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An on Farm Trail and Front Line Demonstration on Management of Pod Borer Complex in Pigeon Pea

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Authors' contributions

This work was carried out in collaboration among all authors. Author VR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GV, BS, KAS, PJMR and PRR managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The study was undertaken on management of pod borer complex in redgram, *Cajanus cajan* by erecting of pheromone traps for monitoring of *Helicoverpa armigera* @ 4/ac. Spraying azardiractin 1500 ppm @ 5ml/ l, two sprays with 10 days interval during flower initiation stage. Spaying of Bt @ 2g/l at 25 per cent flowering stage of the crop followed by need based application of emamectin benzoate 0.4 g/l at flowering and pod formation stage was done in 5 locations for an on farm trial and 10 locations for front line demonstration in Bhadradri Kothagudem district of Telangana State during *Kharif* 2018 and 2019, respectively. The cost benefit ratio (BC Ratio) was higher in technology demonstrated plots with 2.5:1 and 2.3:1 whereas BC ratio was lower comparatively in farmers practiced plots with 1.8: 1 and 1.9:1 in corresponding *Kharif* 2018 and 2019.

Keywords:Helicoverpa armigera; Maruca vitrata; redgram.

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1. INTRODUCTION

Pulse are the rich source of vegetable protein called as poor man's meat for the underprivileged people who cannot afford animal proteins or particularly in regions where meat and dairy are not economically accessible. India is the world's largest producer and consumer of pulses including pigeon pea. However, pulses production has been stagnant over the last two decades due to several reasons. Amongst them, insect pests is one of the major constrains for poor productivity of pigeon pea. About 250 insect species belonging to 8 orders and 61 families have been found to infest pigeon pea from seedling to harvesting stage and virtually no plant part is free from insect infestation [1]. The production of pigeon pea is the damage caused by insect pests with avoidable losses extending up to 78 per cent in India [2]. A large number of insect pests has been reported which attack pigeon pea crop in India but only a few are responsible for economic losses and so can be regarded as major pests. The most important pests those attack at flowering and pod formation stage of the crop are pigeon pea pod borer, *Helicoverpa armiger* and spotted pod borer, *Maruca vitrata*. Damage to pods due to the borer complex was reported to be 20 to 72 per cent. In long duration varieties *H. armigera* infestation of 15.6 per cent was recorded, whereas, *M. vitrata* infestation was upto 16.4 per cent in short duration varieties [3]. Due to the adoption of improper management practices, imbalanced and indiscriminate use of insecticides farmers getting low yield and income [4]. Hence, the present on farm trail and frontline demonstration were taken up to demonstrate the impact of integrated crop management practices and create awareness among the farmers on increasing the yield and income.

2. MATERIALS AND METHODS

The present study was undertaken at five locations for an on farm trial and ten locations for front line demonstration during *Kharif* 2018 and 2019, respectively in different farmers fields of in Laxmidevipally and Sujathanagar divisions of Bhadradri Kothagudem Districts of Telangana. The spraying of synthetic pyrethroidsafter noticing the insects (Farmer practice). In demo plot the erection of pheromone traps for monitoring of *Helicoverpa armigera* @ 4/ac. Spraying azardiractin 1500 ppm @ 5ml/ l, two sprays with 10 days interval during flower initiation stage. Spaying of *Bacillus thuringiensis* @ 2g/l at 25 per cent flowering stage of the crop followed by need based application of emamectin benzoate 0.4 g/l Economic Threshold Level : 2-3 eggs per plant or 2 early instar/10 plants or 1 matured larva/ 10 plants of *H. armigera* and 3 webs / plant or 5 larva /10 plants of *M. vitrata* at flowering and pod formation stage was done in 5 locations for an on farm trial and 10 locations during *Kharif* 2018 and 2019, respectively. Observations on *M. vitrata* and *H. armigera* larvae was recorded at the mid period of flower initiation to maturity from 50 randomly selected plants. The trend of population build-up of the borer was determined by working out the mean number of larvae/plant. The observations were recorded as number of larvae per plant and the per cent pest incidence was calculated. To find out the economic impact of treatments on pest incidence, pigeon pea yield and cost benefit ratio were calculated.

3. RESULTS AND DISCUSSION

Results revealed that the incidence of the pests *i.e H. armigera* and *M. vitrata* was lower in the fields assessed and demonstrated by erecting of pheromone traps for monitoring of *Helicoverpa armigera* @ 4/ac. Spraying azardiractin 1500 ppm @ 5ml/ l, two sprays with 10 days interval during flower initiation stage. Spaying of Bt @ 2g/l at 25 per cent flowering stage of the crop followed by need based application of emamectin benzoate 0.4 g/l at flowering and pod formation stage at the mid period of flower initiation to maturity with pests incidence of *H. armigera* and *M. vitrata* is 9.4 and 2.4 during *Kharif* 2018 and 9.2 and 3.5 during *Kharif* 2019. The higher per cent of pests incidence *i.e H. armigera* and *M. vitrata* was observed in farmer practiced plots with 16.2 and 4.6 per cent during *Kharif 2*018 and 18.0 and 6.7 per cent during *Kharif*2019, respectively Table 1.

