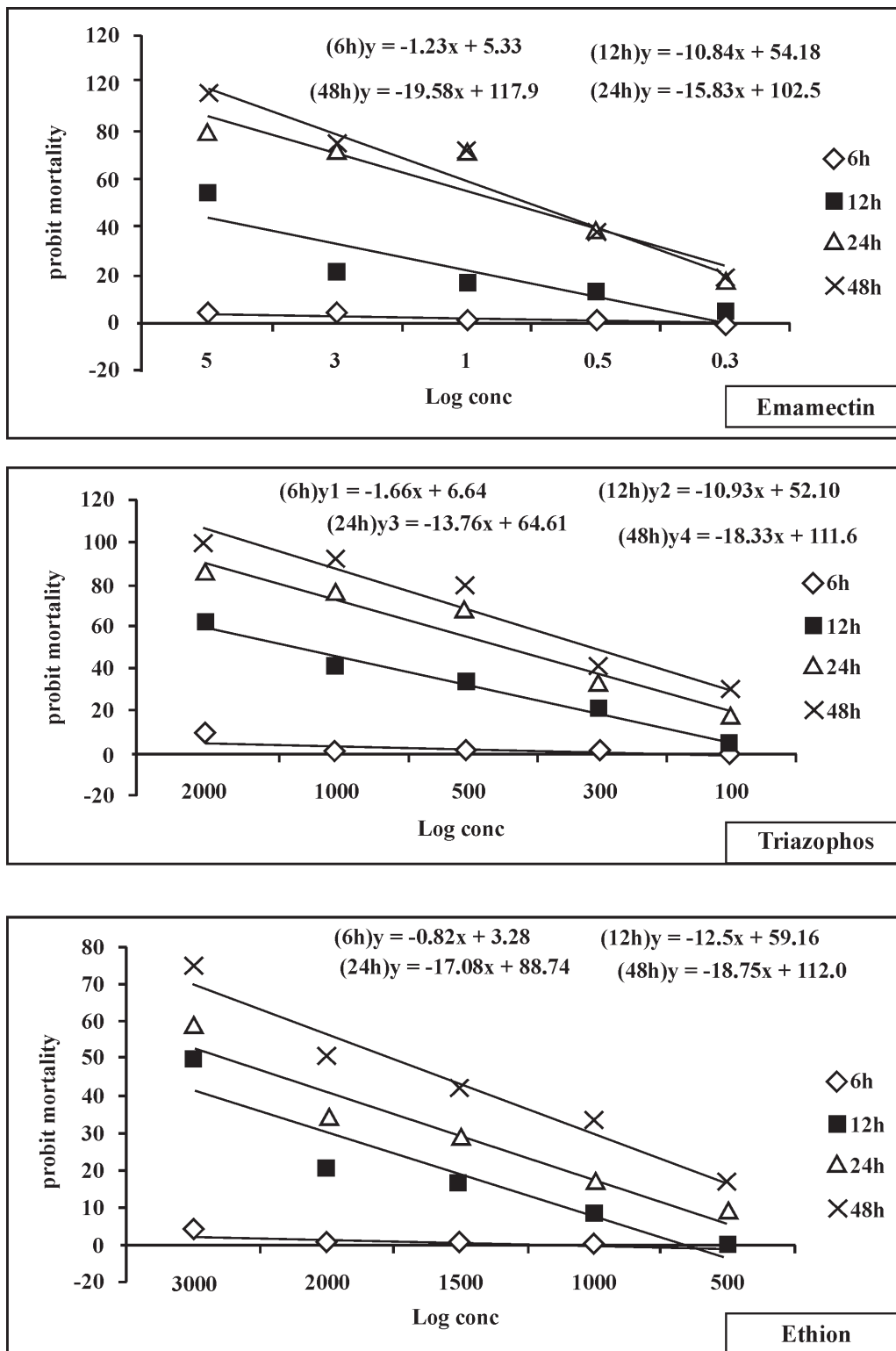


Figure 1. Dosage–mortality response of three insecticides against the larvae of *Spodoptera litura* (Fab.) by leaf dip method

## RESULTS AND DISCUSSION

On the basis of probit analysis, at 24h after exposure, emamectin benzoate was most toxic insecticide ( $LC_{50} = 0.9$  ppm) followed by triazophos ( $LC_{50} = 405$  ppm) and ethion ( $LC_{50} = 2739$ ). The order of toxicity at all the three LC levels was: Emamectin Benzoate > Triazophos > Ethion (Table 1). Similar trend of toxicity was observed at 48 hr and 72 h exposure wherein  $LC_{50}$  for emamectin benzoate, triazophos and ethion were 0.7, 239 and 1698 and 0.6, 229 and 1271 respectively.

The result of present investigation showed similar order of toxicity of different insecticides with relative toxicity in parentheses as: emamectin benzoate (6.93) > fenvalerate (1.82) > indoxacarb (1.62) > cypermethrin (1.00) > abamectin (0.94) > quinalphos (0.67) > bifenthrin (0.51) > spinosad (0.44) > endosulfan (0.28) > betacyfluthrin (0.23) > lambda cyhalothrin (0.19), earlier reported by Raghuraman *et al* (2008).

Dhawan *et al.* (2007) also observed that  $LC_{50}$  values of emamectin benzoate, novaluron, pyridalyl,

**Table 1. Dosage – mortality response of 7d old larvae of tobacco caterpillar, *Spodoptera litura* (Fab.) against three insecticides by leaf dip method at 24, 48, 72 h after exposure**

Insecticides	Exposure hours	LC value in ppm						$\chi^2$	Regression equation Y=a + bx
		$LC_{30}$	Fiducial Limit	$LC_{50}$	Fiducial Limit	$LC_{90}$	Fiducial Limit		
Emamectin benzoate	24h	0.3595	(0.1–0.6)	0.9075	(0.5–1.4)	8.86	(3 – 23)	5.15	Y=10.22 + 1.2931X
	48h	0.4028	(0.2–0.6)	0.7831	(0.5–1)	4.0218	(2.1 – 7.4)	5.01	Y=12.39 + 1.8013X
	72h	0.2994	(0.1–0.5)	.6474	(0.4 – 0.9)	2	(2 – 8)	4.07	Y=11.48 + 5.22X
Triazophos	24h	191	(117–313)	239	(107 – 396)	1568	(1253–5242)	2.11	Y= 7.20 + 1.59X
	48h	111	(16–192)	229	(102 – 372)	1458	(490–5017)	5.03	Y= 7.57 + 1.56X
	72h	108	(17–185)	1698	(12841–2478)	7485	(481–4418)	3.74	Y=7.59 + 1.59X
Ethion	24h	929	(541–1233)	1698	(12841–2478)	7485	(3247–17258)	0.9956	Y= 6.51 + 1.98X
	48h	929	(541–1233)	1698	(12841–2478)	7485	(3247–17258)	0.9956	Y= 6.51 + 1.98X
	72h	791	(506–1016)	1271	(984–1600)	4084	(2522–6618)	1.85	Y=1.38 + 1.79X

flubendiamide, chlorantraniliprole, chlorpyrifos and thiodicarb as 0.0001, 0.0020, 0.0037, 0.0040, 0.0044, 0.0390 and 0.0410, respectively. Based on the  $LC_{50}$  value, the order of toxicity of different insecticides was emamectin benzoate > novaluron > pyridalyl > flubendiamide > chlorantraniliprole > chlorpyrifos > thiodicarb.

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