



Research Article

Effect of IPM modules on population of natural enemies on Soybean

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ABSTRACT: Field experiments were conducted during *kharif* 2010-2011 and 2011-12, in the field of Department of Agricultural Entomology, College of Agriculture, Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra). During this experiment, significantly highest population (1.70 LB/5 plants) of lady bird beetle, (1.00 chrysopa /5 plants) of chrysopa and (1.60 spiders /5 plants) of spider were observed in untreated control and were at par with MAU IPM module. Significantly lowest population was observed in chemical control treatments.

KEY WORDS: Chrysopa, Integrated pest management, IPM, Lady bird beetle, Natural enemies, Spider

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INTRODUCTION

Soybean (*Glycine max* (L.) Merrill) grows well in varied agro-climatic conditions and emerged as important commercial crops in many countries and international trade of soybean is spread globally. The use of broad-spectrum insecticides is one of the main obstacles to effective biological control because natural enemies are just as susceptible to the insecticide as the pest. Different pesticides have been used for control of Soybean pests. But several pesticides have broad spectrum activity and are highly toxic to non-target organisms. Among many predators on soybean like lady bird beetle (*Coccinella septempunctata*), chrysopa (*Chrysoperla arabica*) and spider are predominant. Most species of ladybirds are considered beneficial because they are predators of Homoptera or Acarina, many of which are considered to be pests. A single lady beetle may eat as many as 5,000 aphids in its lifetime. Releases of *C. carnea* eggs in field cages at rates of 50,000 and 100,000 per acre also provided effective control of the tobacco budworm. Therefore present field studies were undertaken to determine the integrated pest management modules on population of lady bird beetle, chrysopa and spider on soybean.

MATERIAL AND METHODS

During IPM experimental design MAUS 7 variety sown by spacing 45 x 5 cm under Randomized Block Design (RBD) of plot size 9.9 x 9.0m in which 3 treatments with 7 no. of replications were taken. Distance between two

replications and plots were 2 m and 1 m respectively. Components of IPM modules are given in Table 1. Population of Lady bird beetle, Chrysopa and spider were recorded on randomly selected five plants from each net plot on weekly interval during both the years.

Statistical analysis: As per Gomez and Gomez (1984), the data obtained on live population i.e. observations on larval population were subjected to $\sqrt{x+0.5}$ transformation i.e. Poisson formula. Whereas data on per cent infestation were transformed into arc sin transformation values before statistical analysis.

X = average number of pest population.

RESULT AND DISCUSSION

Effect of different IPM modules on population of Lady bird beetle

The data presented in Table 2 revealed that during *kharif* 2010-11, untreated control recorded highest population of (1.55 LB/5 plants) of lady beetle which was at par with MAU IPM module (0.80 LB/5 plants). Significantly lowest population of (0.60 LB/ 5 plants) was observed in chemical control treatment. As during *kharif* 2011-12, untreated control recorded significantly highest population of (1.85 LB/5 plants) of lady beetle followed by MAU IPM module (0.85 LB/5 plants) which were found at par with each other. Significantly lowest population of (0.70 LB/ 5 plants) was

Table 1. Components of different IPM modules

Module	Components used	Date of applications	
		2010-2011	2011-12
1. MAU Module	1. Deep summer ploughing before soybean cultivation.	17-06-2010	11-07-2011
	2. Border row of trap crops i.e. castor and sunflower	09-07-2010	25-07-2011
	* Recommended spray adopted on trap crop after noticing incidence	25-08-2010 20-09-2010	16-09-2011 28-09-2011
	3. Destruction of alternative hosts	Done	Done
	4. Installation of 25 bird perches/ha	30-6-2010	21-07-2011
	5. Mechanical collection and destruction of stemfly and girdle beetle affected plant parts	Done	Done
	6. Application of phorate 10 G @10 Kg/ha in soil before sowing	17-06-2010	11-07-2011
	7. Spraying of NSKE 5% at 25-30 days after sowing	13-07-2010	06-08-2011
	8. Collection and destruction of <i>Spodoptera</i> egg masses and gregarious larvae along with leaves.	Done	Done
	9. <i>Nomuraea rileyi</i> @4 g/l after noticing incidence of <i>Spodoptera litura</i>	17-07-2010	12-08-2011
2. Chemical Control	1. Triazophos 40 EC @ 0.064%	03-07-2010	26-07-2011
	2. Quinalphos 25EC @ 0.05%	17-07-2010	10-08-2011
	3. Emamectin benzoate 5SG @ 0.002%	05-08-2010	25-08-2011
	4. Indoxacarb 14.5 % @ 0.0145%	18-08-2010	10-09-2011
3. Untreated control	No plant protection measure adopted. The plots were sprayed with plain water.		

observed in chemical control treatment. Results based on pooled data revealed that untreated control recorded significantly highest population of (1.70 LB/5 plants) of lady beetle and was at par with MAU IPM module (0.82 LB/5 plants). Significantly lowest population was observed in chemical control treatment (0.65 LB/ 5 plants). Results obtained during present experiment are in conformity with the findings of Patil and pawar (1994) who observed highest population of natural enemies in control followed by NPV @ 500 and 250 LE/ha. Patil *et al.* (2008) reported highest predatory activities in untreated control (0.44/plant) followed by imidacloprid 70 WS @ 4.9 g a.i./kg (0.38/plant) and thiamethoxam 3 g a.i./kg (0.35/plant) at 15 and 25 DAS during 2005-06. Rathod (2011) reported that highest population of coccinellids in untreated control which was at par with BIPM module, MAU module. Significantly lowest

population was observed in chemical control treatment.

