



Toxicity of Spinosad 45 SC to natural enemies associated with insect pests of pigeonpea at Pantnagar*

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ABSTRACT: A study was conducted to assess toxicity of Spinosad 45 SC (Tracer) and other commercial insecticides on natural enemies associated with insect pests of pigeonpea at Pantnagar during *kharif* season of 2003 at Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar. Among the natural enemies, spider population appeared to be significant during 50 per cent flowering and podding stage of crop growth period. The insecticides did not affect the natural population of spiders during the crop growth. The natural enemies of pigeonpea pests observed included *Mantis religiosa* (Linnaeus), *Crocothemis servilia* Drury, *Chrysoperla carnea* (Stephens), *Eocanthecona furcellata* (Wolff.), *Apanteles* sp., *Xanthopimpla* sp., *Ropalidia ferruginea* (Fabricius), *Odynerus ovalis* Saussure, *Clubiona* sp. and *Araneus* sp. The spiders and braconid parasitoids were more prevalent than the other natural enemies.

KEY WORDS: Hyperactivity, natural enemies, pigeonpea, toxicity

Insect pests are among the major biotic constraints to pigeonpea production in India (Lateef and Reed, 1990). Important insect pests include, gram pod borer, *Helicoverpa armigera* (Hübner); legume pod borer, *Maruca vitrata* (Fabricius); leaf webber, *Grapholita critica* (Meyrick); plume moth, *Exelastis atomosa* Walshingham; pod fly, *Melanagromyza obtusa* (Malloch) and jassids (Chaudhary and Sachan, 1995). The important species of natural enemies may vary across seasons and regions. Reed *et al.* (1989) recorded a large number of parasitoids and predatory insects, several species of spiders, lizards and birds in pigeonpea.

Sahoo and Senapati (2000) and Kumar and Nath (2003) recorded natural enemies of pigeonpea insect pests, which included hymenopteran parasitoids, predatory wasps, spiders, ladybird beetle, mirid bug and dragonfly. Information available on the natural enemy fauna associated with the pests on pigeonpea at Pantnagar is scanty. Keeping in view the above observations, the present study was undertaken to list out the natural enemies associated with pigeonpea ecosystem and to study the effect of insecticidal sprays on these natural enemies.

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Effect of Spinosad 45 SC (Tracer) and commercial insecticides was studied against spiders in early pigeonpea variety, Manak. The field experiments were carried out during *kharif* season of 2003 at Crop Research Centre of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar. The sowing of crop was done on ridges during the first week of July each year. Each plot consisted of 10 ridges of 5 m length each at 60 cm spacing. The experiment was conducted in a randomized block design. Each treatment was replicated thrice. The crop was protected at critical stages *i.e.* flowering and podding with insecticidal sprays applied thrice from 50 per cent at 15 days interval using spray volume @ 800 litres/ ha with foot sprayer. Spider population was recorded on 5 plants selected at random in each plot at one day before spray, and third, seventh and tenth days after each spray. For observation on other natural enemies the larvae collected from different treatment plots in field were brought to the laboratory and reared on fresh buds, flowers and pods in incubator at $27 \pm 1^\circ \text{C}$ till the emergence of adults. The parasitization of field-collected larvae was observed and the emerged parasitoids were kept in vials with 70 per cent alcohol. The predator's populations were also observed during field observations and collected for their identification. The data collected from the experiments were subjected to the analysis of variance (ANOVA). Data on spider population were converted to square root transformation before using ANOVA.

Effect of insecticides on spider population

The data recorded on spider population have been presented in Table 1. Most of the natural enemies were observed in low numbers. Among the natural enemies, only the spider population appeared to be in more numbers during the reproductive stage of the crop. Before the initiation of insecticidal treatments the mean spider population did not differ significantly among treatment (ranged from 0.00 to 1.00 spider/5 plants). Three days after first spray also the spider population reduced was non-significantly (ranged from 0.00 in treatments with endosulfan and Spinosad 45g as against 1.00 in untreated control).

The effect was more pronounced after 7 days of first spray in which the spider population declined significantly and it varied from 0.00 in treated plots with Spinosad as against 1.00 in untreated control. At 10 days after first spray, the spider population increased significantly in most of the protection treatments ranged from 0.67 in Spinosad 90g, Spinosad 73g and chlorpyrifos to 2.00 in untreated control. This was probably due to substantial number of host insects, *Helicoverpa* and *Maruca* larvae.

One day before second spray the spider population varied non-significantly from 0.33 in treatment with Spinosad 90g and chlorpyrifos to maximum of 2.00/5plants in untreated check. Three days after second application of insecticides, no significant reduction in the spider population was observed in most of the treatments that clearly indicate that these two insecticides had no adverse effect on spider population.

Similar trend in the spider population was observed among the various treatments including untreated control at 7 days, 10 days after second spray and 1 day before third spray. However, after 3 days of third spray, the spider population slightly increases in untreated plots over previous observations, which ranged from 0.00 in most of the treatments as against 1.00/5plants in untreated control. At 7 and 10 days after third spray no spider population was observed in any treatments. This may be due to declining pest population and temperature during maturity of the crop.

