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# Bio efficacy of novel insecticide against chickpea pod borer, *Helicoverpa armigera* (Hubner)

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**Abstract**

*The bio efficacy of novel insecticide Flubendiamide (39.35% SC) against chickpea pod borer,* Helicoverpa armigera *was assessed through on farm trial at multi locations during rabi 2019-20 and 2020-21. The mean larval population of* H. armigera *at vegetative and pod formation stage was comparatively less (2.28, 3.87) in T1 (Pheromone traps @ 5-6/ha and Flubendiamide 39.35% SC) during both the year. Similarly, T1 also registered lower pod damage (5.01%) as compared to farmers practices (7.56%). Application of Flubendiamide 39.35% SC provide higher seed yield (16.99) and mean net return (64182/-). Incremental benefit cost ration was higher in T1 (3.09) as compared to T2 (2.68).*

**Key words**: *Helicoverpa armigera,* Chickpea, Bio efficacy, Pheromone traps

## Introduction

Pulses are an important group of food crops that, due to their high protein content, hold a unique position in agriculture. Chickpea (*Cicer arietinum* L.) also known as Bengal Gram or Chana is an important Rabi pulse crop in India. It originated in south-western Asia. This is known as the "King of Pulses" (Bhatt and Patel, 2001). In Rajasthan, it is cultivated on 2.11 million ha with a production of 2.26 million tonnes and contributes 14% of total countries chickpea production (Anonymous, 2021). In Nagaur total area under chickpea cultivation was 47083 ha with the total production of 75728 tonnes (Anonymous, 2020-21) and productivity 16.08 q/ha. Chickpea is infested by nearly 60 species, the most important of which are cut worm, *Agrotis ipsilon* (Ratt.), *H. armigera* (Hub). (Acharjee and Sharma, 2013), semilooper, *Autographa nigrisigna* (Walk.), aphid, *Aphis craccivora* (Koch.). Among these, the gram pod borer, *H. armigera* is a serious pest of chickpea causes the most damage. The annual losses caused by *H. armigera* to the chickpea crop have been estimated to be around 2030 million (Annonymus 1996). During its life, a single larva can damage 30-40 pods and under congenial weather conditions this pest can cause up to 80% crop loss. Massive application of pesticides not only leave harmful residues in the food chain but also causes harmful effect on non-target organism and environment, causes pest resurgence and development of resistance in insect to insecticides. The new generation molecules are less dangerous to natural enemies such as honeybees and other pollinators than the old generation molecules. An experiment was carried out to evaluate the bio efficacy of Flubendiamide 39.35 SC against pod borer *H. armigera*.

## Materials and Methods

The investigation on bio efficacy of Flubendiamide 39.35 SC on pod borer, *H. armigera* in chickpea (*Cicer arietinum* L.) was carried out at different locations during the *Rabi* 2019-20 and 2020-21. An on-farm trial was conducted by KVK, Maulasar (Nagaur-II) Rajasthan, India at farmer's field in Maulasar and Dausar villages. The details of experiment are furnished in Table 1. The data on mean larval population/meter row length, per cent pod damage, seed yield was also collected. The observation on larval population count was taken after one day of spray. However, per cent pod damage was recorded at the time of crop harvest by counting damaged pods and undamaged pods per plant. The cost of cultivation, gross return, net return and incremental benefit cost ratio was calculated and compare within treatments. Pheromone traps were installed in chickpea field at 1m above the crop canopy

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@ 5/ha to monitor the adult male moth population and lure septa was replaced after every 28 days.

Table 1: Details of experiment

| Parameter | Details |
|---|---|
| Crop | Chickpea, *Cicer arietinum* L. |
| Season | *Rabi*, 2019-20 & 2020-21 |
| Variety | GNG-1581 |
| Soil type | Sandy soil |
| Treatments | T1- (Farmer practices) Quinalphos 25 EC @ 1 lit./h T2-(Improved technology) Pheromone trap 5-6/ha, Flubendiamide 39.35% SC @ 150 ml/ha at vegetative stage |
| Replications | 10 |
| Plot size | 0.4 ha |
| Location | Maulasar and Dausar |

## Results and Discussion

The results pertaining to mean larval population of *H. armigera* in different insecticidal treatments at different locations is presented in Table 2.

