DOI : 10.5958/2349-4433.2024.00059.7

J Krishi Vigyan 2024, 12(2) : 327-332

Integrated Approaches for the Management of *Helicoverpa armigera* in Hyacinth Bean [*Lablab purpureus* (L.)]

Prasad Y P*, Vinay G M, Shamraj and Divya H V
ICAR JSS Krishi Vigyan Kendra, Suttur, Mysuru, 571129, Karnataka, India

ABSTRACT

Gram pod borer *(Helicoverpa armigera) is* one of the major pest infecting field beans in Mysore district results in more than 80 per cent crop loss. The pest mainly infects the pods which in turn reduces the crop yield and market acceptance. To control this pest, the farmers are using chemicals indiscriminately which increase the cost of production and also harmful to the ecosystem. The present experiment was conducted at 10 farmers field at Hulyalu village, Hunsuru Taluk and introduced the integrated management of gram pod borer technology which involved installation of pheromone traps 20/ha at flowering stage, application of Azadiractin 10000ppm @ 2 ml/l and need based application of Emamectin benzoate 5%SG 0.5 gram per liter. The experimental results indicated that the demonstrated fields were recorded with an average 6.50 per cent pod damage by the pod borer larvae compare to 70 per cent in uncontrolled farmer's field. Meanwhile the significantly a greater number of pods (75.80) per plant were observed in treated plots with yield of 92.10 q/ ha compared to 52.60 pods and 61.30 q/ha in untreated fields, respectively. The overall results and farmers feedback implies that the adoption of integrated pest management technologies for the management of gram pod bore in field bean reduced the cost on pest management by 50 per cent by reduction in the number of sprays (total number of sprays-3) and also improves the yield by 33.44 per cent and market acceptability.

Key Words: Field bean, Gram pod borer, Integrated approaches for pest management, crop yield and economics

INTRODUCTION

Lablab purpureus (L.), commonly known as field bean is one of the ancient leguminous crops cultivated mainly in southern parts of India. It is a perennial herbaceous plant, primarily grown for green pods, while dry seeds are used in vegetable and culinary preparations. The immature pods are eaten as vegetables; they are high in carbohydrates (55%) and proteins (22.4–31.3%) and can serve as a great alternative to animal proteins (Snafi, 2015). In Karnataka, field bean is cultivated in 0.6 lakh ha with an annual production and productivity of 0.5 lakh tones and 892 kg/ha, respectively. Mysuru district is situated in the southern part of the Deccan Peninsula and it forms the southernmost district of Karnataka State in the Indian Union. The district comprises two Agro climatic regions *viz.,* Southern Dry Zone and Southern Transition Zone. Field bean crop is mainly grown in Hunsuru taluk of Mysore district which belong to Southern Transition Zone (Zone 7). The total area under cultivation in Mysore district is 20,069 hectors with average production of 7.66 q/ha (*Anonymous,* 2018).

The major drawback in achieving the potential yield in field bean at Mysore district is the insect pest's damage. Many insect pests severely ravage bean crop's buds, flowers and maturing seeds of bean crop which finally resulting in crop loss and unmarketable. Earlier studies reported that around 55 species of insects and one species of mite feeding on the crop from seedling stage till the harvest in Karnataka (Govindan, 1974). Of these, pod borers are the most important pests regularly causing crop loss to the extent of 80-100% (Reddy *et al,* 2017; Katagihallimath and Siddappaji, 1962), and thus a key Barrier for production and productivity of the crop. The field bean inflorescence is attacked by several species of borers, of which *Exelastis atomosa*, *Adisura atkinsoni* and *Helicoverpa armigera* have been considered as major pests (Mallikarjuna, *et al,*

Corresponding Author's Email - prasuhortico@gmail.com

Table 1. Components of gram pod borer management.

Sr. No.	Particular	Dosage
01	Installation of Pheromone traps at the level of crop canopy	20/ha
02	Azadiractin (Nimbecidine 10000 ppm)	2 ml/liter
03	Emamectin benzoate 5% SG	0.5 gram/liter

2012). Helicoverpa species are polyphagous pests of at least 181 plant species from 49 families including cotton, corn, soybeans, tobacco, tomato, Dolichos bean and chick-pea etc., (Sivakumar *et al,* 2007). The damage inflicted by *H. armigera* is generally limited to flower buds, seeds and pods. High polyphagy, mobility, reproduction rate, and diapause are major factors contributing to its serious pest status and the pest mainly feeds on reproductive structures, growing points such as buds, corn ears, sorghum head and pods of legumes. The damage to these structures will have a direct influence on yield.

