

VARIETAL SCREENING OF CHICKPEA AND THE EFFICACY OF DIFFERENT INSECTICIDES AGAINST CHICKPEA POD BORER *HELICOVERPA ARMIGERA* (HB)

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ABSTRACT

Two experiments were conducted at the Research Farms of Agriculture Research Institute Ratta Kulachi Dera Ismail Khan to test six varieties of gram (KK-1, CM-88, CM-72, C-3, C-40 and Piadar) for their tolerance against gram pod borer and to assess comparative efficacy of five insecticides (Thiodan 40EC, Lorsban 40EC, Ripcord 10EC, Nurell-D (Chlorpyrifos + Cypermethrin 50 + 500 g/L EC) and Methomy 45 WP) against gram pod borer *Helicoverpa armigera* (Hubner) during the year 2003-04. Gram variety CM-72 was found significantly more tolerant to the attack of gram pod borer followed by KK-1. Maximum pod borer infestation was found in variety CM-88. All the tested insecticides significantly reduced the infestation of gram pod borer as compared to control plots. However, Methomyl was found most effective against the tested pest under field conditions.

KEY WORDS: Gram, Pod borer, *Helicoverpa armigera*, Insecticides

INTRODUCTION

Chickpea (*Cicer arietinum* L.) occupies an important place among pulses. It was grown especially in the Barani areas of Pakistan over a total area of about 963 thousand hectares with annual production of 493 thousand tones during 2000-01 (Anonymous, 2002). In NWFP it thrives best in respect of adaptation, cultivation and environmental conditions in the barani areas of Kohat, Karak, Bannu, Lakki Marwat and D.I.Khan districts. During 2006-7 it was cultivated on about 46023.8 hectare with a production of about 20003 tones (Anonymous, 2007). It is sown in November on the residual moisture of the monsoon rains. Chickpea is sown on sandy loam well-leveled and ploughed soils. It is widely consumed in the central and southern NWFP in forms like dal, seed, whole seed and roasted whole seed etc. The fresh plants and hay are used as feed for livestock. Its grain contains 20.8% protein, 4% fat, 8.5% fiber and 2.9% mineral matter, 8.49% lysine, 0.04% tryptophan and 0.11% methionine. It is a rich and inexpensive source of proteins and vitamins. Chickpea is usually called "poor man meat". Chickpea is a cash crop and helps to overcome the food shortage of starving and poor people in the country.

Being a leguminous crop, it also plays a special role in enriching the soil fertility.

Yield/ha of gram in our country is very low compared to other gram growing countries of the world. Low yield of gram is attributed to conventional method of its cultivation, diseases and insect pest attack. If effective pest management strategies are employed, the production can be increased. The insect pest complex of gram include gram cut worm *Agrotis* spp, pod borer *H. armigera*, pod fly and semi looper.

Gram pod borer is very notorious pest, causing 37-50% crop losses. This pest also attacks cotton, tobacco, tomato, maize, cabbage, peanuts and other pulses. Adult female lays 300-500 eggs on host plants. The eggs hatch in 2-5 days and caterpillars bore in pods. Single caterpillar can damage up to 40 pods. Full-grown larvae drop to the ground for pupation. The life cycle is completed in 30-37 days. There are 5-7 generations in a year (Malik, 1994). Economic injury levels for *H. armigera* were determined as 0.90 and 0.92 larvae/meter row under rain fed and irrigated regimes, respectively (Prabhakar *et al.*, 1998).

Many workers tested various chickpea cultivars for their resistance/tolerance

against *H. armigera*. According to Sundeeep *et al.* (1999) larval population of this pest was lower on the wild species (0.53 to 0.81 larvae/plant) than on the cultivated genotypes (1.03-1.54 larvae/plant). The wild species, *Cicer echinospermum* and *Cicer reticulatum* were similar to cultivated genotypes in terms of pod and seed size. Pod borer incidence on chickpea at the flowering stage 30 days after sowing (two larvae per plant) was occurred and its peak incidence was recorded on 87 days old crop (Rao *et al.*, 2001). Out of 11 chickpea cultivars (ICCV 10, PG 81-1-1, GG 1, JD 315, GG 2, Chaffa, GNG 469 (C), Dahod Yellow, BG 391, Phule G5 and ICC4) tested, Chaffa was found the most tolerant cultivar with lowest larval population (Bhatt and Patel, 2001). Akbar *et al.*, (2003) reported genotype C-727 as relatively resistant to pod borer infestation, compared to other seven genotypes.

