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Shivaray Navi
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Shashi Kumar C
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Naresh NT
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Yogesh GS
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Chandrakala Hanagi
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Correspondence
Shivaray Navi
ICAR Krishi Vigyan Kendra, Chamarajanagar, UAS, Bengaluru, Karnataka, India

Evaluation of IPM Package against Pod borer, *Helicoverpa armigera* (Hubner) in Chickpea through Front Line demonstration in Chamarajanagar district of Karnataka

Shivaray Navi, Shashi Kumar C, Naresh NT, Yogesh GS and Chandrakala Hanagi

Abstract
Chickpea, (*Cicer arientinum* L) is an important pulse crop is being cultivated in Chamarajanagar district of Karnataka state during rabi season. The main biotic constraint in the production of this crop is pod borer incidence which causes severe losses. To curtail this problem, Front Line Demonstration (FLD) on Integrated Pest management was conducted with farmers participation (80 farmers) during rabiseason of 2015-16 and 2017-18. Results indicated that lowest number of larvae (1.96/m row) and minimum Percent pod damage (6.57%) was recorded in FLD plot as compared to check plot. The Average technology gap, extension gap and technology index were 9.35 q/ha, 1.75 q/ha and 49.20 percent, respectively. FLD plots recorded highest yield (9.65 q/ha) with higher net profit of Rs 23955.50/ha and benefit cost ratio of 2.10 as against farmers practice

Keywords: Chickpea, IPM, front line demonstration

Introduction
Chickpea, (*Cicer arientinum* L) is an important pulse crop worldwide. India is third largest producer of chickpea (FAO, 2010) [5]. The crop is damaged extensively by gram pod borer (Reed *et al.*, 1980; Lal *et al.*, 1985; Naresh and Malik, 1986) [15, 8, 11]. as it feeds on tender shoots and young pods (Lal, 1996). In addition to making holes in tender pods of the plant it also inserts its half of the body inside the pods to eat developing seeds (Kadam and Patel, 1960) [6]. It is very serious pests and has assumed the status of national pest in India reaching the damage up to 10-30% in grain yield (Quadeer and Singh, 1989) [13] or even up to 60 percent In favorable condition, pod damage goes up to 90-95 percent. On an average 30-40 percent pods were found to be damaged by this pest and an average of 400 kg /ha grain was lost by the borer (Rahman, 1990) [14]. Preference of insecticides depends on their easy availability and applicability but their excessive and indiscriminate use has resulted in the development of insecticidal resistance in the pests and environmental pollution (Phokela *et al.*, 1990) [12]. Recently *H. armigera* is reported to have developed resistance to many commonly used insecticides (Phokel *et al.*, 1990) [12]. The increasing concern for environmental awareness of pesticide hazards has evoked worldwide interest.
Looking to these facts or incidence, there is a need to explore alternatives, encompassing available pest control methods and techniques in order to reduce the sole dependence on insecticides. For this purpose, Integrated Pest Management (IPM) strategies seems to be the most appropriate approach to achieve sustainability in chickpea production. Keeping this in view, attempts have been made to evaluate IPM packages which comprises pheromone traps, bio-pesticides, botanical pesticides and need based insecticides against chickpea pod borer.

Materials and methods
The present study was conducted by the ICAR Krishi Vigyan Kendra, Chamarajanagar, Karnataka in the farmers fields during *rabi* season of 2015-16 and 2017-18 under National Food Security Mission (NFSM) cluster front line demonstration on pulses. Each demonstration was conducted in an area of 0.4 ha and adjacent to the demonstration plot a check plot of 0.4 ha was maintained for the comparison (farmer practice).

