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Assessment of Integrated Pest Management Module for Management of Pod Borer in Chickpea

N. K. Yadav [a*#], Sarita Devi [a#], Dinesh Tiwari [a#] and N. K. Pandey [a#]

[a] Krishi Vigyan Kendra, Lalitpur, Banda University of Agriculture and Technology, Banda, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

A On Farm Trial (OFT) on Assessment of Integrated Pest Management module for management of pod borer in chickpea was conducted at Krishi Vigyan Kendra, Lalitpur. The practices such as cultural and mechanical, biological and need based chemical practices were followed in IPM plot. The IPM practices deep summer ploughing, use of pheromone traps @ 5 traps / ha for Monitoring purpose, Bird perches @ 50/ ha, HaNPV @ 250 LE/ha and Emamectin benzoate @ 220 gm/ha gave average yield 19.85 q/ha as compared to farmers practices i.e 14.5 q/ha. The per cent increase in yield over control was 35.91 and 37.83 during 2020-21 and 2021-22, respectively. The net return was Rs. 73120/-, Rs. 76260/- and Rs. 46550/-, Rs. 47320/- in IPM plot and Non IPM plot during 2020-21 and 2021-22, respectively. The average benefit cost ratio was 3.1 and 1.8 in IPM plot and Non IPM plot, respectively.

Keywords: Chickpea; integrated pest management; pod borer; on farm trial.

[#] *Subject Matter Specialists;*
**Corresponding author: E-mail: nitin_agril@rediffmail.com;*

1. INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the most important pulse crop in the world with production of 14.78 millions tons from an area of 14.56 millions hectares and productivity of 1014.60 kg/ha in 2017 [1]. Chickpea is an important source of energy, protein, Fiber, Vitamins and minerals for vegetarian population. Chickpea plays a significant role in improving soil fertility by fixing atmospheric nitrogen and the crop meets up to 80 per cent of the soil nitrogen needs from symbiotic biological nitrogen fixation, so farmers have to apply less nitrogenous fertilizer than they do for other non-legume crops. India is the world's leading producers of chickpea accounting for 11.23 million tons from the 10.56 million hectares with a productivity of 1063 kg/ha in 2017-18 [2]. In Uttar Pradesh, chickpea crop is cultivated over an area of 0.50 million hectare with an annual production of 0.58 million tones and productivity of 1156 kg/ha [2]. In 2017-18 district Lalitpur produced 17774 metric tons from 13726 hectares area with average productivity 12.95 q/ha [3]. The major biotic stresses viz. gram pod borer, gram semi-looper, termite, wilt, collar rot, black rot, rot, root rot, ascochyta blight and botrytis grey are responsible for low yield of chickpea. Chickpea is attacked by 57 insect species but gram pod borer is key pest that causes heavy economic loss throughout the country [4]. Gram pod borer is a major pest (Kumar et al., 2019) accounting for 21 per cent yield losses and 50-60 per cent pod damage in the crop [5]. It has been estimated that a single larva damages 30-40 pods of chickpea in its life cycle. Therefore, present studies were carried out at farmer field as on farm trial (OFT) to identify existing practices that may help to solve major problems of many farmers in defined areas and also create awareness / establishment of new management technologies available. The on-farm trial conducted under the close supervision of scientists of the KVK.

2. MATERIALS AND METHODS

A on-farm trial on Assessment of IPM module for management pod borer in chickpea was conducted by Krishi Vigyan Kendra, Lalitpur conducted at different villages namely, Raogarh, Jamunia, Jugpura, Jakhlaun and Sindhwaha during rabi season 2020-21 and 2021-22. Technological gap between improved management package and farmers practices were studied based on survey and group discussion with farmer of chickpea growers in the above selected villages. The farmers of these villages had small and marginal land holdings and a total of 8 farmers were selected for on farm trial (OFT) for pod borer management. The experiment was conducted in an area of 0.2 hectare for each farmer and repeated four times with a total area of 1.6 hectares for trials of assessment of IPM practices for pod borer management of chickpea. The chickpea variety RVG 202 was sown with two treatments and four replications. The IPM practices for pod borer management were proper tillage, line sowing, HYV RVG 202, seed treatment with Carbendazim @ 2 gm/kg of seed for management of collar rot and Fusarium wilt and Use of Pheromone trap for monitoring purpose, Bird perches @ 50/ha, spray of HaNPV @ 250 LE/ha and application of Emamectin benzoate 5 % SG @ 220 gm/ha when a critical catch level was reached (5 moths or more / trap). The farmers practices i.e. no use of chemicals for seed treatment, spray of insecticide and non-application of other IPM practices.

Performance of IPM practices against pod borer was observed in terms of the percentage of infested plant per meter row and damage pod due to pod borer on the basis of affected plants and pod in relation to total pods in respective treatment. Benefit cost ratio of each treatment was also assessed. Farmers reactions were observed with the help of personal interview and data on quantitative parameters were recorded and Pod damage per cent and per cent increase yield were calculated by using following Statistical equations [6].

Pod damage per cent= No. of damaged pod / Total No. pod observed x 100

Per cent increase yield = Demonstrated yield - Farmers yield / Farmers yield x 100

BCR= Net Income (Rs) / Gross Cost (Rs.)