Effect on pod damage and yield loss-The observation on larval population after one day of spraying compared to control. At vegetative stage treatment flubendiamide 39.35% SC @ 150 ml/ha significantly reduce larval population (2.28) followed by quinalphos 25 EC @ 1 liter/ha (5.87). At pod formation stage again treatment flubendiamide 39.35% SC @ 150 ml/ha significantly reduce larval population (3.87) followed by quinalphos 25 EC @ 1 liter/ha (7.05) at different location (Table 2). Significantly the lowest percent pod damage (5.01) was observed in the treatment where Pheromone trap 5-6/ha and Flubendiamide 39.35% SC @ 150 ml/ha followed by quinalphos 25 EC (7.56). This might be due to its (T1) high pest specificity with fast acting activities that produced quick knock down action to pod borer resulted in the lowest pod damage and also reduce larval population. Due to highest pod borer infestation, some twigs, flower and pod might completely damage in untreated control resulted highest pod damage. Seed yield- Pheromone trap 5-6/ha and Flubendiamide 39.35% SC @ 150 ml/ha as the most effective insecticide with respect to seed yield as well, with seed yield of 16.99 q/ha (Table 3). The seed yield per treatment in case of farmer practice (quinalphos 25 EC) and control was 13.25 and 9.38 quintals respectively.

According to Neharkar *et. al.* (2018) flubendiamide emerged out as the most superior one against pigeon pea pod borer complex in reducing percent fruiting body damage, percent pod damage at harvest, percent grain damage at harvest. Similar result reported by Meena *et. al.* (2006) suggested that the bio efficacy of some newer insecticides such as flubendiamide against gram pod borer was found to be most effective and recorded minimum grain damage in pigeon pea. Safer chemical control methods reduce the pest population, pod damage and grain damage with higher yield; therefore, chemical management popularizes as an effective, practical alternative and makes lucrative cultivation of pigeon pea crop. These properties suggest that the suitability of chlorantraniliprole and flubendiamide for integrated

Table 2: Bio efficacy of Flubendiamide 39.35% SC against chickpea pod borer during 2019-20 and 2020-21

| Treatments | Mean No. of larvae (/meter row length) | | | | | |
|---|---|---|---|---|---|---|
| | Vegetative stage | | | Pod formation stage | | |
| | Maulasar 2019-20 | Dausar 2020-21 | Mean | Maulasar 2019-20 | Dausar 2020-21 | Mean |
| T1 Pheromone traps @ 5-6/ha and Flubendiamide 39.35% SC | 2.11 | 2.45 | 2.28 | 3.76 | 3.98 | 3.87 |
| T2 Farmers practices (Quinalphos 25 EC) | 5.59 | 6.15 | 5.87 | 6.90 | 7.20 | 7.05 |
| T3 Untreated control | 8.63 | 9.67 | 9.15 | 10.05 | 9.95 | 10.00 |

Table 3: Cumulative pod damage due to pod borer and seed yield of chickpea (2019-20 to 2020-21)

| Treatments | Cumulative pod damage (%) | | | Seed yield (q/ha) | | |
|---|---|---|---|---|---|---|
| | Maulasar 2019-20 | Dausar 2020-21 | Mean | Maulasar 2019-20 | Dausar 2020-21 | Mean |
| T1 Pheromone traps @ 5-6/ha and Flubendiamide 39.35% SC | 4.98 | 5.05 | 5.01 | 18.90 | 15.09 | 16.99 |
| T2 Farmers practices (Quinalphos 25 EC) | 7.15 | 7.97 | 7.56 | 14.00 | 12.50 | 13.25 |
| T3 Untreated control | 10.12 | 10.50 | 10.31 | 9.67 | 9.10 | 9.38 |

Table 4: Effect of treatment on economics in chickpea

| Treatments | Gross Cost (Rs/ha) | | | Gross return (Rs/ha) | | | Net Return (Rs/ha) | | | IBCR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2019-20 | 2020-21 | Mean | 2019-20 | 2020-21 | Mean | 2019-20 | 2020-21 | Mean | 2019-20 | 2020-21 | Mean |
| $T_1$ | 30506 | 30525 | 30515 | 100936 | 88459 | 94697 | 70430 | 57934 | 64182 | 3.30 | 2.89 | 3.09 |
| $T_2$ | 28200 | 27265 | 27732 | 76193 | 72750 | 74471 | 47993 | 45485 | 46739 | 2.70 | 2.66 | 2.68 |

pest management program. Keeping in view the pooled data of all the parameters; Viz- no. of webs and larvae per plant, cumulative pod damage and grain yield in different trials, the new generation and novel insecticides like chlorantraniliprole and flubendiamide were found effective against the pod borer complex in pigeon pea coupled with higher net return. Hence it is suggested that the effective insecticides may be alternated in order to avoid the development of resistance to pod borer in pigeon pea.

## Conclusion

Experiment was conducted to assess the influence of insecticide on the pod borer and to monitor the adult male *H. armigera* population through pheromone trap along with safer new molecule flubendiamide 39.35 SC as an effective of oviposition inhibitor and larvicidal effect for the managing the pod borer, reducing damage percentage in chickpea and enhance per hectare grain yield.

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