Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-11: 2736-2740

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-11 pp. 2736-2740**
Journal homepage: http://www.ijcmas.com

Original Research Article

Evaluation of Insecticides for the Management of Gram Pod Borer on Gram

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A B S T R A C T

Gram Pod Boreris a very destructive and serious pest of Gram and causes serious damage to gram. They feed on leaves and tender shoots and bore into the pod to feed on seeds, sometimes half of the body remains outside the pod if the pod is small. One larva may feed on several fruits before completing development. In severe infestation cases, it causes about 55-90% losses in seed yield. Gram is the important pulse crop grown in Rabi season by the farmers of District Kathua. Every year infestation due to Pod borer in gram causes huge economic loss results in low yield. Therefore, KVK-Kathua had conducted On Farm Trials during *rabi*2017-18 and *rabi*2018-19 at farmer's field to assess the efficacy of insecticides for the management of Gram Pod Borer (*Helicoverpa armigera)* in Gram. On the basis of three treatments assessed i.e. (a) Farmer's practice (No Spray) (b) Cypermethrin 25EC @1.5ml./lt. of water(recommended) (c) Indoxacarb 14.5Sc @1ml. /lt. of water(Intervention).The results of OFT during 2017-18 revealed that use of Indoxacarb 14.5Sc @ 1ml. /lt. of water was observed to be superior resulting in 74.46% reduction in damage to pods of Gram and increased the grain yield to an extent of 47.36% over farmers practice (No spray) followed by Cypermethrin 25EC @1.5ml./lt. of water resulting in 67.69% reduction in damage to pods of Gram and increased the grain yield to an extent of 34.21% over farmers practice (No spray) and the results of OFT during 2018-19 revealed that use of Indoxacarb 14.5Sc @ 1ml. /lt. of water was observed to be superior resulting in 71.42% reduction in damage to pods of Gram and increased the grain yield to an extent of 55.55% over farmers practice (No spray) followed by Cypermethrin 25EC @1.5ml./lt. of water resulting in 61.03% reduction in damage to pods of Gram and increased the grain yield to an extent of 38.88% over farmers practice (No spray). In terms of cost benefits Indoxacarb 14.5Sc was the best. Therefore, the use of Indoxacarb 14.5Sc @ 1ml. /lt. of water can be recommended for control of pod borer under rainfed conditions of Kathua.

Keywords

Gram pod borer, On farm trial, *Helicoverpa armigera*, Indoxacarb, Cypermethrin

Introduction

Pulses are an important group among the food crops which occupy a unique position in agriculture by virtue of their high protein content. Chickpea (*Cicer arietinum* L.), commonly known as Bengal gram, gram or chana, originated from South Western Asia, is an important *rabi* pulse crop of India, which has been considered as king of Pulses (Bhatt and Patel, 2001). Chickpea was cultivated in an area of 135.4 lakh hectares with a production of 131.02 lakh tones and a productivity of 968 kg/ha in the world

(Tiwari and Shivhare, 2016). Chickpea was cultivated in an area of 73.7 lakh hectares with a production of 58.9 lakh tones and a productivity of 799.19 kg/ha in India. In north India, states like Uttar Pradesh, chickpea is cultivated in an area of 5.05 lakh hectares with a production of 3.78 lakh tones with a productivity of 7481.51 kg/ha (Anonymous, 2015). Among biotic factors chickpea is infested by nearly 60 insects' species in which cutworm, Agrotisipsilon (Ratt.), gram pod borer, *Helicoverpa armigera* (Hub.), semilooper, *Autographanigrisigna* (Walk.), and aphid, *Aphis craccivora* (Koch.) are the pests of major importance (Acharjee and Sharma, 2013). Among these, the major damage is caused by gram pod borer which is polyphagous in nature; *Helicoverpa armigera* is one of the serious pests of chickpea, which feeds more than 150 crops throughout the world (Vinutha *et al.,* 2013). Gram pod borer is widely distributed and a serious pest of chickpea causing heavy crop losses (20-60%) throughout the India (Anonymous, 2013a, b). *Helicoverpa armigera* is the major and most devastating pest of chickpea which can cause crop loss up to 80 per cent under congenial weather conditions. In terms of monetary value, the estimated annual loss due to this pest in chickpea is Rs.2030 million in India (Anonymous, 2013a). It is estimated that *Helicoverpa armigera* alone is responsible for losses over Rs. 3500 million annually in India, despite heavy application of pesticides inputs (Kumar and Kapur, 2003). *Helicoverpa armigera* alone accounts for the consumption of half of the total pesticides used in India for the protection of different crops (Suryavanshi *et al.,* 2008).

