EFFICACY OF INSECTICIDES AGAINST POD FLY (*Melanagromyza obtusa*) OF PIGEONPEA

ABSTRACT

Efficacy of insecticides against pod fly (*Melanagromyza obtusa*) of pigeonpea was evaluated under field conditions. There are 9 treatments *viz*., chlorantraniliprole 18.5% SC, indoxacarb 14.5% SC, spinetoram 11.7% SC, emamectin benzoate 5% SG, acetamiprid 20% SP, lambda-cyhalothrin 5% EC, spinetoram 11.7% SC, fipronil 5% SC, quinalphos 25% EC and untreated control. Two sprays were conducted at an interval of 15 days. The performance of each insecticide treatment was categorized on the basis of maggot population. Results revealed that, chlorantraniliprole 18.5% SC @ 0.3 ml/l of water was superior treatment with least average population of pod flies (0.95 maggots/plant). However, it was followed by indoxacarb 14.5% SC @ 0.7 ml/l of water and spinetoram 11.7% SC @ 0.5 ml/l of water with 0.98 and 1.05 maggots/plant, respectively and were at par with each other.

1. INTRODUCTION

Pigeonpea (*Cajanus cajan* L. Millsp.), also known as Red gram or Arhar or Tur. The term 'pigeonpea' was coined in Barbados, where its seeds were considered as an important pigeon feed (Gowda *et al*., 2011). It is thought to have originated in India. It belongs to the genus-*Cajanus*, subtribe-*Cajaninae*, family-Fabaceae. Pigeonpea is the second important pulse crop in India after chickpea grown in many countries and contributes important share in sustainable nutritional food security. It is an important grain legume crop predominantly grown in the Indian subcontinent as an important source of dietary protein. It is also cultivated in other parts of the world, including sub-Saharan Africa, Latin America, the Caribbean and South-East Asia. Its cultivation is increasing in semi-arid areas because of the crop's ability to thrive under prolonged drought and in degraded lands (Upadhyaya *et al*., 2012). Since its domestication in the Indian sub-continent at least 3500 years ago, its seeds have become a common food in Asia, Africa and Latin America.

In India, it is mainly consumed in the form of split pulse as dal. The people consume pigeonpea as dry seeds and green peas as it is staple food crop for several communities in India (Tabo *et al*., 1995). Its immature green seeds and pods are also consumed as a green vegetable. Pigeonpea's fiber quality is very great (7g/100g of seeds) (Kandhare, 2014). The defoliated leaves also add nitrogen and organic matter to the soil (Mafongoya *et al*., 2006). The husk of pods and leaves makes a valuable cattle fodder. The dry sticks of the pigeonpea plant are used for fuel, thatches, storage bins (baskets) and also at present days for biochar making etc. (Tiwari and Shivhare, 2017). Pigeonpea contains higher amounts of proteins (20% to 22%), carbohydrates (65%), fat (1.2%) and ash (3.9%) (Anonymous, 2005). Pigeonpea seeds are rich in potassium, phosphorus, magnesium, calcium and iodine and also provide essential amino acids like lysine, tyrosine and arginine, whereas cystine and methionine contents are low (Saxena *et al*., 2010).

The principal causes for least productivity as growing pigeonpea under poor conditions such as cultivating on marginal lands and lack of proper management techniques in controlling insect pests. Those pests attacking red gram mainly damages pods and flowers and that causes maximum economical damage. Red gram is attacked by several insect pests regularly. Among the insect pests attacking red gram, *Helicoverpa armigera, Maruca vitrata, Melanagromyza obtusa, Exelastis atomosa,* and *Clavigralla gibbosa* damages pigeonpea drastically. Among the pests above mentioned, Pod fly, *Melanagromyza obtusa* is notorious and serious pest that causes more than 20% to 80% damage to grains (Subharani and Singh, 2009).

Melanagromyza obtusa (Diptera: Agromyzidae) is an important pigeonpea insect-pest in North- east Asia. Pod fly attacks the crop during pod maturity also starting from pod filling stage. They lay eggs (oviposition) on inner walls of pod. Adult females oviposit singly inside the epidermis and after larvae coming out will feed on pods by mining in to it and that leads the pods not fit for consumption and seed value also decreases (Lal and Yadav, 1993). It feeds on internal parts of the pod. Pupa and maggots of pod fly are generally found inside the pod. In general, no symptoms are observed while the larvae growing inside the pod. Later adult fly comes out through the thin paper like membrane (window) which is a layer of pod wall left by larvae. Due to concealed way of life within the seeds, the pod fly attack remains unnoticed by farmer and thus it has become hard to control the pod fly. This pod fly infestation leads to reduced productivity and production.

Hence, it is inevitable to protect the crop from infestation of pod fly by using insecticides. Extensive use of conventional chemical insecticides may lead to development of resistance to insecticides, outbreak of secondary pest, and the problem residues in the food and fodder as chemical control is the most effective and produce instantaneous effects in reducing these menaces. Therefore, keeping this view and considering economic importance of pigeonpea this study was taken up to test the efficacy of insecticides against pigeonpea pod fly.

