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Effect of Certain New Insecticide Molecules on *Spodoptera litura* (Fab.) larvae

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ABSTRACT

Laboratory investigations were carried out during 2010-11 in the Department of Entomology, Agricultural College, Bapatla, Guntur district, Andhra Pradesh to study the efficacy of certain new insecticide molecules on *Spodoptera litura* (Fab.) larvae. The results revealed that chlorfenapyr 10SC @ 0.015% was most effective against *S. litura* larvae followed by the flubendiamide 480SC @ 0.0118%, chlorantraniliprole 18.5SL @ 0.0083% and thiodicarb 75WP @ 0.15%. Pupation per cent was high in thiodicarb treated larvae (57.5) followed by chlorantraniliprole (27.5) treated larvae. Lowest pupation per cent was recorded in chlorfenapyr (22.5) treatment followed by flubendiamide (25.0) treated larvae. Adult emergence per cent was also more in thiodicarb (55.0) treatment followed by chlorantraniliprole (27.5) treatment.

Key words : Adult emergence, Efficacy, Pupation, *Spodoptera litura*.

Tobacco caterpillar*, Spodoptera litura* (Fab.) is a polyphagous lepidopteran pest reported to infest about 112 crop species throughout the country such as cotton, tobacco, chilli, groundnut, castor *etc* (Jotwani *et al.,* 1961 and Azam, 1979) including leafy vegetables in different parts of the world (Metcalf and Flint, 1962). This was the first lepidopteran pest to develop insecticide resistance in India (Srivastava and Joshi, 1965). This pest has defied conventional insecticides based control strategies and developed resistance against a range of insecticides and a multifaceted approach is required for proper management of *S. litura.*

Resistance in strains of *S. litura to* chlorinated hydrocarbons, organo phosphorous and carbamates have been detected in all areas, where intensive control operations were carried out with these insecticides (Kranthi *et al*., 2002).

High levels of resistance to synthetic pyrethroids were also detected in the field strains of *S. litura* (Armes *et al*., 1997) and Mehrotra (1991) expressed that *S. litura* developed multiple resistance to insecticides because of this reason.

MATERIAL AND METHODS

S. litura egg mass were collected from Guntur district during August 2010 and the larvae were reared on castor hybrid, GCH-4.

The commercial grade insecticides:

Chlorfenapyr (Intrepid 10 SC, BASF India Ltd.), thiodicarb (Larvin 75WP, Aventis crop science India Ltd.) and chlorantraniliprole (Coragen 18.5SL, DuPont India Ltd.), flubendiamide (Fame 480SC, Bayer crop science India Ltd.), representing pyrrole, carbamate and diamide group of insecticides, respectively were used for bioassay.

Bioassays were conducted on third instar larvae of *S. litura* (7±1 day old and 30-35 mg weight) of F_1 generation using leaf dip method. One litre solutions were prepared by measuring respective concentrations of the test insecticides *viz.* chlorfenapyr 10SC @ 0.015%, thiodicarb 75WP @ 0.15%, chlorantraniliprole 18.5SL @ 0.0083% and flubendiamide 480SC @ 0.0118% by using water as a solvent. Castor leaves were dipped in different test insecticide solutions and fed to the larvae after shade drying. Four replications were maintained for each insecticidal concentration @ ten larvae per replication. Fresh castor leaves were provided after 24 hrs of treatment as diet to the survivals. Constant temperature of 27±2ºC and 78±2% RH was maintained in the laboratory.

Data Collection:

Mortality of the treated larvae was recorded at 24, 72 and 120 hours after treatment (HAT). The data was also recorded on number of larvae pupated, number of adults emerged and malformed adults. Mortality data was statistically subjected to completely randomised design (CRD).

RESULTS AND DISCUSSION

Mean mortality per cent of *S. litura* larvae treated with chlorfenapyr was high (47.5) at 24 HAT compared to all other treatments where as lower

Table 1. Efficacy of new insecticide molecules on *S. litura* larvae.

