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Varietal Performance of Gram and Comparative Effectiveness of Three Insecticides Against Gram Pod Borer (*Helicoverpa armigera* Hb.).

Said Mir Khan, and Syed Faizullah

Faculty of Agriculture, Gomal University, D.I.Khan, Pakistan.

Abstract

A research project was initiated to evaluate varietal resistance of gram against pod borer, and to determine the comparative efficacy of three insecticides against *Helicoverpa armigera* (Hb). Gram varieties Viz. NIFA-88, PAIDAR-91 and KARAK-1 were selected while three insecticides namely Thiodan 35 EC, Cymbush 10EC and Actellic 50 EC were applied. KARAK-1 variety of gram was found significantly least susceptible to the attack of gram pod borer, followed by NIFA-88, PAIDAR-91. All the tested insecticides significantly reduced the infestation of gram pod borer *Helicoverpa armigera* (Hb) as compared to control plots. Thiodan (Endosulfan) was found most effective than Actellic (Pirimiphos methyl) and Cymbush (Permethrin).

Introduction

Chickpea is a cash crop and cultivated on about 70 per cent of total area in Pakistan. It thrives best in respect of adaptation, cultivation and environmental conditions in the arid areas like Kohat, Karak, Bannu, Lakki Marwat and D.I.Khan districts of NWFP. It is sown in sandy loam, well levelled and ploughed soils on the residual moisture of monsoon rains in the month of August to November. The popularity of gram is due to its high nutritive value having 17 percent protein, 8.49 percent lysin, 0.04 percent tryptophan and 0.11 percent methionine and the multipurpose use like culinary dishes of high plastibility, confectioneries and in the various fried and caned products (Bashir and Bantel, 1994). Its seed is used as a food for human being in a variety of forms like Dal seed, whole seed and roasted whole seed. It is a rich and cheap source of proteins and vitamins. It recovers the soil by the process of nitrogen fixation through nodular bacteria (*Rhizobium* Spp). Unfortunately the yield and quality of chickpea are not upto the standard as compared to other gram growing countries. Among the factors responsible for low yield and poor quality, diseases and insects play a vital role. About 20 insect pests attack gram crop and adversely affect its production. Gram pod borer *Helicoverpa armigera* (Hb) is one of the most damaging and devastating pests causing 37-50 percent losses to the crop. Snap and Deshmukh (1987) tested seven insecticides (Quianlphos, Carbaryl, Permethrin, Oncol (Benfuracarb), Chlorpyrifos, Monocrotophos, Endosulfan and Sevimol (Carbaryl) for the control of noctuid *Helicoverpa armigera* on chickpea in Maharashtra, India. All the insecticides reduced the damage and increased yield. Endosulfan (0.07 percent) reduced the damage (1.4 percent) and increased yield 1209 kg/ha) followed by 0.05 percent Monocrotophos (Novacron) with 2.2 percent damage. Pokharkar and Borle (1989) found Oncol 40EC (Benfuracarb) as effective as Carbaryl and Endosulfan for the control of *H.armigera* on chickpeas. Gupta *et al.* (1990) tested the effectiveness of the

insecticides Monocrotophos, Endosulfan, Fenvalerate, Decamethrin (Deltamethrin), Cypermethrin and oils of Neem (*Azadirachta indica*) and karanji (*Pongamia pinnata*) against *Helicoverpa (Heliothes armigera)* on chickpea (*Cicer arietinum*) in the field in Madhya Pradesh, India. All treatments significantly reduced the larval population. The highest grain yield was obtained with 0.07 percent Endosulfan, followed by 0.06 percent Endosulfan, 0.04 percent Monocrotophos and 0.001 percent Deltamethrin. Dubey *et al.* (1991) reported the ovicidal effect of insecticides on eggs of gram pod borer (*H.armigera*). According to their laboratory studies with 8 different insecticides, Methyl parathion (Parathion methyl) at 0.04 percent and Quinaphos at 0.03 percent were found toxic to the eggs of this pest. Mehta *et al.* (1991) stated that Cypermethrin at 0.004 percent was the most effective insecticide against *H.armigera* resulting in lowest pod damage and maximum yield.

