FIELD EFFICACY OF BIOPESTICIDES ALONE AND IN COMBINATION WITH INSECTICIDES AGAINST BRINJAL SHOOT AND FRUIT BORER AND NATURAL ENEMIES

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ABSTRACT

A study was made for two successive seasons during 2011 and 2012 to access the bio-efficacy of bio-pesticides against shoot and fruit borer and natural enemies on brinjal.The treatmentsprofenophos (40%) + cypermethrin (4%) 0.04 per cent, NSKE 5 per cent and neemazal 0.005 per cent were found most effective against the pest with minimum shoot and fruit infestation on both number and weight basis. NSKE 5 per cent and neemazal 0.005 per cent were found as a safest treatment on brinjal.

KEY WORDS: Bioefficacy, biopesticides, brinjal shoot and fruit borer,natural enemies

INTRODUCTION

Brinjal, *Solanummelongena* Linnaeus, commonly known as egg plant is an important vegetable crop cultivated since ages.It is widely grown all over the globe including India for its immature tender fruits. South-East Asia, probably India, is the native of brinjal. In Gujarat, the crop is cultivated in almost all the districts occupying an area of about 0.62 lakh hectares with production of about 10.46 lakh metric tones. In Junagadh, the area under cultivation of brinjal is about 0.082 lakh hectares with production of about 1.16 lakh metric tones (Anonymous, 2009). A major constraint in vegetable production is poor and inadequate control of pests and diseases, which cause high yield losses (Tindall, 1983). Shoot and fruit borer, *L. orbonalis* (Lepidoptera: Pyralidae) is the key pest throughout Asia (Purohit and Khatri, 1973; Kuppuswamy and Balasubramanian, 1980; Allam*et al*., 1982). In India, this pest has a countrywide distribution and has been categorized as the most destructive and the most serious pest causing huge amount of losses of brinjal (Patil, 1990). In this context, a strategy like use of bio-pesticides has come up into vogue during the last two decades. Bio-pesticides have high target selectivity, environmental compatibility, economic viability, novel mode of action and are considered much safer to environment and other beneficial organisms as well as rational approach at a long run. Like all microorganisms, entomopathogenic fungi have specific biological characteristics that influence their activity in the environment (Parker *et al*., 2003). Realizing this and appreciating the needs of perishable goods for safer and biodegradable products, emphasis is in favour of bio-pesticides (Patel *et al*., 1993). Presently, more emphasis is being given to the development of suitable integrated pest management strategies, based on ecological principles.

MATERIALS AND METHODS

Field trials were conducted at the Instructional Farm, Junagadh Agricultural University, Junagadh during *rabi* 2011 and 2012. The experiments were laid out in Randomized Block Design with three replicationsand twelve treatments. The brinjal cv. JBGR-1 was transplanted with the spacing of 90 cm x 60 cm in a plot size of 3.6 m x 3.0 m and 1.8 m x 1.8 m, gross and net plot, respectively. Two sprayings were carried out; first at the appearance of the pest and second at 15 days interval as well as subsequent sprays on need base. Different bio-pesticides evaluated for their bio-efficacy against brinjal shoot and fruit borer, *L. orbonalis*are presented in Table 1. Five plants were randomly selected from net plot area of each plot and tagged for recording the incidence of shoot and fruit borer, *L. orbonalis* as well as the incidence of natural enemies. The observations were recorded one daybefore the spray as well as one, three and five days after each spray. The harvested fruits of each plot were carefully observed after each picking to ascertain fruit infestation and percentage fruit infested was worked out. Observation on natural enemies was recorded by counting the number of adults from selected plants. The natural enemies observed during the season were coccinelids and green lace wing.

RESULTS AND DISCUSSION

Shoot infestation

Results indicated that the treatment profenophos (40%) + cypermethrin (4%) 0.04 per cent found significantly effective in lowering down shoot infestation (2.33%) due to brinjal shoot and fruit borer, *L. orbonalis*. However, it was statistically at par with neemazal 0.005 per cent with 4.39 per cent shoot infestation. The untreated check recorded significantly highest shoot infestation of 28.36 per cent (Table1).