The demonstration was conducted under rain fed condition in medium black soils in different villages (Chikkati and Tondawadi, Gundlupet taluka during 2015-16; Kottamballi Village, Chamarajanagar Taluka during 2017-18) by using JAKI 9218 variety in demonstration plot and local variety in farmers practice. Under Integrated Pest Management (IPM) demonstrations, totally 80 demonstrations were conducted in 80 farmers fields covering an area of 32 ha land. Interested farmers were selected and problems were identified through questionnaire. Each year prior to implementation of demonstration, all selected farmers were trained on IPM practices at ICAR Krishi Vigyan Kendra and these selected participants were provided with essential critical inputs. Integrated Pest Management (IPM) practices includes installation of pheromone traps @10/ha (*Helicoverpa armigera* lure),mixing of 200 g of sorghum seeds along with chickpea,use of Bird perches @ 15-20/ac, spraying of neem oil 2ml/l, *Ha*NPV 250LE/ha, Methomyl 1g/l and Indoxacarb 0.3ml/l.

Data on number of larvae per meter row was recorded in 10 randomly selected places in both demonstration and check plots. At maturity, all the pods were collected from 25 randomly selected plants from each plot and examined. The damaged (bored) and total numbers of pods were counted and the percent pod damage was determined using the following formula:

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

The data on production cost, inputs used and monitory returns which are essential for working out the economic feasibility of the recommended technology at experimental station to work out the technology gap, extension gap, technology index. Technology gap, extension gap and technology index were calculated using following formula as suggested by Samui *et al* (2000).

$$\text{Percent increase yield} = \frac{\text{Demonstration yield - farmers yield}}{\text{Farmers yield}} \times 100$$

Technology gap (q/ha) = Potential yield - Demonstration yield

Extension gap (q/ha) = Demonstration yield- yield under existing practice

$$\text{Technology index (\%)} = \frac{\text{Potential yield- Demonstration yield}}{\text{Potential yield}} \times 100$$

Table 1: Observation on Growth parameters in chickpea under FLD.

Year	Germination (%)		Plant height (cm)		No of pods per plant		Pod length (cm)		Pod filling (%)	
	Demo	Check	Demo	Check	Demo	Check	Demo	Check	Demo	Check
2015-16	98.15	97.24	36.52	36.58	70.12	65.25	2.10	1.80	83.58	81.28
2017-18	98.24	96.56	37.07	37.22	69.19	64.75	2.00	1.78	83.03	82.44
Average	98.19	96.90	36.79	36.90	69.65	65.00	2.05	1.79	83.30	81.86

Table 2: Impact of IPM technology on incidence of pod borer, *Helicoverpa armigera* and pod damage.

Year	No. of larvae/meter row		Total No. of pods observed		No. of damaged pods		Pod damage (%)		Damage reduction over check (%)
	Demo	Check	Demo	Check	Demo	Check	Demo	Check	
2015-16	2.10	8.20	100	100	6.80	25.24	6.80	25.24	73.05
2017-18	1.82	7.25	100	100	6.34	23.32	6.34	23.32	72.81
Average	1.96	7.72	100	100	6.57	24.28	6.57	24.28	72.93

Table 3: Impact of Integrated Pest Management practices on yield, technology gap, extension gap and technology index of chickpea grown under FLD

Year	Area (ha)	No. of Demo.	Yield (q/ha) Demo			Farmers practice (FP) (q/ha)	% increase in yield over FP	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Highest	Lowest	Average					
2015-16	12.00	30	8.90	7.00	8.25	6.50	26.92	10.75	1.75	56.57
2017-18	20.00	50	12.50	9.80	11.05	9.29	18.94	7.95	1.76	41.84
Average			10.70	8.40	9.65	7.89	22.93	9.35	1.75	49.20

FP-Farmers practice

Table 4: Impact of IPM Technology on Economics of chickpea under FLD

Year	Gross return (Rs./ha)		Cost of cultivation (Rs./ha)		Net return (Rs./ha)		BC ratio	
	Demo	Check	Demo	Check	Demo	Check	Demo	Check
2015-16	41250	32500	21000	22500	20250	10000	1.96	1.44
2017-18	49761	41849	22100	23400	27661	18449	2.25	1.79
Average	45505.5	37174	21550	22950	23955	14224	2.10	1.61

