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Relative toxicity of different insecticides against *Spodoptera litura*

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Abstract
The present investigation entitled "Relative toxicity of different insecticides against *Spodoptera litura*" was conducted, in order to study the life stages of *Spodoptera litura* on different hosts. The experiment was conducted during year 2013- 2014 in the Laboratory of Toxicology, Department of Entomology, Dr. PDKV, and Akola. The *Spodoptera litura* reared on three host plants *viz.*, Castor, Soybean, Sunflower. These host plant Influenced on the toxicity of different insecticides to *Spodoptera litura*, showed that the indoxacarb and Spinosad was most effective against *Spodoptera litura* fed on castor and Soybean host followed by emamectin benzoate and for Sunflower host spinosad was most effective insecticide followed by indoxacarb and emamectin benzoate. The relative toxicity of four different insecticides in third instar larvae of *Spodoptera litura*, reared on three host plants *viz*. Castor, Soybean and Sunflower, The order relative toxicity for Castor and Soybean host was Indoxacarb > Spinosad > Emamectin Benzoate >Rynaxypyr. And for Sunflower host the order relative toxicity was Spinosad > Indoxacarb > Emamectin benzoate >Rynaxypyr.

Keywords: Host plants, rearing, *Spodoptera litura*, toxicity, insecticide

1. Introduction
Spodoptera litura (Fab.) commonly known as tobacco leaf eating caterpillar has being the polyphagous pest with high reproductive and damage potential, its suppression has become inevitable over past decade due to development of resistance to commonly used chemical insecticides. The control of *S. litura* has depended mostly on application of various chemical insecticides. The indiscriminate and extensive uses of these chemical insecticides in past few decades have led to emergence of many serious pest problems. Among the various problems the leading one is development of resistance to insecticides in target insect pest. As a result, many field populations of *S. litura* have developed multiple resistances and field control failure has been observed very frequently (Armes *et al*., 1997; Kranthi *et al*., 2001; Ahmad *et al*., 2007a; Ahmad *et al*., 2007b) [3, 7, 2-1]. *Spodoptera litura* is the first lepidopterous pest and second agricultural pest developed resistance in India. By 1965, resistance to benzene hex chloride (BHC) was reported in field populations from Rajasthan. In the early 1980s, populations in the South Indian state of Andhra Pradesh were shown to be highly resistant to linden, carbonyl and malathion (Ramakrishnan *et al.*, 1984) [9]. Recently, the pest has been reported to develop resistance to insecticides belonging to different group (Armes *et al.*, 1997.) [3] *S. litura* is also notorious for developing insecticide resistance. High resistance to various insecticides including organ chlorines, organophosphates, cremates, pyrethroids and Bt, and also field control failures. have been reported in China and India (Ramakrishna *et al*., 1984; Armes *et al.*, 1997; Kranthi *et al.*, 2001) [3, 7, 9]. Damage is caused by larvae by feeding mainly on the foliage and is responsible for reduction in yield, if, it is not properly managed (Weight man and Rao, 1993) [10]. An ability to diagnose the median lethal concentration of the insecticides *viz*., Indoxacarb, Rynaxpyr, Emamectin benzoate and Spinosad for the management of *S. litura* (Fab.) fed on three different host plants *viz*., castor, soybean and sunflower. It is a well-documented fact that the host plants exert profound influence on the susceptibility of an insect to insecticides and on its biological parameters *viz.*, larval, pupal development, adult fecundity and longevity. Effect of host plants on the susceptibility of insects to insecticides has been investigated by the earlier workers. Research done to date indicates to cross-resistance with current products including conventionally used insecticides. For contemplating research on different aspects of Indoxacarb, Rynaxpyr, Emamectin benzoate and Spinosad toxicity against *Spodoptera litura*, fed on the three different host plants.