The yield was higher in technology assessment plots with 1348 (kg/ha) and technology demonstrated plots 1410 (kg/ha) in *Kharif* 2018 and 2019, respectively whereas lower yield was recorded in farmers practiced plots with 1210 (kg/ha) and 1250 (kg/ha) in *Kharif* 2018 and 2019 respectively. The per cent of increase in technology assessment plots and technology demonstrated plots when compared with the farmers practiced plots was 11.4 and 12.8 in *Kharif* 2018 and 2019, respectively.

The net returns was higher in technology assessment plots with Rs. 46168/- and

technology demonstrated plots Rs. 50460/- in *Kharif* 2018 and 2019, respectively whereas net return was lower comparatively in farmers practiced plots with Rs. 34640/- and Rs. 37580/- in *Kharif* 2018 and 2019, respectively.

The benefit cost ratio (BC Ratio) was higher in technology assessment plots with 2.50: 1 and technology demonstrated plots with 2.61:1 in *Kharif* 2018 and 2019, respectively whereas benefit cost ratio (BC Ratio) was lower in farmers practiced plots with 2.00: 1 and 2.07:1 in *Kharif* 2018 and 2019, respectively.

It is evident from Table 3 that pests incidence in term of percentage and correlation coefficient between different weather parameters revealed that the maximum and minimum temperatures were positively correlated whereas rainfall was negatively correlated in both *Kharif* 2018 and *Kharif* 2019.

For successful management of pod borer complex under field condition cultural methods and insecticides efficient [5]. Pheromone traps helped to monitor the incidence of pod borer, there by demo plot could manage this pest in time before it reached to Economic injury level. In present investigation yield improvement in technology assessment plots with 1348 (kg/ha) and technology demonstrated plots 1410 (kg/ha) might be due to spraying of bio pesticides *i.e.* neem oil and Bt formulation and timely spray of new generation insecticide. Where as in case of farmers practice yields were affected by lack of awareness on technology and spraying of insecticides after the notice of damage symptoms. This is conformity with, Chandrayudu et al. [6], Chittibabu et al. [7] and Gopali et al. [8]. Borah and Dutta [9] had also reported a positive and significant correlation of *H. armigera* larvae with the maximum and minimum temperatures. Sahoo and Behera [10] and Jat et al. [11] had reported a positive correlation between populations of *M. vitrata* and the minimum and maximum temperatures, whereas, population of pod borers was adversely affected by the intensity of rain fall. Keval et al. [12] indicated that population of *H. armigera* exhibited a significant positive correlation with maximum temperature (r = 0.753), minimum temperature (r = 0.583).

Demo plot examination *Kharif* 2018 -19 **Kharif 2019-20**

Table 1. Pests incidence (%) at different locations during *Kharif* 2018 and *Kharif* 2019

Locations	Pest incidence	Locations (Pests incidence in percentage)										Mean (%)
		1	2	3	4	5	6	7	8	9	10	
Kharif 2018 (Farmers practiced plots)	*H. armigera*	18	12	18	18	15	-	-	-	-	-	16.20
	M. vitrata	6	4	3	7	3	-	-	-	-	-	4.60
Kharif 2018 (Technology Assessment plots)	*H. armigera*	10	13	9	7	8	-	-	-	-	-	9.40
	M. vitrata	2	1	5	3	1	-	-	-	-	-	2.40
Kharif 2019 (Farmers practiced plots)	*H. armigera*	18	22	15	12	19	16	22	18	19	19	18.00
	M. vitrata	8	5	8	5	9	4	4	6	8	10	6.70
Kharif 2019 (Technology Demonstrated plots)	*H. armigera*	10	8	10	12	8	7	12	12	5	8	9.20
	M. vitrata	4	2	4	1	2	8	5	3	4	2	3.50

Table 2. Economic impact of experiment during *Kharif* 2018 and *Kharif* 2019

	Kharif 2018		*Kharif* 2019	
	Farmers practiced plot	**Technology Assessment plot**	**Farmers practiced plot**	**Technology Demonstrated plot**
Yield (Kg/ha)	1210	1348	1250	1410
Per cent increase over farmers practice	11.4		12.8	
Net Return (Rs.)	34640	46168	37580	50460
B:C ratio	2.0:1	2.5:1	2.07:1	2.61:1

Table 3. Correlation of weather parameters with pest incidence (%)

Season	Larval population	Correlation coefficient values (r)		
		Maximum temp. (°C)	Minimum temp. (°C)	Rainfall (mm)
Kharif	*Maruca vitrata*	0.80	0.66	- 0.69
2018	*Helicoverpa armigera*	0.84	0.73	- 0.82
Kharif	*Maruca vitrata*	0.75	0.32	-0.75
2019	*Helicoverpa armigera*	0.91	0.42	-0.61

4. CONCLUSION

It is unambiguous to conclude that the adoption of improved package of practices for management of pod borers in pigeon pea may result in higher productivity per unit area. An efficient IPM intervention at right stage helped in effective pest management.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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