Fruit infestation

The fruit infestation due to shoot and fruit borer in various treatments varied from 4.09 to 27.84 per cent on number basis, whereas it was varied from 7.42 to 36.41 on weight basis (Table1).The lower (4.09%) fruit infestation on number basis due to *L. orbonalis* was recorded in the treatment of profenophos (40%) + cypermethrin (4%) 0.04 per cent and found as a most effective treatment for fruit infestation on number basis.It was statistically at par with neemazal 0.005 per cent with 5.75 per cent fruit infestation. The untreated check recorded highest fruit infestation of 27.84 per cent.

On the other hand, the result of fruit infestation on weight basis revealed that the lower fruit infestation of 7.42 per cent due to brinjal shoot and fruit borer, *L. orbonalis* was recorded in the treatment of profenophos (40%) + cypermethrin (4%) 0.04 per cent which was the lower than other treatments and it was statistically at par with NSKE 5 per cent with 10.15 per cent fruit infestation.

The effectiveness of neem against the pest has been reported by several workers in brinjal Singh (2003) reported that the incidence and yield recorded in basal application of neem cake with foliar application of neem oil showed lower incidence against brinjal shoot and fruit borer. Spinosad was found effective against shoot and fruit borer in brinjal (Sinha and Sharma, 2008). Emamectin benzoate was found effective against shoot and fruit borer in brinjal (Prasad Kumar and Devappa, 2006; Anil and Sharma, 2010).

Natural enemies

The per cent reduction in the population of natural enemies after first and second spray is reported in Table 2. The results revealed that after spray, the significantly minimum (2.12%) mortality of the natural enemies was recorded on one day, 1.16 per cent on three day and 0.63 per cent after five day in the control. Itwas statistically at par with the treatment of NSKE 5 per cent with the per cent mortality of 2.89 per cent after one day, 1.65 per cent after three day and 1.23 per cent five day after second spray. After second spray, the significantly minimum (2.85%) mortality of the natural enemies was recorded on one day, 1.67 per cent on three day and 0.70 per cent after five day in the control. Itwas statistically at par with the treatment of NSKE 5 per cent with the per cent mortality of 3.97 per cent on one day, 3.19 per cent after three day and 1.65 per cent five day after second spray.

Earlier, the safetyness of neemto natural enemies and beneficial arthropods had been reported by Mishra and Mishra (2002) and found that the predatory coccinellids and spiders were active in the bio-pesticide treated plants. The present results are in accordance with Sharma and Kaushik (2010), who reported that Spinosad proved as a safe to the natural enemies such as *Encarcialutea*, *Chrysoperlacarnea* and lady bird beetle.

CONCLUSION

The conclusion can be made based on the results found in the present investigation that the treatment profenophos (40%) + cypermethrin (4%) 0.04 per cent was found to be most effective treatment for management of brinjal shoot and fruit borer, as it minimizes the infestation on both shoot and fruit of brinjal.

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Table 1: Per cent shoot infestation, fruit infestation (on number basis) and fruit infestation (on weight basis) due to shoot and fruit borer, *L. orbonaliS* infesting brinjal