Effect of different IPM modules on population of *Chrysoperla arabica*

The data presented in Table 3 revealed that during *kharif* 2010-11, untreated control recorded highest population of (1.00 chrysopa /5 plants) of *Chrysoperla arabica* followed by MAU IPM module (0.65 chrysopa /5 plants) which were found at par with each other. Significantly lowest population of (0.55 chrysopa / 5 plants) was observed in chemical control treatment. During *kharif* 2011-12, untreated control recorded significantly highest population of (1.10 chrysopa /5 plants) of *Chrysoperla arabica* followed by MAU IPM module (0.70 chrysopa /5 plants) which were found at par with each other. Significantly lowest population was observed in chemical control treatment (0.60 chrysopa

Table 2. Effect of IPM modules on population of lady beetle, *Chrysopa* and spiders

Sr.no.	Modules	No. of LB per 5 plants			No. of <i>Chrysopa</i> per 5 plants			No. of spiders per 5 plants		
		2010-11	2011-12	Pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
1.	MAU IPM Module	0.80 (1.57)	0.85 (1.73)	0.82 (1.65)	0.65 (1.00)	0.70 (1.20)	0.68 (1.25)	1.20 (1.41)	1.30 (1.48)	1.25 (1.45)
2.	Chemical control	0.60 (1.21)	0.70 (1.24)	0.65 (1.25)	0.55 (1.11)	0.60 (1.14)	0.57 (1.13)	0.70 (1.04)	0.80 (1.12)	0.75 (1.00)
3.	Untreated control	1.55 (1.81)	1.85 (2.00)	1.70 (1.45)	1.00 (1.21)	1.10 (1.35)	1.05 (1.45)	1.60 (1.80)	1.40 (1.83)	1.50 (1.74)
SE±		0.11	0.10	0.09	0.10	0.08	0.09	0.08	0.07	0.11
CD at 5%		0.31	0.30	0.28	0.31	0.33	0.28	0.26	0.23	0.35

Figures in parentheses are $\sqrt{x + 0.5}$ transformed values *Average of 8 weeks

/ 5 plants). Pooled data revealed that untreated control recorded highest population of (1.05 chrysopa / 5 plants) of *Chrysoperla arabica* followed by MAU IPM module (0.68 chrysopa / 5 plants) which were found at par with each other. On the contrary significantly lowest population of (0.57 chrysopa / 5 plants) was observed in chemical control treatment. Results obtained during present investigation are in conformity with the findings of Rajaram *et al.* (2001) who reported 1 and 8 population per plant was in IPM module and 0.7 and 2 in farmers method with 6 sprays of insecticides during consecutive season, respectively. Sarode and Sonalkar (1999) tested the insecticidal products for their biosafety to *Chrysoperla zotswani arabica* under laboratory condition. None of the insecticides was found safer predators. However Neem seed Kernen extract proved comparatively safe. Bhosle *et al.* (2009) observed that the mean population of chrysopa was 1.04 per plant in IPM and in non-IPM module it was 0.61 per plant.

Table 3. Effect of IPM modules on population of *Chrysoperla arabica*

Sr. No.	Modules	No. of <i>Chrysopa</i> per 5 plants		
		2010-11	2011-12	Pooled
1	MAU IPM module	0.65*	0.70	0.68
		(1.00)	(1.20)	(1.25)
2	Chemical control	0.55	0.60	0.57
		(1.11)	(1.14)	(1.13)
3	Untreated control	1.00	1.10	1.05
		(1.21)	(1.35)	(1.45)
	SE±	0.10	0.08	0.09
	CD at 5%	0.31	0.33	0.28

Figures in parentheses are $\sqrt{x+0.5}$ transformed values

Effect of different IPM modules on population of spiders

During *khariif* 2010-11 presented in Table 4, untreated control recorded highest population of (1.60 spiders / 5 plants) followed by (1.20 spiders / 5 plants) in MAU IPM module. Significantly lowest population of (0.70 spiders / 5 plants) was observed in chemical control treatment. Whereas during *khariif* 2011-12, untreated control recorded highest population of (1.40 spiders / 5 plants) spiders followed by MAU IPM module (1.30 spiders/5 plants). Significantly lowest population of (0.80 spiders / 5 plants) was observed in chemical control treatment. Results based on the pooled data revealed that untreated control recorded highest population of (1.50 spiders / 5 plants) which was at par with MAU IPM module (1.25 spiders / 5 plants). On the contrary significantly lowest population of (0.75 spiders / 5 plants) was observed in chemical control. Results obtained during present investigation are in conformity with those of Ameta *et al.* (2004) who observed that IPM module supported higher population owing to non chemical formulations. Similarly Dhawan *et al.* (2009) observed higher population of natural enemies in IPM as compared to non IPM. Bhute

(2010) recorded (1.11 spiders/plants) in untreated control which was significantly superior over all other modules and at par with BIPM module (0.93 spiders/ plant).

Table 4. Effect of IPM modules on the population of spiders

Sr. No.	Modules	No. of spiders per 5 plants		
		2010-11	2011-12	Pooled
1	MAU IPM module	1.20*	1.30	1.25
		(1.41)	(1.48)	(1.45)
2	Chemical control	0.70	0.80	0.75
		(1.04)	(1.12)	(1.00)
3	Untreated control	1.60	1.40	1.50
		(1.80)	(1.83)	(1.74)
	SE±	0.08	0.07	0.11
	CD at 5%	0.26	0.23	0.35

Figures in parentheses are $\sqrt{x+0.5}$ transformed values

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