2. MATERIAL AND METHODS

The experiment on efficacy of insecticides against pod fly (*Melanagromyza obtusa*) of pigeonpea was carried out at Research Farm of Pulses Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri during *Kharif* 2023. There are 9 treatments were taken. Different insecticides *viz.,* spinetoram 11.7% SC @ 0.5 ml/l of water, indoxacarb 14.5% SC @ 0.7 ml/l of water, chlorantraniliprole 18.5% SC @ 0.3 ml/l of water, lambda-cyhalothrin 5% EC @ 1.0 ml/l of water, fipronil 5% SC @ 0.66 ml/l of water, acetamiprid 20% SP @ 0.4 g/l of water, emamectin benzoate 5% SG @ 0.44 g/l of water and quinalphos 25% EC @ 2.0 ml/l of water were tested for their efficacy against pod fly (*M. obtusa*). These treatments were replicated three times in randomized block design (RBD). The performance of each insecticide treatment was categorized on the basis of maggot population (number of maggots per plant), per cent pod damage and per cent grain damage. Two sprays were conducted at an interval of 15 days.

The efficacy of insecticides was evaluated by selecting five plants randomly from each treated plot and 5 pods from each plant for recording observations on number of maggots of pod fly before each application and at 3, 7 and 14 days after the application of insecticide treatment.

3. RESULTS AND DISCUSSION

3.1 Efficacy of insecticides against pod fly (*M. obtusa*) on pigeonpea

First Spray:

The data presented in Table 1 represents population (maggot) of pigeonpea pod fly, *Melanagromyza obtusa* on one day before, 3, 7 and 14 days after the first spray. The average population of *M. obtusa* one day before spray was ranged between 4.12 to 5.04 maggots/plant and were found statistically non-significant, suggesting that the population of pod fly on pigeonpea was uniform in field. Results of the mean efficacy of different insecticides against pod fly on pigeonpea at first spray revealed that, the treatment with insecticide chlorantraniliprole 18.5% SC @ 0.3 ml/l of water recorded minimum mean average population of pod fly (1.34 maggots/plant) and was followed by the treatments with indoxacarb 14.5% SC @ 0.7 ml/l of water and spinetoram 11.7% SC @ 0.5 ml/l of water with 1.40 and 1.46 maggots/plant, respectively which were at par with each other. Next best treatment was emamectin benzoate 5% SG @ 0.4 g/l of water with 1.69 maggots/plant and it was at par with acetamiprid 20% SP @ 0.4 g/l of water (1.75 maggots/plant) and lambda-cyhalothrin 5% EC @ 1.0 ml/l of water (1.80 maggots/plant). Whereas, fipronil 5% SC @ 0.66 ml/l of water recorded 2.03 maggots/plant. However, the treatment with quinalphos 25% EC @ 2.0 ml/l of water (2.07 maggots/plant) was found least effective among all tested insecticides. Whereas, untreated control recorded highest mean population of pod fly (4.58 maggots/plant) after first spray.

Table 1. Efficacy of insecticides against pod fly (*M. obtusa*) on pigeonpea after first spray

Tr. No.	Treatments	Dose g or ml/litre of water	Pre count	Number of maggots per plant			
				3 DAS**	7 DAS	14 DAS	Mean
1.	Spinetoram 11.7% SC	0.5 ml	4.76 (2.29)*	1.64 (1.46)	1.28 (1.33)	1.46 (1.40)	1.46 (1.40)
2.	Indoxacarb 14.5% SC	0.7 ml	4.84 (2.31)	1.58 (1.44)	1.22 (1.31)	1.42 (1.38)	1.40 (1.38)
3.	Chlorantraniliprole 18.5% SC	0.3 ml	4.32 (2.19)	1.52 (1.42)	1.14 (1.28)	1.36 (1.36)	1.34 (1.35)
4.	Lambda-cyhalothrin 5% EC	1.0 ml	4.12 (2.15)	2.06 (1.60)	1.58 (1.44)	1.76 (1.50)	1.80 (1.51)
5.	Fipronil 5% SC	0.66 ml	4.64 (2.27)	2.34 (1.69)	1.80 (1.52)	1.96 (1.57)	2.03 (1.59)
6.	Acetamiprid 20% SP	0.4 g	4.56 (2.25)	2.00 (1.58)	1.54 (1.43)	1.72 (1.49)	1.75 (1.50)
7.	Emamectin benzoate 5% SG	0.4 g	4.96 (2.33)	1.92 (1.55)	1.50 (1.41)	1.66 (1.47)	1.69 (1.48)
8.	Quinalphos 25% EC	2.0 ml	5.04 (2.35)	2.38 (1.70)	1.84 (1.53)	1.99 (1.58)	2.07 (1.60)
9.	Untreated control	-	4.24 (2.18)	4.45 (2.22)	4.76 (2.29)	4.52 (2.24)	4.58 (2.25)
S. E.(m)±			0.04	0.03	0.02	0.02	0.02
C. D. @ 5%			N. S.	0.08	0.07	0.06	0.07