Sr. No.	Treatments	Per Cent Shoot Infestation	Per Cent Fruit Infestation	
			On Number basis	On Weight Basis
		Pooled Over Two Years		
1	*V. lecanii* @ 2.5 kg/ha	26.50 (19.91)	24.02 (16.56)	28.29 (22.46)
2	*M. anisoplae* @ 2.5 kg/ha	25.77 (18.91)	25.44 (18.45)	29.59 (24.39)
3	*B. bassiana* @ 2.0 kg/ha	23.27 (15.60)	22.90 (15.15)	27.33 (21.07)
4	*Bt* @ 2.0 kg/ha	20.29 (12.02)	19.90 (11.59)	26.15 (19.42)
5	Spinosad 0.01%	15.18 (6.85)	14.69 (6.43)	20. 33 (12.08)
6	Emamectin benzoate 5%	15.94 (7.54)	15.46 (7.11)	21.18 (13.06)
7	Cartap hydrochloride 0.1%	17.50 (9.05)	16.98 (8.53)	22.89 (15.13)
8	NSKE 5%	13.89 (5.77)	14.20 (6.02)	18.58 (10.15)
9	Neemazal 0.005%	12.10 (4.39)	13.87 (5.75)	19.90 (11.58)
10	Profenophos (40%) + Cypermethrin (4%) 0.04%	8.78 (2.33)	11.66 (4.09)	15.81 (7.42)
11	Control (water spray)	28.77 (23.16)	27.61 (21.48)	31.57 (27.41)
12	Control	32.18 (28.36)	31.85 (27.84)	37.12 (36.41)
	S. Em ±	1.44	1.17	1.07
	C. D. at 5%	4.12	3.34	3.06
	CV%	17.66	14.41	10.57

***Note:** Figures in the parentheses are retransformed values, while outside are angular transformed values.*

Table2: Safety of bio-pesticides to natural enemies on brinjal after first and second spray

Sr. No.	Treatment	Per Cent Reduction in the Population of Natural Enemies (Pooled Over Years)					
		First Spray			Second Spray		
		1 DAS	3 DAS	5 DAS	1 DAS	3 DAS	5 DAS
1	*V. lecanii* @ 2.5 kg/ha	13.26 (5.26)	11.80 (4.18)	9.51 (2.73)	14.55 (6.31)	13.12 (5.16)	11.48 (3.96)
2	*M. anisoplae* @ 2.5 kg/ha	14.88 (6.60)	13.62 (5.54)	12.05 (4.36)	16.04 (7.63)	14.75 (6.48)	13.33 (5.32)
3	*B. bassiana* @ 2.0 kg/ha	14.26 (6.07)	12.99 (5.05)	11.43 (3.93)	15.44 (7.09)	14.12 (5.96)	12.69 (4.83)
4	*Bt* @ 2.0 kg/ha	18.53 (10.10)	17.55 (9.09)	16.41 (7.99)	19.47 (11.11)	18.40 (9.97)	17.31 (8.85)
5	Spinosad 0.01%	18.82 (10.41)	17.85 (9.40)	16.74 (8.29)	19.75 (11.42)	18.70 (10.28)	17.62 (9.16)
6	Emamectin benzoate 5%	20.06 (11.76)	19.14 (10.76)	18.10 (9.65)	20.94 (12.77)	19.94 (11.63)	18.92 (10.52)
7	Cartap hydrochloride 0.1%	21.21 (13.08)	20.33 (12.08)	19.34 (10.97)	22.05 (14.09)	21.09 (12.95)	20.12 (11.84)
8	NSKE 5%	9.78 (2.89)	7.39 (1.65)	6.36 (1.23)	11.50 (3.97)	9.67 (2.82)	7.39 (1.65)
9	Neemazal 0.005%	10.41 (3.27)	8.61 (2.24)	5.72 (0.99)	12.01 (4.33)	10.29 (3.19)	8.62 (2.25)
10	Profenophos (40%) + Cypermethrin (4%) 0.04%	25.19 (18.11)	24.04 (16.60)	21.95 (13.97)	25.95 (19.15)	25.00 (17.86)	23.91 (16.43)
11	Control (water spray)	8.38 (2.12)	6.19 (1.16)	4.55 (0.63)	9.73 (2.85)	7.41 (1.67)	4.78 (0.70)
	Control	0.81 2.32 12.53	0.75 2.15 12.69	0.77 2.19 14.55	0.79 2.26 11.38	0.82 2.34 12.79	0.74 2.12 12.78

Where, DAS- Days after spray

Note: Figures in the parentheses are retransformed values, while outside are angular transformed values.

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