2.1 Statistical Analysis

The experiment was analyzed by using Statistical T test for comparison of means with Microsoft excel 2010.

Table 1. Comparison between improved practices and farmers practices under OFT on chickpea

Sr. No.	Particulars	Improved practices	Farmers practices
1	Variety	RVG -202	Local
2	Seed rate	80 kg	100 kg
3	Sowing method	Line sowing with seed drill	Broadcasting
4	Situation	Rainfed	Rainfed
5	Fertilizer dose	NPK 20:60:20 and 20 kg sulphur	100 kg DAP
6	Seed treatment	Carbendazim @2 gm/kg seed	No seed treatment
7	Weed management	One hand weeding	One hand weeding
8	Plant protection measures	Use of IPM Practices	No use of IPM
	Bird perches	50 @ha	-
	Pheromone traps	5 traps /ha	-
	Flowering stage	HaNPV @ 250 LE/ha	Chloropyriphos 20 EC @ 1 lit /ha
	Pod development stage	Emamectin benzoate @ 220 gm/ha	Chloropyriphos 20 EC @ 1 lit /ha

3. RESULTS AND DISCUSSION

The pod borer incidence on chickpea during 2020-21 and 2021-22 was observed in demo and check plots and presented in Table 2. On the basis of these data pod borer per cent and damage reduction over check was calculated. The number of larvae per meter row recorded in demo plots and check plots were 1.4, 1.1 larvae / meter and 6.8, 5.4 larvae / meter during 2020-21 and 2021-22, respectively. The mean No of larvae per meter was significantly less in the demo plots than in check plots during both years. The average no of larvae in demo and check plot recorded 1.3 and 6.1 larvae per meter, respectively. The mean per cent of pod damage were 5.8, 5.0 per cent and 24.2, 20.7 per cent in demo and check plots during 2020-21 and 2021-22, respectively. The mean per cent pod damage significantly less in demo plots than check plots during both 2020-21- 2021-22. The average pod damage per cent were 5.4 and 22.5 per cent in demo and check plot, respectively. The damage reduction over check plot was 76.1 and 75.9 per cent during 2020-21 and 2021-22, respectively. The mean yields were significantly greater in IPM plots than in the non IPM plots. The average yield was 19.8 q/ha in demo plot as well as control plot was 14.5 q/ha. The per cent increase in yield over control was 35.9 and 37.8 during 2020-21 and 2021-22, respectively. The similar findings were Ahmad and Chandel [7] reported treated plot gave 36 per cent increase in yield. Singh et al., [8] also reported the highest average yield i.e. 13.2 to 13.6 q/ha. Singh et al., [9] reported the average yield 17.28 q/ha in demo and 12.06 q/ha in control plot. The present results are in agreement with Ahmad and Chandel [7], Singh et al., [8] and Singh et al., [9].

The data on economic analysis for IPM technology presented in Table 3 revealed a net profit of Rs. 73120/-, Rs. 76260/- and Rs. 46550/-, Rs. 47320/- in IPM and Non IPM plot during 2020-21 and 2021-22, respectively. The average benefit cost ratio was 3.1 and 1.8 in IPM plot and Non IPM plot, respectively. Ahmad and Chandel [7] reported average benefit cost ratio was 3.3 in demonstrated plot, Singh et al., [9] reported BCR 3.3 and 2.8 in demonstration plot and check plot, respectively. Jat et al., [10] reported benefit cost ratio was 3.3 in demo plot and 2.6 in check plot. The present results are in agreement with the findings of Ahmad and Chandel [7], Singh et al., [6] and Jat et al., [10].

Table 2. Impact of IPM technology on pod borer in chickpea

Year	No. of larvae/meter row			Pod damage %			Damage reduction over check %	Yield (q/ha)			Per cent increase in yield
	Demo	Check	P value	Demo	Check	P value		Demo	Check	P value	
2020-21	1.4*	6.8	6.4	5.8*	24.2	3.3	76.1	19.3*	14.2	3.6	35.9
2021-22	1.1*	5.4	8.8	5.0*	20.7	4.5	75.9	20.4*	14.8	5.4	37.8
Average	1.3	6.1	-	5.4	22.5		75.96	19.8	14.5		36.8

**significant result at 5 % level of probability*

Table 3. Impact of IPM technology on economics of chickpea

Year	Gross cost (Rs./ha)		Gross Income (Rs./ha)		Net profit (Rs./ha)		BCR	
	Demo	Check	Demo	Check	Demo	Check	Demo	Check
2020-21	23380	24450	96500	71000	73120	46550	3.1	1.9
2021-22	23700	25200	99960	72520	76260	47320	3.2	1.8
Average	23540	24825	98230	71760	74690	46935	3.1	1.8

4. CONCLUSION

On the basis of the findings study it can be concluded that IPM module will bring significant increase in the yield of chickpea with IPM interventions viz., installation pheromone traps, and bird perches with application of HaNPV @ 250 LE/ha at flowering period, application of Emamectin benzoate 5% SG @ 220 gm / ha at pod development stage.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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