Results and Discussion

Integrated Pest Management technology was evaluated for the management of pod borer in chickpea through Front Line Demonstration and compared with farmers practice. The data on growth parameters like germination percentage (%), plant height (cm), number of pods per plant, pod length (cm) and pod filling (%) was recorded and presented in Table.1. Germination percentage in demonstration plots was 98.15 percent and 98.24 percent, whereas in check plot it was 97.24 and 96.56 percent during 2015-16 and 2017-18, respectively. When mean of both years were taken, it was 98.19 percent in demo plot and 96.90 percent in check plot. There was no much variation in plant height in both demo and check plots during both the years. When number of pods per plant was considered, there was a slight higher number of pods per plant was recorded in demo plot *i.e.,* 70.12 and 69.19 during 2015-16 and 2017-18 as compared to check plot. There was no much numerical difference in pod length recorded in demo and check plots. From each demo and check plots, pod filling percentage was worked out and results indicated that 83.58

percent and 83.03 percent ; 81.28 percent and 82.44 percent pod filling was observed in demo and check plots during the both the years, respectively. Mean data on pod filling percentage during both the years evidenced that demo plot recorded higher pod filling percentage as compared to check plot (Table 1).

Observation was also made on number of larvae per meter row, number of damaged pods due to pod borer in both demo and check plots. From these observed data pod damage in percentage and damage reduction over check was worked out and presented in Table 2.The results on number of larvae/m row reviled that minimum number of larvae were recorded in demo plots during both the years as compared to check plots (2.10, 1.82 larvae/m row in demo plots and 8.20, 7.25 larvae/m row in check plots, respectively). Low incidence of pod borer was observed in demo plots. This might be due to trapping of male moths and timely spray of insecticides. These finding are in agreement with Agrawal *et al*. (2003) [1] and Tripathi (2014) [1]. Their results evidenced that reduced incidence of pod borer in pigeon pea by installation of pheromone traps; spray of NPV at pre-flowering or podding stage with increase in the yield of pigeon pea at farmers field. First spray given with *H a* NPV followed by neem oil spray killed effectively first appearing of smaller pod borer, and third and fourth spray with Methomyl and Indoxacarb killed both the smaller and larger borers which eventually gave the best protection. The finding of the present study is in accordance with the findings of the Suganthy and Kumar (2000) [4]. Who evaluated different IPM modules comprising of insecticides and bio-pesticides found superior to untreated control. Opined that IPM modules (installation of bird perches and pheromone traps, spray of insecticide at podding stage) are significantly superior over the untreated control both in terms of protection (pod damage 10.86%) and production (yield 14.49 q/ha) of gram. When mean of both the years is worked out, similar trend was evidenced. As the number of larvae per meter row were minimum in demo plots which were able to cause less damage of pods as against in check plots. Regarding Pod damage percentage was considered, meagre percent pod damage (6.57%) was recorded in demo plots, on the other hand 24.28 percent damage was noticed in check plots. The pod borer damage reduction by IPM technology was 73.05 percent and 72.81 percent during both the years compared to that in check plots (Table 2.).