Effect of insecticides on other natural enemies

The natural enemies observed included praying mantis, *Mantis religiosa* (Linnaeus); dragonfly, *Crocothemis servilia* Drury; green lacewing, *Chrysoperla carnea* (Stephens); cantheconid bug, *Eocanthecona furcellata* Wolff; braconid wasp, *Apanteles* sp.; ichneumonid wasp, *Xanthopimpla* sp.; wasp, *Ropalidia ferruginea* (Fabricius); wasp, *Odynerus ovalis* Saussure; spider, *Clubiona* sp. and *Araneus* sp. between 1st week of October and last week of November. The braconid parasitoids and the spiders were more

Table 1. Toxicity of various insecticides to spiders on early pigeonpea cv. Manak during *kharif*, 2003

Treatment(g a. i. /ha)	No of spider/5 plants											
	First Application				Second Application				Third Application			
	Pretreat ment	3 DAFS	7 DAFS	10 DAFS	1 DBSS	3 DASS	7 DASS	10 DASS	1 DBTS	3 DATS	7 DATS	10 DATS
Spinosad 45 g	1.00 (1.17)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.00 (1.22)	0.00 (0.71)	1.00 (1.17)	0.00 (0.71)	0.33 (0.88)	0.33 (0.88)	0.00 (0.71)	0.00 (0.71)
Spinosad 56 g	0.67 (1.05)	0.33 (0.88)	0.00 (0.71)	0.00 (0.71)	0.67 (1.05)	0.33 (0.88)	0.67 (1.05)	0.67 (1.05)	0.33 (0.88)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Spinosad 73 g	0.33 (0.88)	0.33 (0.88)	0.00 (0.71)	0.67 (1.05)	0.67 (1.05)	0.33 (0.88)	0.33 (0.88)	0.67 (1.05)	0.33 (0.88)	0.33 (0.88)	0.00 (0.71)	0.00 (0.71)
Spinosad 90 g	0.33 (0.88)	0.33 (0.88)	0.00 (0.71)	0.67 (1.05)	0.33 (0.88)	0.00 (0.71)	0.33 (0.88)	0.67 (1.05)	0.33 (0.88)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Chlorpyrifos 500 g	0.67 (1.05)	0.33 (0.88)	0.67 (1.05)	0.67 (1.05)	0.33 (0.88)	0.33 (0.88)	0.67 (1.05)	0.33 (0.88)	0.67 (1.05)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Quinalphos 500 g	0.33 (0.88)	0.33 (0.88)	1.00 (1.22)	0.00 (0.71)	0.67 (1.00)	0.33 (0.88)	0.33 (0.88)	1.00 (1.22)	0.67 (1.05)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Endosulfan 525 g	0.00 (0.71)	0.00 (0.71)	0.33 (0.88)	1.67 (1.46)	1.00 (1.17)	0.67 (1.05)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.00 (1.22)	0.00 (0.71)	0.00 (0.71)
Untreated control	0.67 (1.05)	1.00 (1.17)	1.00 (1.22)	2.00 (1.58)	2.00 (1.58)	0.67 (1.05)	0.67 (1.05)	0.33 (0.88)	0.33 (0.88)	1.00 (1.22)	0.00 (0.71)	0.00 (0.71)
SEM ±	(0.18)	(0.17)	(0.09)	(0.12)	(0.19)	(0.16)	(0.18)	(0.13)	(0.17)	(0.09)	-	-
CD (P=0.05)	-	-	(0.28)	(0.37)	-	-	-	-	-	(0.27)	-	-

Data in parentheses are $\sqrt{N+0.5}$ transformed values.

DBFS = Day before first spraying,

DBSS = Day before second spraying,

DBTS = Day before third spraying

DAFS = Day after first spraying,

DASS = Day after second spraying,

DATS = Day after third spraying

prevalent than other natural enemies. Reddy *et al.* (1998) also reported *Chrysoperla scelestes*, *Apanteles* sp. and spiders associated with pigeonpea pest complex. Kumar and Nath (2003) recorded natural enemies of pigeonpea pests including braconid wasp (*Apanteles* sp.), praying mantis (*Mantis religiosa*), dragon fly (*Crocothemis seravilia*), green lacewing (*C. carnea*) and spiders (*Araneus* sp., *Clubiona* sp), sac spider (*Clubiona* sp.). Chaudhari (2000) reported the parasitism of *H. armigera* in pigeonpea by *Xanthopimpla* sp. while Sharma (1998) reported *Ropalidia flavopicta flarobrunnea* van der Vecht as predator of *M. vitata*.

The present study suggests that Spinosad had no significant effect on the population of spider and other natural enemies on pigeonpea crop at Pantnagar. Thus it can be recommended as safe insecticide to replace presently ineffective and harmful insecticides in pigeonpea crop.

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