

Original Research Article

Management of gram pod borer, *Helicoverpa armigera* Hub. on chickpea in Saran District, Bihar, India

Abstract:

Field experiment was conducted for management of gram pod borer during *rabi* season in 2019-20 and 2020-21. Two technologies were tested on 8 farmer's field on variety "BG-372". In technology I two spray of profenophos 50% EC @ 1.5 ml/liter of water at 50% flowering time and 50% pod formation time, and technology II use of pheromone trap @ 20/ha at flowering time and spray of sponosad 45 SC @ 0.3ml/liter of water at time of 50% pod formation with compare of farmer's practices spray of quinalphose @ 2ml/liter of water at time of pod formation. The results of two years pooled data revealed that technology option II was most effective against gram pod borer management. Minimum per cent pod infestation was recorded (1.75%) in technology option II followed by technology option I (2.74%) compare with farmer's practices (782%). Similarly, the significantly maximum grain yield was recorded in technology option II i.e. 14.84 q/ha followed by technology option I and farmer's practices i.e. 12.26 q/ha and 9.42 q/ha, respectively. The impact analysis showed that pooled data net return and benefit cost ratio was also higher in technology option II in compared to farmer's practices which was ₹ 52763/ha and 2.48:1, ₹ 28544/ha and 1.55:1, respectively.

Key word: Management, Gram pod borer, chickpea

Introduction:

Gram commonly known as "Chickpea" or Bengal gram is the most important pulses crop of India. In India, chickpea accounts for about 45% of total pulses production. Similar to the case of other pulses, India is the major chickpea producing country and contributing for over 75% of total world chickpea production. The chickpea production in the country has gone up from 3.65 to 9.53 million tons between 1950-51 and 2013-14, registering a modest growth. During the period while the area has also gone up from 7.57 to 9.93 million ha, the yield has steadily increased from 482 kg/ha to 960kg/ha (Maurya and Kumar, 2018). There is steady decline in the area, production and productivity of the crop. The farmers are losing the ground due to heavy

losses from pests and disease. Gram pod borer, *Helicoverpa armigera* (Hub.) is the most damaging pest in most of areas where this pulse crop is grown. *H. armigera* is a charismatic and one of the most dominant insect pests in agriculture, accounting for half of the total insecticides usage in India for protection of crops. This pest damages the chickpea plants from seedling stage to crop maturity stage and its larvae can thrive on leaves, tender twigs, flowers and pods. After pod formation, the larvae bore into the pods and feed on the seed inside and cause considerable loss to seed yield. Its caterpillars feed on young pods by making holes and eat the developing seeds by inserting the half portion of their body inside the pod. It is attacked by more than 250 species of insect, of which pod borer *Helicoverpa armigera* Hubner is the major pest in most parts of the country (Shanower *et al.*, 1999). Excessive and indiscriminate use of pesticides to control these pests has resulted in undesirable ecological changes (Mahapatro and Gupta, 1998). About 20-30% of the chickpea yield can be reduced due to ravages of pod borer (Sarwar, 2012). In view of the above, management of gram pod borer through different chemicals in holistic manner incorporating judicious use of newly introduced modern pesticides seem to be best alternative. Hence, the present investigation was carried out to Management of gram pod borer, *Helicoverpa armigera* Hub. on chickpea in Saran District, Bihar.

MATERIALS AND METHODS

The on farm trails were conducted at eight farmer's field of Saran District (Bihar) for two consecutive years of 2019-20 and 2020-21. The trials were laid out in randomized block design with eight replications. Chickpea crop was sown in last week of October 2019 and 2020. All the agronomical practices recommended to raise the good crops followed. Two technologies were tested on 8 farmer's field on variety "BG-372". In technology I two spray of profenophos 50% EC @ 1.5 ml/liter of water at 50% flowering time and 50% pod formation time, and technology II use of pheromone trap @ 20/ha at flowering time and spray of sponosad 45 SC @ 0.3ml/liter of water at time of 50% pod formation with compare of farmer's practices spray of quinalphose @ 2ml/liter of water at time of pod formation. After treatments observations were made on related problem addressed to average numbers of infested pod per square meter area, per cent pod infestation, weight of harvested grain per square meter (gram) and calculate of total yield per ha. Gross return Rs./ha, net return Rs./ha and cost-benefit ratios were also calculated. Two years

data were pooled and per cent pod infestation and its reduction due to various treatments were transformed to Arc Sine.