The indiscriminate use of the pesticides will lead to development of insecticide resistance, pest resurgence, accumulation of pesticide residue in the final product etc., in order to save the farmers income, to get a good quality produce and for a sustainable agriculture there is a need of integrated pest management in the crop production. This will help the farmers to save their cost and to save the environment. The cryptic behavior of larvae's makes chemical insecticide-based management of pod borers is difficult and challenging. By considering the seriousness of damage caused by the pod borer it is felt necessary to manage major pod borer of field bean by integrated approach. The objective of the present study included demonstration of integrated approaches for the management of gram pod borer by installation of pheromone traps and need based application of insecticides.

MATERIALS AND METHODS

The present investigation was carried out in selected farmer's field at Hulyalu village, Hunsuru Taluk, Mysore district during *Kharif* 2023-24. Hunsuru is situated in Agro climatic region Southern Transition Zone (Zone-7) of Karnataka. All the recommended routine agronomic practices except plant protection measures were followed for raising the field bean crop. The details of the integrated management strategies were mentioned below (Table 1).

The Green funnel pheromone traps were installed @ 20/ha with Heli lure to collect male moths of gram pod borer H. armigera. Polythene cover was tied at the bottom by folding and fastened with stick to prevent the escape of insects. Count was taken by removing the thread at the bottom. Lure was placed in the provision provided for it in the lid of the trap at the center. The spays were initiated after flowering or when there is peak collection of moths in green funnel trap. The bio-pesticide Azadiractin 10000ppm @ 2 ml per liter and Emamectin benzoate 5% SG was sprayed 3 times at 15 days intervals.

In the present study the observation was recorded in each plot on 10 randomly selected and tagged plants. Number of H. armigera larvae was counted on flowers and pods in each selected plant from flowering till the harvest at weekly intervals. The numbers of moths cached by pheromone traps were recorded at weekly interval. For recording observations on pod damage, total and damaged pods from the selected plants were counted at each picking. Pods which are shrunken, deformed and shriveled were considered as damaged pods. Then, the per cent damage was calculated by using below mentioned formula. The yield of green pods was recorded plot wise during each picking, and plot-wise yield obtained was converted into kg/ha.

$$\text{Per cent Pod Damage} = \frac{\text{Number of damaged pods/plants}}{\text{Total Number of pods/plants}} \times 100$$

RESULTS AND DISCUSSION

The results revealed that, green funnel traps installed at the level of crop canopy recorded maximum of 321moths / 8 traps were collected from the flowering to harvest stage in the farmer field. The average maximum number of caches

Fig. 1: Number of *Helicoverpa armigera* moths catches by pheromone trap

Table 2. Average number of moth catches by pheromone traps during *kharif* 2023-24 in relation to Standard Meteorological Week (SMW).

Month	Standard Meteorological Week (SMW)	Average Number of moths caches
October	40	8.20
	41	16.40
	42	13.50
	43	22.90
Oct-Nov	44	35.90
	45	72.70
	46	57.20
	47	36.20
Nov-Dec	48	23.10
	49	14.40
	50	7.50

72.7 moths were recorded among 10 farmers field at 45th Standard Meteorological Week (SMW) coincides with peak flowering to pod formation stage (Table 2). Whereas the minimum number of caches 7.50 were notices during 50th SMW this coincides with pods maturity stage (Figure 1). At the peak flowering stage, we initiated the spraying of Azadiractin 10000 ppm and Emamectin benzoate 5% SG 0.5 gram/liter. The results are in contrast to the findings of Mallikarjuna *et al* (2012) reported that the incidence of *H. armigera* started from beginning of flowering i.e. from bud formation stage to pod maturation stage and it reached peak during third week of November (Pod maturing stage) 2008 with a mean of 80.5 larvae per 10 plants, significantly higher from other weeks. Similarly, Rekha and Mallapur (2007) noticed the peak activity of the gram pod borer pest on field bean during November month. Shinde *et al* (2017) also observed peak incidence of *H. armigera* during second week of November (45th SW) on pigeon pea. Thus, the observations on incidence of *H. armigera* during the study are in accordance with the above reports.