Materials and Methods

The experiment was conducted at farmer's field during *rabi*2017-18 and *rabi* 2018-19 with an objective to assess the efficacy of different insecticides for the management of Gram Pod Borer (*Helicoverpa armigera)* in Gram. During 2017-18, five farmers were selected and a trial of Chickpea was sown in four Kanals of each of farmer's field as described in Table 1. The recommended agronomical practices were followed to raise the good crop. The detail of treatment for management of *Helicoverpa armigera*, are as follows: Table 2. Three treatments were (a) Farmer's practice (No Spray) (b) Cypermethrin 25EC @1.5ml./lt. of water (recommended) (c) Indoxacarb 14.5Sc @1ml. /lt. of water(new Intervention). The incidence of *H. armigera* was recorded on regular basis to apply different treatments at appropriate time. The treatments were applied, as and when larval population was reached Economic Threshold Level *i.e.* 01 larvae m-1 linear row length. The required amounts of insecticides were calculated by using the formula as given below:

$$\text{Required amount of insecticides} = \frac{\text{Vol. of water (lit/ha)} \times \text{Desired cons. (\%)}}{\text{Strength of insecticides formulation}}$$

Insecticides were sprayed with the help of hand Sprayer. The care was taken to avoid drift of spray from one plot to another plot. The pre and post treatment observations on larval population of *H. armigera* were taken in each treatment at five places. The percentage reduction of larval population was determined for each treatments using following formula.

$$\text{Percent reduction in population} = \frac{\text{Control} - \text{treatment}}{\text{Control}} \times 100$$

Seed yield of chickpea was recorded on the basis of individual plot and expressed in kg

plot-1 and converted in to kg ha-1. The increase in seed yield of chickpea over control was calculated for each treatment separately by using the following method given by Pradhan, (1964).

Increase in Yield (%) =
Yield in treatment - Yield in Control
---------- X 100
Yield in control

The benefit: cost ratio was determined for each treatment by using the following formula:

Benefit: Cost ratio =
Monetary gain over control (Rs/ha)

Cost of plant protection (Rs/ha)

Results and Discussion

Field trial was conducted during *rabi*2017-18 and*rabi*2018-19 to evaluate the efficacy of insecticides against grampod borer. In order to ascertain the time of application of treatments, population of gram pod borer, *H. armigera* was recorded at weekly interval and treatments were applied as and when mean larval population of *H. armigera* reached ETL *i.e.* 1 larvae m-1 row length during both the years. The trend of effectiveness of different insecticides has been presented below:

Efficacy of treatment (2017-18)

The data presented in Table-3 reveals that both insecticides lowered down and reduced percentage of the population of gram pod borer in comparison to control. The results of OFT during 2017-18 revealed that use of Indoxacarb 14.5Sc @ 1ml. /lt. of water was observed to be significantly superior resulting in 72.30% reduction in damage to pods of Gram and increased the grain yield to an extent of 47.36% over farmers practice (No spray) followed by Cypermethrin 25EC @1.5ml./lt. of water resulting in 67.69% reduction in damage to pods of Gram and increased the grain yield to an extent of 34.21% over farmers practice (No spray).

Efficacy of treatment (2018-19)

The data presented in Table-4 reveals that all insecticides lowered down and reduced percentage of the population of gram pod borer in comparison to control.

The results of OFT during 2018-19 revealed that use of Indoxacarb 14.5Sc @ 1ml. /lt. of water was observed to be superior resulting in 71.42% reduction in damage to pods of Gram and increased the grain yield to an extent of 55.55% over farmers practice (No spray) followed by Cypermethrin 25EC @1.5ml./lt. of water resulting in 61.03% reduction in damage to pods of Gram and increased the grain yield to an extent of 38.88% over farmers practice (No spray).

In terms of cost benefits Indoxacarb 14.5Sc was the best in both years. Farmers were satisfied and ready to adopt insecticide for control of pod borer of Gram. Therefore, the use of Indoxacarb 14.5Sc @ 1ml. /lt. of water can be recommended for control of pod borer under rainfed conditions of Kathua.

Table.1 Details of on farm trial in farmers field

S. No	Crop	Title of OFT	Area(in Ha)	No. of Farmers
1	Gram	Management of pod borer in Gram	2.0	5

Table.2 Details of technologies selected for assessment/refinement

S.No.	Treatments	Technology Assessed
1	Treatment 1	No Spray (Farmer's practice)
2	Treatment 2	Cypermethrin 25 EC@ 1.5ml. /lt. of water (recommended Practice)
3	Treatment 3	Indoxacarb 14.5Sc @ 1ml. /lt. of water(New Intervention)

Table.3 Evaluation of new insecticide for the management for pod borer in gram in 2017-18

Technology Assessed	Yield (q/ha)	Damage Percent(%)	BC Ratio
No Spray (Farmer's practice)	9.50q/ha	16.25%	2.95
Cypermethrin 25 EC@ 1.5ml. /lt. of water (recommended)	12.75q/ha	5.25%	3.90
Indoxacarb 14.5Sc @ 1ml. /lt. of water (Intervention)	14.00q/ha	4.50%	4.10

Table.4 Evaluation of new insecticide for the management for pod borer in gram in 2018-19

Technology Assessed	Yield (q/ha)	Damage Percent (%)	BC Ratio
No Spray(Farmer's practice)	9.0q/ha	19.25	2.02
Cypermethrin25EC@1.5ml./lt. of water (recommended)	12.50q/ha	7.50	3.0
Indoxacarb 14.5Sc @ 1ml. /lt. of water(Intervention	14.0q/ha	5.50	3.42

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