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Integrated Pest Management Module against Pod borer Complex in Pigeon pea (*Cajanus cajan* L.)

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ABSTRACT

A study on integrated pest management (IPM) module towards pod borer complex in pigeon pea was conducted during the year 2019-20 at Agricultural Research Station, Virinjipuram with an objective to assess its yield and economic benefits of the module. The results revealed that there was a remarkable decrease in pod borer population taken at different stages of crop growth *viz.,* flowering, pod-formation and at pod-maturity. The larval population of *H. armigera* (6.43 No/plant) and *M. vitrata* (11.0 No/plant) were reported in farmers' practice. However, the highest larval population of *H. armigera* (13.0 No/plant) and *M. vitrata* (14.4 No/plant) was reported in untreated check (control) with the lowest in IPM module. At the time of harvest, pod damage due to different pod borers *viz., H. armigera, M. vitrata and M. obtusa* were recorded in IPM module, farmers' practice and untreated check. Among the podborers the highest per cent damage was caused due to *M. obtusa* in all the three modules tested and reported as IPM (10.29), farmers' practice (17.14) and untreated (19.43). The reduction in the larval population and pod damage in IPM treated plots resulted in significant increase in yield (1325 kg/ha) followed by farmers' practice (1045 kg/ha) and in untreated check (757 kg/ha). The difference in the yield increase was noticed due to an additional investment of Rs.4000/ha towards IPM module and Rs.2500/ha towards farmers' practice. The excess expenditure incurred resulted in the highest net return of Rs. 44,375/-ha in IPM module as compared to farmers' practice with Rs.23,260/-ha with the lowest return in untreated check (Rs.17135/- ha).

Key Words: Pigeonpea, IPM module, Farmers practice, Management, Podborer complex.

INTRODUCTION

Pigeon pea (*Cajanus cajan,* L.) is the second most important pulse crop in India after chickpea. India is the largest producer in the world with 26 per cent share in the global production by producing 25.23 Mt of pulses from an area of 29.99 Mha. The losses due to insect pests are much higher in pulses due to the feeding of economic parts *viz.,* buds, flowers and pods. Among the insect pests, legume pod borer, *Maruca vitrata* (Geyer), gram pod borer, *Helicoverpa armigera* (Hubner) and pod fly, *Melanagromyza obtusa* (Malloch) are the major biotic constraints in increasing the production and productivity under subsistence farming conditions of pigeon pea irrespective of agro ecological zones. The potential damage of pod borer complex had been avoided due to timely application of the new insecticide molecule like flubendiamide and chlorantraniliprole (Rajabaskar and Natarajan, 2018). Further, (Randhawa and Verma, 2011) reported that 26-28 per cent flower damage due to *M. vitrata* alone. Management of all these above insect pests is complicated as the crop get affected by three groups of insects with different biology and variable population dynamics occurring throughout the year across wider geographical areas. Sole reliance on chemical pesticides led to the development of resistance and resurgence of secondary pests. Due to pesticide resistance in podborer complex (Kranthi *et al*, 2002) and subsequent promotion of integrated pest management (IPM), the need for the development

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of safe, economic and effective pest management strategies have become serious issues. Keeping this in view, the components of IPM module along with farmers' practice were tested to assess its yield on pigeonpea and economical impact

MATERIALS AND METHODS

On-farm testing of IPM module in pigeon pea was carried out Agricultural Research Station, Virinjipuram, Vellore district during *kharif* season 2019-20 with three components *viz.,* IPM module, farmers' practice and untreated check without plant protection measures. Under each module, an area of 20 cents were taken in to account and recommended package of agronomic practices were followed and plant protection measures (Table 1). Observations on insect population of *H. armigera* and *M. vitrata* were taken at flowering, pod-formation and pod-maturity stage in twenty five randomly selected plants. Pod damage due to podborers was calculated at harvest and per cent pod damage was calculated by using the formula (Naresh and Singh, 1984). The yield data was obtained from different plots by random crop cutting method and per cent yield increase were calculated by using the following formula as given below. The data thus obtained were subjected to AGRES analysis (Gomez and Gomez 1984).

$$\text{Percent pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

$$\text{Percent increase yield} = \frac{\text{Yield in treated plots} - \text{Yield in untreated plots}}{\text{Yield in untreated plots}} \times 100$$