In the present study the per cent pod damage was observed more in farmers plots

Fig. 2: Pod yield and per cent reduction in number of larvae per pod

Table 3. Overall competition between percentage of pod damage and reduction in larvae per plant between farmers practice and technology demonstrated.

Treatment	Before spray	First spray	Second spray	Third spray	Per cent reduction over control
Demonstrated plot	39.72	28.87	17.25	6.50	83.63
Check (farmers practice)	40.84	52.60	68	82	-
Percentage reduction in larval population					
Demonstrated plot	63.50	42.96	64.64	80.09	26.12
Check (farmers practice)	62.68	-	-	-	-

compared to demonstrate one. 3 Sprays were taken in demonstrated plots at 15 days interval and observations were recorded. Before spray the per cent pod damage was 39.72 per cent and it was reduced to 28.87, 17.25 and 6.50 per cent after 1st, 2nd and 3rd spray respectively (Figure 2). The results are in contrast with the findings of Ahmed *et al.* (2020) found Emamectin benzoate @ 1.0 g/ l as the most effective against *M. vitrata* and *H. armigera*. Spinosad 45SC @ 75 ml/ ha followed by Emamectin benzoate 5SG @ 200 ml/ ha were effective against pod borers in lablab and green gram reported by Haripriya *et al* (2021).

The number of larvae per pod was also less in demonstrated plots, whereas maximum number of larvae per plant were observed in untreated control that leads to yield loss and reduces market acceptability. The results of per cent reduction in the larval population for 10 plants reveals that the pre-treatment population varied from 4.3 to 4.8 larvae/plant. The insecticide and botanical/biopesticide sprays at 15 days interval gives best result over control in reducing the larval population of pod borer. After 1st, 2nd and 3rd spray, the maximum larval population reduction was 42.96, 64.64 and 80.09 per cent respectively (Table 4). The results are in accordance with the findings of Khan *et al* (2023) they have observed that installation of pheromone traps 5/ha + need based two sprays of Indoxacarb 14.5 SC@ 1ml/liter showed less fruit infestation of *Helicoverpa armigera* in tomato with increased yield(530q/ha) and BC ratio (1:2.40). Similarly, Shivaraju *et al* (2008), Chittibabu *et al* (2009) and Sonune *et al* (2010) reported that the peak larval activity coincided with peak flowering stage in

Table 4. Yield performance and the cost economics between farmers practice and technology demonstrated.

Particular	Days taken for first harvest	Pods per plant (No.)	Damaged pods (No.)	Pods yield per plant (gm)	Yield (t/ha)	Cost of Cultivation (Rs. /ha)	Gross Return (Rs. /ha)	Net Return (Rs. /ha)	B:C Ratio
Demonstrated plot	56	75.80	9.4	88.5	9.21	55000	180000	125000	3.27
Check (farmers practice)	71	52.60	15.9	64	6.13	65800	132000	66200	2.01

black gram. The present study results were also in conformity with Thejaswi *et al* (2008) they noticed that the incidence of pod borers is peak from second fortnight of November to December first fortnight in field bean at Karnataka and maximum number of larvae per plant were observed at that time.

The yield parameters like number of pods per plant, pod weight and yield per hector are considered for evaluation. During each picking, the yield of green pods was recorded plot wise and was converted into kg/ha. The maximum number of pods per plant (75.80), pod weight (52.60) and average maximum yield was recorded in field beans cultivated by adapting integrated pest management strategies whereas less yield and less number of pods per plant was noticed in untreated control plots. The maximum yield of 92.1 q/ha was recorder in demonstrated plot compare to 61.3 q/ha in untreated plot. The per cent increase in yield over control was 33.44 % (Table 4). The highest benefit cost ratio was recorded in demonstrated fields compared to untreated control plots with 1:3.4 B:C ratio. The similar result was reported by Vaidik *et al* (2023) maximum pod yield was obtained with Emamectin benzoate 5SG (21.75 q/ ha) compare to control 11.11 q/ha. This may be due to less intervention/ minimum number of chemical sprays were taken in the demonstrated plots where in normal farmers plots, they usually take 6 to 8 sprays that will result in more cost incurred in the production. Meena *et al* (2018) obtained maximum yield (16.49 q/ha) in the plots treated with indoxacarb (1.0 ml/lit.) followed by NSKE @ 5.0 ml/lit. (12.22 q/ha). However, the yield obtained from NSKE was comparable to all other treatments but superior than control.