Pod damage analysis

$$\text{Per cent pod damage} = \frac{\text{No. of affected pods}}{\text{Total no. of pods}} \times 100$$

Benefit Cost Ratio

Gross return was calculated by multiplying total yield with the market price of the produce. Cost of cultivation and cost of treatment imposition was deducted from the gross returns, to find out net returns and cost benefit ratio by following formula:

$$B : C = \frac{\text{Net returns}}{\text{Total cost of cultivation}}$$

Results and Discussion:

The results showed that the number of infected pod per square meter area and per cent pod infestation counted by *H. armigera* on chickpea. The data pertaining to management of gram pod borer, *H. armigera* through different technology on chickpea crop during 2019-20 and 2020-21 in presented in table 1 and 2. The data revealed that use of technology were significantly superior in compression to farmer's practices. The number of infected pod and per cent pod infestation rage from 47.12 to 153.50 per square meter area and 2.01 to 9.38 per cent pod infestation in 2019-20 and 62.63 to 137.77 per square meter area and 1.49 to 6.26 per cent pod infestation in 2020-2, respectively. Pooled data showed that significantly minimum pod infected (54.88) per square meter in technology option II (use of pheromone trap @ 20/ha at flowering time and spray of sponosad 45 SC @ 0.3ml/liter of water at time of 50% pod formation) followed by 81.37/sq m in technology option I (two spray of profenophos 50% EC @ 1.5 ml/liter of water at 50% flowering time and 50% pod formation time) in compare (145.64 pod/sq m) with farmer's practices (spray of quinalphose @ 2 ml/liter of water at time of pod formation). Similarly, significantly minimum per cent pod infestation showed in technology option II followed by technology option I compare with farmer's practices in both year i.e. 2.01% 3.33% and 9.38% during 2019-20 and 1.49%, 2.14% and 6.26% during 2020-21, respectively. Pooled data was also observed in similar trend. Moreover, significantly maximum grain weight was observed in technology option II followed by technology option I compared with farmer's practices in both respective years i.e. 128.81 g, 105.29 g and 89.48 g per square meter area and

168.57 g, 139.80g and 98.78 g per square meter area during 2019-20 and 2020-21, respectively. In pooled data total yield per hectare also was calculated in technology option II (14.84 q/ha) followed by technology option I (12.26q/ha) and farmer's practices (9.42q/ha). Overall, result farmer's practices was found less effective in checking pod and grain damage due to pod borer in comparison to new molecule insecticides. These results are in conformity with the report of Prasad and Jha (2014) was found minimum pod and grain damage and maximum yield produce in spray of spinosad 45 SC @0.33 ml/liter water. Rashid *et al.* (2003) reported that spinosad 45 SC @ 0.33 ml/liter water gave the highest percentage of reduction of pod borer and same results are supported by Ahmed *et al.* (2004) and Ni tharwal *et al.* (2017).

While judging the utility of any technology in pest management programme, it is not only evaluated by its relative potency against the target pest and the period for which its application provides protection to the crop, but the economics of treatments also remained a major consideration. Hence, the benefit cost ratio was also worked out in the present investigation. The data recorded that the technology option II gave maximum cost benefit ratio of 2.48:1 (Table -2). Followed by technology option I (1.90:1) and farmer's practices (1.55:1). Gowda *et al.* (2007) who reported that the spinosad 45 SC recorded the highest yield and maximum cost benefit ratio. Ni tharwal *et al.* (2017) also recorded most economical treatment of spinosad 45 SC (3.40:1).

Conclusion :

The present finding clearly indicate that the new generation insecticides like spinosad was effective against gram pod borer, *Helicoverpa armigera* along with an increased level of yield. Further, the benefit cost ratio was also more with technology option II (use of pheromone trap @ 20/ha at flowering time and spray of spinosad 45 SC @ 0.3ml/liter of water at time of 50% pod formation). Hence, it is suggested that the effective technology may be alternated in order to avoid the development of resistance.

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Table 1: Incidence of gram pod borer, *Helicoverpaarmigera*Hub. on chickpea crop during *rabi* 2019-20 and 2020-21

Treatments	No. of infected pod /sq m			Pod infestation (%)			Weight of grain/sq m (g)			Yield q/ha		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
Farmers practice	153.50	137.77	145.64	9.38 (17.83)	6.26 (14.49)	7.82 (16.16)	89.48	98.79	94.14	8.95	9.88	9.42
Technology option I	72.87	89.86	81.37	3.33 (10.51)	2.14 (8.41)	2.74 (9.46)	105.29	139.80	122.55	10.53	13.98	12.26
Technology option II	47.12	62.63	54.88	2.01 (8.16)	1.49 (7.00)	1.75 (7.58)	128.81	168.57	148.69	12.82	16.86	14.84
SEm±	12.66	13.18	12.92	1.49	0.55	1.02	9.35	10.69	10.02	0.90	1.07	0.99
CD at 5%	27.04	28.28	27.66	3.20	1.17	2.19	19.35	22.93	21.14	1.92	2.29	2.11

Figures in parenthesis are the Arc sine.

Table 2: Economic viability of different technology option in chickpea crop during *rabi* 2019-20 and 2020-21

Treatments	Gross return (₹/ha)			Cost of cultivation (₹/ha)			Net return (₹/ha)			Benefit Cost Ratio		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
Farmers practice	43631	50388	46982	18859	18017	18438	24772	32371	28544	1.31	1.80	1.55
Technology option I	51334	71298	61147	21368	20777	21072	29966	50521	40074	1.40	2.43	1.90
Technology option II	62498	85986	74015	21546	20957	21251	40952	65029	52763	1.90	3.10	2.48

Not : The sale price of grain was considered as Rs. 4875/q in 2019-20 and Rs. 5100/q in 2020-21.