Materials and Methods

The experiment was laid out in randomized complete block design in factorial arrangement with three replication. Gram varieties NIFA-88, PAIDAR-91 and KARAK-1 were selected and sown in plots having 3 X 1.8 m² size. The crop was planted with the help of man driven single row hand drill on well prepared seed bed. The plant to plant and row to row distances were kept 10 cm and 30 cm respectively. All the agronomic practices were kept normal and uniform in all of the treatments. Crop was sprayed with following insecticides at recommended dose using knapsack sprayer, when the infestation of *H. armigera* reached to economic threshold level (20 percent):

T ₁ :	Thiodan 35EC	(Endosulfan)
T ₂ :	Cymbush 10EC	(Permethrin)
T ₃ :	Actellic 50EC	(Pirimiphos methyl)

Table 1: Percent infestation of *Helicoverpa armigera* (Hb) in different chickpea cultivars treated by different insecticides after one week of spray.

Cultivars	Control	Cymbush	Thiodan	Actellic	Mean
KARAK-1	1.89 c	0.74 hi	0.84 gh	0.59 i	1.015 c
PAIDAR-91	3.14 b	0.96 fg	1.07 f	1.30 e	1.618 b
NIFA-88	5.49 a	1.64 d	1.05 fg	1.68 cd	2.463 a

LSD values at 1 percent level of probability:

Cultivars:	0.2865
Insecticides:	0.1947
Interaction:	0.2140

Table 2: Percent infestation of *Helicoverpa armigera* (Hb) in different chickpea cultivars treated by different insecticides after two weeks of spray.

Cultivars	Control	Cymbush	Thiodan	Actellic	Mean
KARAK-1	5.29 b	0.97 def	1.16 cd	0.78 ef	2.05 f
PAIDAR-91	9.76 a	1.06 de	0.80 ef	1.46 c	3.27 a
NIFA	5.42 b	0.67 f	0.81 ef	0.79 ef	1.92 b

LSD values at 1 percent level of probability:

Cultivars:	0.4250
Insecticides:	0.2888
Interaction:	0.3175

Table 3: Percent infestation of *Helicoverpa armigera* (Hb) in different chickpea cultivars treated by different insecticides after three weeks of spray.

Cultivars	Control	Cymbush	Thiodan	Actellic	Mean
KARAK-1	8.29 c	0.65 g	0.79 fg	1.34 e	2.767 b
PAIDAR-91	8.84 b	1.38 e	0.91 f	1.19 e	3.080 b
NIFA	10.74a	1.82 d	1.95 d	2.05 d	4.130 a
Mean	9.277 a	1.283 c	1.217 c	1.527 b	

LSD values at 1 percent level of probability:

Cultivars:	0.3390
Insecticides:	0.2304
Interaction:	0.2533

Table 4: Percent infestation of *Helicoverpa armigera* (Hb) in different chickpea cultivars in different durations.

Cultivars	1st Week	2nd Week	3rd Week	Mean
KARAK-1	0.80 g	1.72 e	2.41 bc	1.267 c
PAIDAR-91	1.18 f	1.80 de	2.55 b	1.867 b
NIFA	1.82 de	2.08 cd	3.00 a	2.653 a
Mean	1.26 c	1.863 b	2.653a	

LSD values at 1 percent level of probability:

Dates:	0.4185
Cultivars:	0.4185
Interaction:	0.3362

Table 5: Residual effect of insecticides on *Helicoverpa armigera* (Hb) infestation in chickpea.

Cultivars	1st Week	2nd Week	3rd Week	Mean
Control	3.44 c	6.80 b	10.6a	6.947 a
Cymbush	0.98 f	1.217ef	1.40 def	1.119 b
Thiodan	1.02 ef	0.97 f	1.48 de	1.157 b
Actellic	1.14 b	1.05 ef	1.72 d	1.303 b
Mean	1.26 c	1.863 b	2.653 a	

LSD values at 1 percent level of probability:

Dates:	0.6533
Cultivars:	0.4440
Interaction:	0.488

ata was recorded on the basis of percent pods infestation after one week, two week and three week of spray. Grain yield data was also recorded to calculate the cost benefit ratio. The data obtained were subject to the statistical analysis (Steel and Torri, 1980) and difference among the means were tested by LSD test at 1 percent level of probability.

Results and Discussion

Percent infestation of pods after one week of spray: The data obtained after one week of spray (Table 1) show that maximum pods infestation (3.50 percent) by gram pod borer was obtained in the control (untreated) plots. Best control of the pest was achieved in Thiodan treated plots, which reduced the infestation to 0.99 per cent, followed by Actellic and Cymbush which reduced the infestation to 1.11 and 1.19 per cent respectively. Effect of Thiodan is significantly at par with that of Actellic, but differ significantly from Cymbush and check plots.