Treatment	Mean mortality (%)		
	24 HAT	72 HAT	120 HAT
Chlorfenapyr 10 SC (0.015%)	47.50e	67.5e	77.5d
	(43.54)	(55.26)	(61.74)
Thiodicarb 75 WP (0.15%)	12.5abcd	25.0b	42.5b
	(17.88)	(29.8)	(40.65)
Chlorantraniliprole 18.5 SL (0.0083%)	2.50ab	52.5d	70.0c
	(4.60)	(46.42)	(56.92)
Flubendiamide 480 SC (0.0118%)	7.5abc	40.0c	72.5cd
	(11.24)	(39.15)	(58.58)
Untreated control	0.0a	2.5a	0.0a
CD		(4.60)	
SEM	14.099	8.051	6.024
CV	4.635	2.647	2.039
	59.97	15.09	9.35

HAT=Hours after treatment

* Values indicated by the similar alphabets were not significantly different and values indicated by the sequential alphabets were significantly different.
* Figures in parentheses are angular transformed values.

mortality of 2.5 per cent was recorded in chlorantraniliprole treatment (Table 1). However, flubendiamide and thiodicarb treatments are statistically on par with chlorantraniliprole with 7.5 and 12.5 per cent mortality, respectively. At 72 HAT also chlorfenapyr recorded highest mortality of 67.5 per cent and it is statistically superior over other treatments. The chlorantraniliprole treatment recorded 52.5 per cent mortality at 72 HAT (Table 1). The same treatment at 24 HAT recorded lowest mortality of 2.5 % only. Flubendiamide and thiodicarb treatments recorded 40 and 25 per cent mortality of *S. litura* larvae at 72 HAT and statistically different from other treatments.

Mean maximum mortality of 77.5 per cent was recorded after 5 days in chlorfenapyr treatment followed by flubendiamide, chlorantraniliprole and thiodicarb treatment with 72.5, 70.0 and 42.5 per cent, respectively.

Chlorfenapyr treatment was significantly superior over chlorantraniliprole, and thiodicarb treatments. Flubendiamide treatment is statistically on par with chlorfenapyr and chlorantraniliprole treatments and superior over thiodicarb treatment. Moderate change in mortality was recorded in larvae subjected to chlorfenapyr after 72 HAT but only slight change was noticed after 120 HAT. Sudden increase in mean mortality per cent was noticed in larvae treated with chlorantraniliprole after 72 HAT and moderate increase was recorded after 120 HAT (Table 1).

Larvae subjected to thiodicarb recorded slight increase in mean mortality per cent after 72 HAT but significant increase was noticed after 120 HAT. Larvae treated with flubendiamide recorded mean mortality per cent of only 7.5 at 24 HAT but recorded 40 per cent mortality at 72 HAT. A significant increase in mean mortality (72.5%) of *S.litura* larvae due to flubendiamide treatment was noticed at 120 HAT.

Survival percentage was more in thiodicarb treated larvae (57.5) followed by chlorantraniliprole (30.0) treatment at 120 HAT (Table 1).

Per cent pupation and adult emergence was more in thiodicarb treated larvae followed by chlorantraniliprole, flubendiamide and chlorfenapyr treatments (Table 2). Pupation per cent was high in thiodicarb (57.5) treated larvae followed by chlorantraniliprole (27.5) treated larvae. Lowest pupation per cent was recorded in chlorfenapyr (22.5) treatment followed by flubendiamide (25.0) treated larvae (Table 2). These two treatments were statistically on par with each other and with chlorantraniliprole treatment.

Table 2. Efficacy of new insecticide molecules on *S. litura*

Treatment	Pupation (%)	Adult emergence (%)	Malformed adults (%)
Chlorfenapyr 10 SC (0.015%)	22.5a (28.21)	20.0a (26.18)	5.0 (9.21)
Thiodicarb 75 WP (0.15%)	57.5d (49.30)	55.0d (47.36)	2.5 (4.60)
Chlorantraniliprole 18.5 SL(0.0083%)	27.5abc (31.53)	27.5abc (31.53)	2.5 (4.60)
Flubendiamide 480 SC(0.0118%)	25.0ab (29.87)	25.0ab (29.87)	2.5 (4.60)
Untreated control	97.5e (85.38)	97.5e (85.38)	0.0
CD	7.76	8.56	NS
SEM	2.55	2.81	4.28
CV	11.37	12.75	186.190

* Values indicated by the similar alphabets were not significantly different and values indicated by the sequential alphabets were significantly different.
* Figures in parentheses are angular transformed values.

Adult emergence per cent was also more in thiodicarb (55.0) treatment followed by chlorantraniliprole (27.5) treatment (Table 2). The thiodicarb treatment is statistically different from other treatments. The other three treatments *viz.,* chlorfenapyr, chlorantraniliprole and flubendiamide are statistically on par with each other. Even though malformed adults were more in chlorfenapyr treatment there was no significant difference between the means of the treatments.