2. Materials and methods

Initially larvae of *S. litura* were collected from infested fields of soybean, sunflower and castor in order to study the influence of different host plants on the life stages of *S. litura* by using Completely Randomized Design (CRD) with three treatment and seven replications. The studies on the life stages of *S. litura* were conducted in the laboratory at room temperature for consecutive two generations on castor, soybean and sunflower host plants, respectively. Initially the *S. litura* culture was obtained by collecting the larvae from the infested fields of soybean, sunflower and castor and was reared in the laboratory in the plastic containers. Fresh leaves of castor were provided to the larvae initially collected from fields as food till the larvae became fully grown and ready to undergo pupation. The freshly emerged female and male were sexed and released for mating and oviposition on respective host in glass jar closed with muslin cloths. Cotton swab soaked in 5 per cent honey solution was kept suspended as adult food. Twenty larvae of *S. litura* were fed from hatching to pupation on leaves of castor, soybean and sunflower separately replicated seven times and this was done for two generations so as to allow the *S. litura* to adopt themselves physiologically to particular host plants. The larval respective feed was changed at an alternate days till the feeding was ceased. The insecticide solutions were prepared using the commercial formulation which was diluted with distilled water. Fresh solution was prepared as and when required. The relative toxicity of different insecticides to *S. litura* larvae when reared on Castor, Soybean and Sunflower host plants were calculated by taking the LC_{50} of Indoxacarb 15.8 EC, Rynaxypyr 20 SC, Emamectin benzoate 5 SG and Spinosad 45 SC. The relative toxicity is the ratio between the median lethal concentrations of the two insecticides.

3. Results and Discussion

Table 1: Relative toxicity of different insecticides to third instar larvae of *Spodoptera litura* reared on three host plants.

Sr. No.	Insecticide	Host plant	LC_{50} (ppm)	Relative toxicity	*Index of relative toxicity variation
1	Indoxacarb	Castor	0.618	14.517	
2	Rynaxypyr		8.972	1.000	13.517
3	Emamectin Benzoate		1.094	8.201	
4	Spinosad		0.680	13.194	
5	Indoxacarb	Soybean	0.656	8.992	
6	Rynaxypyr		5.845	1.000	7.992
7	Emamectin Benzoate		0.876	6.672	
8	Spinosad		0.754	7.751	
9	Indoxacarb	Sunflower	0.862	11.598	
10	Rynaxypyr		9.998	1.000	10.598
11	Emamectin Benzoate		0.944	10.591	
12	Spinosad		0.763	13.103	

*The difference between the highest and lowest value of Relative toxicity.

3.1 Relative toxicity of different insecticides to third instar larvae of *Spodoptera litura* reared on three host plant

The data regarding relative toxicity of various insecticides to *Spodoptera litura* third instar larvae for each of the three hosts are presented in Table 1. On the basis of their LC_{50} values the relative toxicity of other insecticides is calculated by keeping the relative toxicity of Rynaxypyr as unity, as the LC_{50} values of Rynaxypyr are maximum. The relative toxicity of Indoxacarb is 14.517 times more than Rynaxpyr, similarly the relative toxicity of emamectin benzoate and Spinosad is 8.201 and 13.194 times more than Rynaxpyr for castor as a host plant. The relative toxicity of Indoxacarb, emamectin benzoate and Spinosad were 8.992, 6.672, and 7.751 times more than Rynaxypyr, respectively, on Soybean host plant and the relative toxicity of Indoxacarb was 11.598 times more than Rynaxypyr, similarly the relative toxicity of Emamectin benzoate and Spinosad was 10.591 and 13.103 times more than Rynaxypyr for Sunflower host plant. The regardless of host on which the larvae were reared the toxicity was in the order Indoxacarb> Spinosad> Emamectin Benzoate> Rynaxypyr for Castor and Soybean host, respectively and for Sunflower host the order of relative toxicity was Spinosad > Indoxacarb > Emamectin Benzoate> Rynaxypyr. The index of relative toxicity variation was maximum in the larvae reared on Castor host plant (13.517) followed by Sunflower (10.598) and Soybean host plants (7.992), respectively. The above findings regarding the relative toxicity of different insecticides are in the same line with the results reported by previous workers; Raman gouda and Srivastava (2009) [8] who reported that bio efficacy of five insecticides *viz*., indoxacarb, methomyl, fipronil, thiamethoxam and imidacloprid against 7 day old larvae of *Spodoptera litura* by contact and leaf dip methods. Indoxacarb was the most toxic insecticide at 24 hour exposure, at all the three concentrations. In leaf dip method also at 24 hour after exposure, at all the three concentrations, indoxacarb was the most toxic insecticide. Gupta *et al.*, (2004) [5] calculated the relative toxicity of certain new insecticides against *Spodoptera litura* (Fab.) results revealed on the basis of LC_{50} value, the order of toxicity of different insecticides with relative toxicity in parenthesis was: emamectin benzoate (6.93) > indoxacarb (1.62) > abamectin (0.94) > bifenthrin (0.51) > spinosad (0.44) > betacyfluthrin (0.23). Ghosh *et al.*, (2008) [4] reported the efficacy of new insecticides *viz.*, indoxacarb, methoxyfenozide, novaluron, lufenuron and fipronil against chilli fruit borer *(Spodoptera litura* Fabre.) Relative toxicity of these insecticides against the third instar larvae of *S. litura* was also evaluated under laboratory conditions was indoxacarb (93.933) > fipronil (5.410) > novaluron (1.488) > lufenuron (1.037) > methoxyfenozide (1.000). With the increase of exposure time upto 48 hours, all the chemicals showed steady decrease in LC_{50} values. Karuppaiah. *et al.*, (2013) [6]. who evaluated that, on the basis of LC_{50} value the order of toxicity to *Spodoptera litura* was chlorantraniliprole > emamectin benzoate > indoxacarb > spinosad > pyridalyl > flubendamide > bifenthrin > Korindo > polytrin C. LC_{50} obtained by leaf dip method revealed that chlorantraniliprole (0.0001) was most effective followed by emamectin benzoate (0.002) and indoxacarb (0.0012). Thus irrespective of bioassay methods, chlorantraniliprole, emamectin benzoate and indoxacarb were