RESULTS AND DISCUSSION

The results (Table 2) revealed that there was a remarkable decrease in pod borer population taken at different stages of crop growth. The larval population of *H. armigera* and *M. vitrata* ranged from 1.14-1.43 and 1.86- 5.6 numbers per plant, respectively in IPM module. The larval population of *H. armigera* (6.43 No/plant) and *M. vitrata* (11.0 No/plant) was reported in farmers' practice with the highest larval population of *H. armigera* (13 .0 Nos/plant) and *M. vitrata* (14.4 Nos./plant) in untreated check (control). At the time of harvest, pod damage due to different podborers viz., *H.armigera*, *M.vitrata* and *M.obtusa* were recorded in IPM module, farmers' practice and untreated check. Among the different pod borers damage recorded, the highest damage was caused due to *M. obtusa* in all the three modules tested and reported as IPM (10.29%), farmers' practice (17.14%) and untreated (19.43 %). However, the results also revealed that the lowest total pod damage due to different pod borers was reported in IPM (22.29 %) with the highest in untreated (59.57%). The reduction in the larval population and pod damage in IPM treated plots resulted in the significant increase in grain yield (1325 kg/ha) followed by farmers' practice (1045 kg/ha) and in untreated check (757 kg/ha) (Table 3). The increase in grain yield was due to an additional investment of Rs.4000/-ha towards IPM module and farmers' practice (Rs.2500/-ha). The excess expenditure incurred resulted in the highest net return of Rs.44,375/-ha in IPM module as compared to farmers practice with Rs.23,260/-ha and in untreated check resulted in the lowest net return of Rs.17135/-ha. The highest yield obtained under improved technologies compared to farmers' practice reflected in the additional return was also reported by (Lathwal, 2010 and Raj *et al,* 2013).

CONCLUSION

The findings clearly revealed that IPM module will bring significant increase in the yield of pigeonpea with IPM interventions *viz.,* growing podborer tolerant variety, two rows of maize as a border crop, installation of pheromone traps and bird perches with the application of botanical based insecticide azadirachtin 1% at vegetative

Table 1. Components of IPM module and farmers' practice.

Sr.No	Particular	IPM module	Farmers' practice	Untreated check
1.	Variety	Pod borer tolerant variety CO (Rg) 8	LRG 41	LRG 41
2.	Border crop	Two rows of maize	-	-
3.	Pheromone trap for *H.armigera*	12 traps/ha	-	-
4.	Bird perches	50 /ha	-	-
5.	Vegetative stage	Azdirachtin 1% @ 500 ml/ha	-	-
6.	Bud-initiation stage (50%)	Chlorantraniliprole 18.5 SC @150 ml/ha	-	-
7.	Flowering stage	Flubendiamide 480 SC@125 ml/ha	Chlorpyriphos 20 EC@1000ml/ha	-
8.	Pod maturation stage	Dimethoate 30 EC @1000ml/ha	Chlorpyriphos 20 EC@1000ml/ha	-

Table 2. Evaluation of IPM module towards podborer complex in pigeonpea.

Treatment	Flowering stage (No/ plant)		Pod formation (No/ plant)		Pod damage (%)			Total pod damage (%)
	H.armigera	*M.vitrata*	*H.armigera*	*M.vitrata*	*H.armigera*	*M.vitrata*	*M.obtusa*	
IPM module	1.43	5.86	1.14	1.86	5.14	6.86	10.29	22.29
Farmers' practice	6.00	11.00	6.43	10.71	13.71	16.57	17.14	47.42
Untreated check	7.14	13.00	8.00	14.43	27.14	13.00	19.43	59.57
SED	0.45	0.73	0.57	1.42	2.35	2.67	2.53	-
CD<0.5%	0.98	1.59	1.25	3.10	5.13	5.18	5.52	-

stage as a oviposition deterrance, application of chlorantraniliprole and flubendiamide at critical stages of pod borer appearance during bud initiation and flowering stages.

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Table 3. Impact of economics with the adoption of IPM module towards podborer complex in pigeonpea.

Particular	Grain Yield (Kg/ha)	Yield increase over check (%)	Cost of cultivation (Rs./ha)	Additional investment for Plant protection(Rs./ha)	Gross Income (Rs./ha)	Net return (Rs./ha)	Profit (%)
IPM module	1325	75.03	28500	4000	72875	44375	61.38
Farmers' practice	1046	38.17	27000	2500	57745	30745	44.26
Untreated check	757	-	24500	-	41635	17135	-

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