The results obtained during 2015-16 and 2017-18 regarding yield, technology gap, extension gap and technology index are presented in Table 3.The results indicated that highest yield (12.5 q/ha) was recorded in FLD plots as against in check plots (9.29 q/ha) during 2017-18.The pooled mean yield was highest in demo plot (9.65/ha) as compared to farmers practice (7.89q/ha). The results clearly showed that due to knowledge and adoption of scientific practices, the yield of chick pea could be increased by 22.93 percent over the yield obtained under farmers practices. The above findings are in line with findings of Dubey, *et al*. (2010) [4] and Meena, (2010) [10]. The average technology gap (9.35 q/ha) was less than that of FLD programme (9.65q/ha).The technology gap observed may be attributed due to dissimilarity in the soil fertility status, agricultural practices and local climatic condition. Average extension gap was 1.75 q/ha, which emphasized the need to educate the farmers through various extension approaches like FLDs, training programmes and method demonstration *etc.* Lower the value of technology index, more is the feasibility of the technology demonstrated. As such reduction of technology index from 56.57 percent (2015-16) to 41.84 percent (2017-18) exhibited the feasibility of technology demonstrated. The FLD obtained a significant positive result and also provided the researchers an opportunity to demonstrate the productivity potential and profitability of the integrated pest management under real farm situation, which they have been advocating for a long time. Similar findings were reported by Kirar *et al*. (2005) [7]

Net profit was maximum with IPM practice demonstrated plots during both the years (Rs.20250 and Rs.27661) as compared to check plot. Chavan *et al*.(2003) [2] also reported highest grain yield and highest return per rupee investment with IPM module *i.e.* hand collection of larvae and bird perching with three sprays of *Bt*, *Ha* NPV and NSKE.

References

1. Agrawal SC, Singh KJ, Tripathi AK, Integrated pest management in pigeonpea. India J Agric. Sci. 2003; 73(5):291-295.
2. Chavan BP, Binnar YP, Snap MM, Satpute BB. Bio intensive integrated management and chickpea pod borer In: National seminar on frontier areas of Entomological research held on 5-7 November 2003; pp 52-53.
3. Deka NK, Prasad D, Chand P. Succession and incidence of insect pests in chickpea, *Cicer arietinum* L. Giornale Italiano di Entomol. 1987; 3:421-8.
4. Dubey Swapnil, Tripathy Sarvesh, Singh Pradyuman, Sharma Rakesh Kumar. Yield gap analysis of Chick pea production through frontline demonstration. J of Progressive Agriculture. 2010; 1(1):42-44.
5. FAO, 2010:http://pib.nic.in/newsite/erelease.aspx?relid=95758.
6. Kadam MV, Patel GA. The gram pod borer. Direc Pub. Govt. Maharashtra Bombay. Crop pests and how to fight them. 1960, 73.
7. Kirar BS, Mahajan SK, Nshine R, Awasthi HK, Shukla RN. Impact of technological practices on the productivity of soybean in frontline demonstration. Indian Res. J of Ext. Edu. 2005; 5(1):15-17.
8. Lal SS, Yadava CP, Dias CAR Assessment of crop losses in chickpea caused by *H.armigera.* FAO Plant Prot. Bull. 1985; 33:27-35.
9. Lal OP. An outbreak of pod borer, *Heliothis armigera* (Hubner) on chickpea in Eastern Uttar Pradesh, India. J Entmol Res. 1996; 20:179-181.
10. Meena BS. Socio - economic characteristics and technology use pattern of farmers. Agricultural Extension Review. 2010; 1(2):16-17.
11. Naresh JS, Malik VS. Observations on the insect pests of chickpea (*Cicer arietinum* L.) in Haryana. Bull Entomol. 1986; 27:75-77.
12. Phokela A, Dhingra S, Singh SN, Mehrotra KN. Pyrethroid resistance in *Helicoverpa armigera* (Hubner). III Development of resistance in field. Pestic. Res. J 1990; 2(1):28-30.
13. Quadeer GA, Singh YP. Some observations on outbreak of gram pod borer on gram during *Rabi* 1987-88 in Haryana. Plant prot. Bull. 1989; 41:1-2.
14. Rahman MM. Infestation and yield loss in chickpea due to pod borer in Bangladesh. Bangladesh J Agril. Res. 1990; 15 (2):16-23.
15. Reed W, Lateef SS, Sithanantham S. Insect pest management on chickpea. In: Proc. Int. Work. on Chickpea Improvement, 1980, 179-83.