most toxic to Sonepat strains of *Spodoptera litura*. Thus in the present findings there are the differences in the relative toxicity of different insecticides to the *Spodoptera litura* showed that indoxacarb followed by Spinosad recorded most toxic insecticides against *Spodoptera litura* fed on castor and soybean host, and for Sunflower host Spinosad was found most toxic insecticide. Thus, it suggest the role of host plant in toxicity of above insecticides and the physiological adoption of the *Spodoptera litura* larvae to the different host plants.

4. References

1. Ahmad MA, Sayyed H, Crickmore N, Saleem MA. Genetics and mechanism of resistance to deltamethrin in a field population of *Spodoptera litura* (Lepidoptera: Noctuidae) in Pakistan. Pest Manage. Sci. 2007b; 63:1002-1010.
2. Ahmad M, Arif MI, Ahmad M. Occurrence of insecticide resistance in field populations of *Spodoptera litura* (Lepidoptera: Noctuidae) in Pakistan. Crop Prot. 20072a; 6:807-809.
3. Armes NJ, Wightman JA, Jadhav DR, Ranga Rao GV. Status of insecticide resistance in *Spodoptera litura* in Andhra Pradesh, India. Pest. Sci. 1997; 50:240-248.
4. Ghosh, Amalendu A, Samanta, Chatterjee ML. Evaluation of some new insect growth regulators and insecticides against chilli fruit borer (*Spodoptera litura* Fab.). Pest Management in Horticultural Ecosystems. 2008; 14(2):122-127.
5. Gupta GP, Seema Rani, Ajanta Birah, Raghu Raman M. Relative toxicity of certain new insecticides against *Spodoptera litura* Fab. Pesticide Research Journal. 2004; 1(16):45-47.
6. Karuppaiah, Chitra Srivastava. Relative toxicity of newer insecticides molecules against *Spodoptera litura* Fab. (Lepidoptera: Noctuidae). Division of Entomology, I.A.R.I., Pusa New Delhi, Annual Plant Protection Science. 2013; 21(2):305-308.
7. Kranthi KR, Jadhav DR, Kranthi S, Wanjari RR, Ali SS, Russell DA. Carbamate and organophosphate resistance in cotton pests in India, 1995 to 1999 Bull. Entomology Res. 2001; 91(1):37-47.
8. Ram Gouda SH, Srivastava RP. Bio efficacy of insecticides against tobacco caterpillar, *Spodoptera litura*. Indian Journal of Plant Protection. 2009; 37(1&2):14-19.
9. Ramakrishna N, Saxena VS, Dhingra S. Insecticide resistance in the population of *Spodoptera litura* (F.) in Andhra Pradesh. Pesticides. 1984; 18:23-24.
10. Weight man JA, Rao GVR. A Groundnut: insect identification handbook of India. ICRISAT Information Bulletien, 1993, 39-60.