Chlorpyrifos, endosulfan, monocrotophos, quinalphos and triazophos were found most effective against the 2nd to 4th instars larvae of *H. armigera*. However, endosulfan and quinalphos were found ineffective against full grown larvae (Khurana,1997). Cypermethrin at 0.0135% and 0.0075% was found effective in reduction of pods damage and in increase of gram yield (Subbarayadu,1997; Jadhav & Suryawanshi,1998). Applications at flower initiation and subsequently 2 sprays at fortnightly intervals, either with nuclear polyhedrosis virus or neem seed kernel extract followed by a third spray with endosulfan were found most effective in control of gram pod borer and resulted in 26.94 and 27.29% increase in yield respectively, (Sanap and Power,1998). Bajpai and Sehgal, 1999, stated that endosulfan was very effective in term of decreasing pod damage and in increase of chickpea yield. These workers further reported that among botanical insecticides Karanj oil resulted in the highest grain yield. Two sprays of thiodicarb 300g/ha reduced 24.7% of pod damage and increased seed yield (0.86t/ha), while sprays of quinalphos and endosulfan 15days apart resulted in

20.5% pod damage and a seed yield of 0.83t/ha.in India (Biradar *et al.*,1999). Pampapathy and Basavanagound, 2000 reported that cypermethrin 10 EC resulted in the highest mean reduction in egg laying (39.73%), followed by thiodicarb 75 WP (32.56%), triazophos 40EC (24.39%) and methomyl 12.5 SL (23.57%). According to Balikai *et al.*,2001, carbaryl, quinalphos and malathion gave effective pod borer control. These three insecticides recorded higher yields compared with the control. Methemyl 40SP + fenvelerate 20EC provided the lowest pod damage (24.7%) and the highest chickpea yield (Biradar *et al.*,2001). Endosulfan 0.07%, HNPV 500 I.E/ha and Dipel 8L, 0.0075 were found effective in restricting the development of larval population of *H. armigera* on chickpea (Kulat *et al.*, 2001). According to Patel *et al.*,2002, application of insecticides at the time of 50% pod setting, effectively prevented the pod damage compared to application at 15 days after 50% pod setting and 50% flowering stages. They further stated that one application of fenvalerate at the time of 50% pod setting provided a higher pod protection against pod borer.

MATERIALS AND METHODS

Variatal Performance of Gram Against Pod Borer:

The experiment was conducted to find out the most tolerant variety of chickpea against gram pod borer. Seed of six varieties viz Karak-I, CM-88, CM-72, C-3, C-40 and Piadar were obtained from Cotton Research Station, D.I.Khan and planted in RCB design with three replications. Row to row distance was kept 60cm and plant-to-plant distance was kept 10cm. All the cultural practices were performed equally in all the treatments. Nitrogenous and phosphorus fertilizers were applied in all of the plots as per recommendation. Percent infestation data were recorded one week before harvesting the crop. For this purpose five plants were selected randomly from each treatment. Total number of pods and

damaged pods per plant were counted. The percentage infestation was calculated by the following formula.

$$\% \text{ Infested pods} = \frac{\text{Number of infested pods}}{\text{Total No of pods examined}} \times 100$$

Chemical Control of Chickpea Pod Borer

An experiment was conducted to find out the most effective insecticide for the control of gram pod borer at the Agriculture Research Institute Ratta Kulachi, Dera Ismail Khan. Variety Karak-I was planted on November 4, 2003. The experiment was laid in R.C.B design with three replications

and five treatments. Five insecticides, viz (Thiodan 35EC, Lorsban 40EC, Ripcord 10 EC, Nurell-D (50+500g/L) EC and Methomyle 45 WP) were applied at their recommended doses when the pest population reached at ETL. Second spray of the insecticides was applied to the respective plots with 15 days interval. All cultural practices and fertilizers application were done similar to that as mentioned above. Data on number of infested pods by the gram pod borer and total number of pods per plant from five randomly selected plants were recorded one week before harvesting the crop. The data were subjected to statistical analysis and means were separated by using LSD test.