As far as varietal performance is concerned, maximum borer infestation was recorded in NIFA-88 (2.463%), followed by PAIDAR-91 (1.618%), while minimum infestation (0.015%) was recorded in KARAK-1.

The interaction between varieties and insecticides was also significantly different. Minimum borer infestation was recorded in plots of KARAK-1, treated with Actellic, while maximum infestation was recorded in untreated plots of NIFA-88.

Percent infestation of pods after two weeks of spray: Data regarding percent infestation of pod borer, recorded after two weeks of spray (Table 2) show that maximum pod infestation (6.823 %) by gram pod borer was observed in untreated plots. All of the insecticides were found significantly different in their effectiveness against the pest infestation and also significantly different from untreated plots. Among the varieties, the maximum infestation (3.27 %) was recorded in PAIDAR-91, while NIFA-88 and KARAK-1 showed 1.92 percent and 2.02 per cent infestation respectively and were found statistically at par with each other. Interaction of varieties with insecticides was found statistically significant. Minimum infestation of pod borer was obtained in the plots of NIFA-88 treated with Cymbush. Maximum infestation was recorded in untreated plots of PAIDAR-91.

Percent infestation of pods after three weeks of spray: The data recorded after three weeks of spray (Table 3) indicate that maximum pod borer infestation in gram was obtained in the control plots. The effect of Cymbush and Thiodan was found significantly at par with each others having 2.283 and 1.217 per cent infestation respectively. However, these insecticides were significantly different from that of Actellic treated plots in which infestation of pest was reduced to 1.527 per cent.

In varietal performance test KARAK-1 and PAIDAR-91 were found statistically at par with each others having 2.767 and 2.080 per cent infestation respectively. Maximum

infestation (4.130 %) was recorded in NIFA-88 plots.

The interaction was also found statistically significant and shows minimum infestation in the plots of KARAK-1 variety treated with Cymbush, while maximum infestation was recorded in untreated plots of NIFA-88.

Varietal performance against gram pod borer in different periods of time: The varietal performance of gram against pod borer in different periods of time (Table 4) indicates that all of the tested varieties were found statistically highly significant from each other. The maximum infestation (2.653 %) was recorded in NIFA-88, while the minimum infestation (1.267 %) was observed in KARAK-1. The results recorded after different weeks of spray show that the highest infestation (2.653 %) was observed after 3 weeks of spray, while minimum (1.267 %) after one week of spray. The interaction between varieties and durations were also statistically significant from one another.

Residual effect of insecticides in different durations: Data regarding residual effectiveness of insecticides after different weeks of spray (Table 5) reveals that effectiveness of insecticides after different weeks was highly significant from each other. Maximum borer infestation (6.947 %) was recorded in the control plots, while all the three insecticides showed significant effect. The maximum borer infestation was recorded after 3 weeks followed by 2 weeks of spray, while minimum infestation was recorded after one week of spray. The interaction was also found significant.

References

- Bashir, E. and R. Bantel, 1994. Crop production. Nat. Book Found., Worldmate, Islamabad.
- Dubey, O.P.; S.C. Odak and V.P. Gargave, 1991. Ovicidal action of insecticides on eggs of gram pod borer. Indian J. Agri. Sci., 61: 291 - 292.
- Gupta, M.P.; S.K. Parsai and D.P. Gupta, 1990. Bio-efficacy and economics of certain insecticides and vegetable oils against gram pod borer. Indian J. Plant Protection, 18: 207 - 211.
- Mehta, P.K., M. Singh and N.P. Kashyap, 1991. Evaluation of different insecticides against gram pod borer *Heliothis armigera* (Hubner). Him. J. Agri. Res., 17: 14 - 16.
- Pokharkar, R.N. and B.R. Borle, 1989. Efficacy of BHC and Carbaryl dusts in different proportions against gram pod borer. Pestology, 13: 34-35.
- Sanap, M.M. and R.B. Deshmuk, 1987. Testing of different insecticides for the control of *Heliothis armigera* (Hub) on chickpea. ICN, 17: 15-16.
- Steel, R.G.D. and J.H. Torrie, 1980. Principles and procedure of statistics. McGraw Hill Book Co. Inc. New York., PP. 232-249.