Chlorfenapyr 10SC @ 0.015% recorded highest mortality at 24, 72 and 120 HAT when compared to the all other treatments. The results indicate that chlorfenapyr was most effective treatment against *S. litura* larvae followed by the flubendiamide, chlorantraniliprole and thiodicarb. The results obtained were in accordance with the findings of Li Tengwu *et al*., (2001), Khalid Mehmood *et al.,* (2001), Paul McLeod *et al.,* (2002), Muhammad Aslam *et al.,* (2004) and Satpathy *et al.,* (2005).

Thiodicarb 75 WP @ 0.15% was least effective (survival percentage of 57.5) among all the treatments indicating that efficacy was low against *S. litura* larvae, which was found to be in congruence with the findings of Vijaya bhaskar *et al*., (2007). Larvae subjected to chlorfenapyr recorded high malformed adults percentage compared to the all other treatments and there is no significant difference between the treatments.

Conclusions

Chlorfenapyr 10SC @ 0.015% was most effective against *S. litura* larvae followed by the flubendiamide 480SC @ 0.0118%, chlorantraniliprole 18.5SL @ 0.0083% and thiodicarb 75WP @ 0.15%. Pupation per cent was high in thiodicarb treated larvae (57.5) followed by chlorantraniliprole (27.5) treated larvae. Thiodicarb 75WP @ 0.15% was least effective among all the insecticides tested with high pupation and adult emergence percentages.

LITERATURE CITED

Armes N J, Whightman J A, Jadhav D R and Rao G V R 1997 Status of insecticide resistance in *Spodoptera litura* in Andhra Pradesh, India. *Pesticide Science,* 50 (3):225-227.

Azam K M 1979 Incidence of *Spodoptera litura* (Fab.) on groundnut and blackgram in Guntur and Prakasam districts. *Andhra Agricultural Journal*, 26: 247-248.

Jotwani M, Rai B K and Pradhan S 1961 Bioassay of comparative toxicity of some insecticides to the larvae of *Prodenia litura* F. (Noctuidae: Lepidoptera). *Indian Journal of Entomology*. 23:50-53.

Khalid Mehmood, Muhammad A and Muhammad Amjad 2001 Some studies on the comparative efficacy of different traditional and non-traditional insecticides against okra jassid (*Amrasca biguttula biguttula* Ishida) on okra variety, "Pusa Green". *Online Journal of Biological Sciences*. 1(2): 60-61.

Kranthi K R, Jadhav D R, Kranthi S J, Wanjari R R, Ali S S and Russel D 2002 Insecticide resistance in five major insect pests of cotton in India. *Crop Protection,* 21: 449-460.

Li tengwu, Shu-qiong, Li-mingfu, Zhang-yong, Zhao-xiaogong and Wang-xinglin 2001 Study on the efficacy of insecticides for controlling *Spodoptera exigua*. *Plant Protection*. 27(4):41-43.

Mehrotra K N 1991 Pyrethroid resistant insect pest management and Indian experience. *Pesticide Research Journal*. 2: 44-53.

Metcalf R L and Flint T 1962 Toxicity of some insecticides against larvae of *Prodenia litura* F. (Noctuidae: Lepidoptera). *Indian Journal of Entomology*. 24: 16-21.

Muhammad Aslam, Muhammad Razaq, Saher Rana and Muhammad Faheem 2004 Efficacy of different insecticides against bollworms on cotton. *Journal of Research* (Science), Bahauddin Zakariya University, Multan, Pakistan. 15(1): 17-22.

Paul Mc Leod, Francisco J, Diaz Donn T and Johnson 2002 Toxicity, Persistence and efficacy of Spinosad, Chlorfenapyr and Thiamethoxam on egg plant when applied against the egg plant flea beetle (Coleoptera: Chrysomelidae). *Journal of Economic Entomology.* 95(2): 331-335.

Satpathy S, Akhilesh kumar, Amit kumar singh and Pandey P K 2005 Chlorfenapyr a new molecule for Diamond back moth (*Plutella Xylostella* L.) management in cabbage. *Annals of Plant Protection Sciences*, 13 (1): 88-90.

Srivatsava and Joshi H C 1965 Occurrence of resistance to BHC in *Prodenia litura* Fabricius (Lepidoptera: Noctuidae). *Indian Journal of Entomology,* 27: 102-104.

Vijayabhaskar L, Manjunath J and Vijayagopal A 2007 Evaluation of new insecticides against mango Hoppers *Amritodus atkinsoni* **L**. *Pestology*, 31(2) 33-34.

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