Detail of Treatments:

	<u>Trade Name</u>	<u>Common Name</u>	<u>Dose/acre</u>
T ₁	Thiodan 35EC	Endosulfan	1000ml/acre
T ₂	Lorsban 40 EC	Chloropyriphos	1000ml/acre
T ₃	Ripcord 10EC	Cypermethrin	330ml/acre
T ₄	Nurelle-D (50+500) EC	Cyhalothrin+Chloropyriphos.	500ml/acre
T ₅	Methomyl 45 EC	Capomyl	250ml/acre
T ₆	Control	-	-

RESULTS AND DISCUSSIONS

Experiment-1 Varietal Performance of Gram Against Pod Borer:

The comparative performance of different chickpea varieties against pod borer infestation is presented in Table 1. The data indicated that minimum infestation (11.55%) was observed in CM-72, while maximum infestation (48.11%) of gram pod borer was recorded in variety CM-88.

The results showed that varieties KK-1 and CM-72 were found non-significantly different and ranked first, while varieties C-40 and Paidar were found non-significantly different and ranked second. Variety C-3 and Variety CM-88 ranked 3rd and 4th respectively from pod borer infestation point of view. Many workers (Sundeep *et al*, 1999; Rao *et al*, 2001; Bhatt and Patel, 2001; Akbar *et al*, 2003) tested the resistance/tolerance of chickpea varieties but

our results can not be compared with the results of these workers as they had evaluated the performance of different varieties in different geographical conditions against the pest.

Table1 Performance of chickpea varieties against pod borer *Helicoverpa armigera* (Hb) infestation

Varieties	Percent infested pods
KK-1	11.75 d
CM-88	48.11 a
CM-72	11.55 d
C-3	34.73 b
C-40	39.08 c
Paidar	27.83 c

LSD value = 2.559

Means followed by different letters are significantly differ at 5% level of significant.

Experiment-2. Chemical Control of Chickpea Pod Borer.

Percent infestation of pods after one week of first spray

Data (Table-2) revealed that maximum pod infestation (19.41%) was recorded in check plot. All insecticides proved best in reducing the borer infestation as compared to check plot. Methomyl with 1.88% infestation was found most effective followed by Nurelle-D (3.99%), Lorsban (4.02%) Thiodan (4.04%) and Ripcord (8.05%). All insecticides were found significantly different from control in reducing pod borer infestation. These results are more or less similar to the results recorded by previous workers. Biradar *et al*, (2001) obtained lowest pod damage (24.7%) and the highest chickpea with application of Methemyl 40SP + fenvelerate 20EC. Khurana, (1997) reported efficacy of chlorpyriphos against 2nd to 4th instars larvae of *H. armigera*. Sanap & Power (1998), Bajpai & Sehgal (1999), Biradar *et al* (1999) and Kulat *et al* (2001) reported effectiveness of thiodan against gram pod borer. Subbarayadu (1997), Jadhav & Suryawanshi (1998) and recorded reduction in pod borer infestation with application of cypermethrin. Basavanagound (2000) obtained highest mean reduction in egg laying (39.73%) by the pest with the use of cypermethrin 10 EC.

Table-2 Efficacy of different insecticides on percent infestation of chickpea by *Helicoverpa armigera* (Hb)

Treatments	Percent infested pods
Thiodan 40 EC	4.04c
Lorsban 40 EC	4.02c

Ripcord 10 EC	8.05b
Nurelle-D EC	3.99c
Methomyl 90 EC	1.88d
Control	19.41a

LSD Value: 1.917

Means followed by different letters are significantly differ at 5% level of significance.

CONCLUSION

It has been concluded from present studies that gram variety CM-72 was proved tolerant to the attack of gram pod borer followed by KK-1. Methomyl was found most effective insecticide against the tested pest followed by Nurel-D, Loresban and Ripcord. However, all of the tested insecticides significantly reduced the infestation of gram pod borer as compared to control plots.

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