CONCLUSION

Upsurge of pod borer moths' population during November season coincides with peak flowering and pod formation and the effective management of pod borer moths/adults by using pheromone traps helps to manage the pest under economic threshold level without any harmful effects on environment**.** The use of integrated pest management strategy at right time will help to reduce the number of sprays and also reduces the cost of production**.** Reduced pod borer per cent damage and improves pod quality**.** The overall results from the present study indicated that, adaption of integrated pest management strategies will save the cost incurred in production, reduces the harmful effects on environmental flora and fauna, avoid insecticide resistance and improves crop yield as well as farmers income.

ACKNOWLEDGMENT

Very much thankful to ATARI Bengaluru, IIHR Bengaluru and ICAR JSS KVK Senior Scientist and Head in helping me to conduct the present study in the farmers' field and also very much graceful to farmers who are involved in this study and given very much interest and full support during the study.

REFERENCES

Ahmed R N, Uddin M M, Haque M A and Ahmed K S (2020). Field evaluation of microbial derivatives for management of legume pod

borer, *Maruca vitrata (F)*. in yard long bean. *J Entom Zool Stud* **8** (3): 162-166.

Anonymous (2018). https://des.karnataka.gov.in/english.

Govindan R (1974). *Insects of the field bean, lablab niger var. lignosus medikus with special reference to the biology and ecology of the pod borer, A. atkinsoni Moore (Leipdoptera: Noctuidae)*. M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Bengaluru. pp. 1-34.

Haripriya K, Jeyarani S, Mohankumar S and Soundararajan R P (2021). Evaluation of biorational methods against spotted pod borer *Maruca vitrata* (F.) in lablab and green Gram. *Indian J Ento* **83**(2): 269-272.

Katagihallimath S S and Siddappaji C (1962). Observations on the incidence of lepidopteran pod borers of Dolichos lablab and the results of preliminary insecticidal trails to control them. *2nd All India Congress of Zoology* p. 59.

Khan I, Yadav B L, Rathore S S and Singh R (2023). Evaluation of insecticide and pheromone trap efficacy for management of fruit borer (*Helicoverpa armigera*) in Tomato. *J Krishi Vigyan* **11**(Supple): 81-84

Mahalakshmi M S, Sreekanth M, Adinarayana M, Reni Y, Pushpa RAO Y, Koteswara and Narayana E (2016). Incidence, bionomics and management of spotted pod borer [*Maruca vitrata* (Geyer)] in major pulse crops in India-*A review. Agric Rev* **37**(1): 19 - 26.

Mallikarjuna J, Kumar A C T, Chakravarthy A K and Santosh R (2012) Seasonal incidence and abundance of pod borers in Dolichos bean, *Lablab purpureus* L. (Sweet) in Bengaluru, Karnataka, South India. *Current Biotica* **6**(1): 107 - 112.

Rekha S and Mallapur C P (2007). Studies on insect pests of Dolichos bean in northern Karnataka. *Karnataka J Agric Sci* **20**(2): 407 - 409.

Shinde S V, Kadam D R, Sonkamble M M and Kadam B S (2017) Seasonal incidence of pigeon pea pod borers in relation to weather parameters *Agric Update* **12**(3): 648 - 652.

Snafi A E (2015). Therapeutic properties of medicinal plants: A review of plants with anti-inflammatory, antipyretic and analgesic activity. *Int J Pharmacy* **5**(3): 125 - 147.

Vaidik D M, Patel D R and Sankhla P M (2023) Efficacy of insecticides against pod borers of Indian bean. *Indian J Ento* **85**(4): 1012-1015.

Sivakumar S, Rajagopal R, Venkatesh G R, Srivastava A and Bhatnagar R K (2007). Knockdown of aminopeptidase-N from *Helicoverpa armigera* larvae and in transfected Sf21 cells by RNA interference reveals its functional interaction with *Bacillus thuringiensis* insecticidal protein Cry1Ac. *J Biol Chem* **282**: 7312-7319.

Received on 20/4/2024 Accepted on 24/5/2024