*Figures in parentheses indicate $\sqrt{n + 0.5}$ transformed values N.S.- Non significant
**DAS – Days after spraying

Second spray:

The data presented in Table 2 represents population (maggot) of pigeonpea pod fly, *Melanagromyza obtusa* on 3, 7 and 14 days after the second spray. Results of the mean efficacy of different insecticides against pod fly on pigeonpea at second spray revealed that, the treatment with insecticide chlorantraniliprole 18.5% SC @ 0.3 ml/l of water recorded minimum mean average survival population of pod fly (0.72 maggots/plant) and was followed by the treatments with indoxacarb 14.5% SC @ 0.7 ml/l of water and spinetoram 11.7% SC @ 0.5 ml/l of water with 0.78 and 0.82 maggots/plant, respectively which were at par with each other. Next best treatment was emamectin benzoate 5% SG @ 0.4 g/l of water with 1.01 maggots/plant and it was at par with acetamiprid 20% SP @ 0.4 g/l of water (1.07 maggots/plant) and lambda-cyhalothrin 5% EC @ 1.0 ml/l of water (1.11 maggots/plant). Whereas, fipronil 5% SC @ 0.66 ml/l of water recorded 1.32 maggots/plant. However, the treatment with quinalphos 25% EC @ 2.0 ml/l of water (1.37 maggots/plant) was found least effective among all tested insecticides. Whereas, untreated control recorded highest mean population of pod fly (4.79 maggots/plant) after second spray.

The results of current study showed similarity with the findings of Dadas *et al.* (2019) who reported that, chlorantraniliprole 18.5% SC was proved most promising in reducing pod fly population. Present finding is also in consistence with Chiranjeevi and Sarnaik (2017) who evaluated the effect of different insecticide treatments on pod fly population. The result related to the population of *M. obtusa*, showed similarity with the Patel and Patel (2013) who also reported chlorantraniliprole @ 30 g a.i./ha was superior treatment against pigeonpea pod borer complex. Patidar and Vaishampayan (2022) found that chlorantraniliprole 18.5 % SC @ 0.2 ml/l followed by indoxacarb 14.5 % SC have good effect for control of pigeonpea borer complex.

Table 2. Efficacy of insecticides against pod fly (*M. obtusa*) on pigeonpea after second spray

Tr. No.	Treatments	Dose g or ml/litre of water	Number of maggots per plant			
			3 DAS**	7 DAS	14 DAS	Mean
1.	Spinetoram 11.7% SC	0.5 ml	1.20 (1.30)*	0.74 (1.11)	0.54 (1.02)	0.82 (1.14)
2.	Indoxacarb 14.5% SC	0.7 ml	1.14 (1.28)	0.68 (1.09)	0.52 (1.01)	0.78 (1.12)
3.	Chlorantraniliprole 18.5% SC	0.3 ml	1.08 (1.26)	0.62 (1.06)	0.48 (0.99)	0.72 (1.10)
4.	Lambda-cyhalothrin 5% EC	1.0 ml	1.52 (1.42)	1.04 (1.24)	0.78 (1.13)	1.11 (1.26)
5.	Fipronil 5% SC	0.66 ml	1.77 (1.51)	1.26 (1.33)	0.94 (1.20)	1.32 (1.35)
6.	Acetamiprid 20% SP	0.4 g	1.48 (1.41)	0.98 (1.22)	0.74 (1.11)	1.07 (1.25)
7.	Emamectin benzoate 5% SG	0.4 g	1.42 (1.39)	0.92 (1.19)	0.68 (1.09)	1.01 (1.22)
8.	Quinalphos 25% EC	2.0 ml	1.80 (1.52)	1.30 (1.34)	1.00 (1.22)	1.37 (1.36)
9.	Untreated control	-	4.72 (2.28)	4.82 (2.31)	4.84 (2.31)	4.79 (2.30)
S. E.(m)±			0.03	0.02	0.03	0.02
C. D. @ 5 %			0.08	0.07	0.08	0.07

*Figures in parentheses indicate $\sqrt{n + 0.5}$ transformed values **DAS – Days after spraying

CONCLUSION

From the present study, it can be concluded that the treatment chlorantraniliprole 18.5% SC was the most effective treatment, resulting in the lowest average pod fly population at 1.0 maggots/plant. This was followed by indoxacarb 14.5% SC and spinetoram 11.7% SC, which recorded 1.09 and 1. maggots per plant, respectively; these three treatments were statistically at par with each other. Chlorantraniliprole 18.5% SC resulted in the lowest percentage of pod damage at 8.74% and grain damage at 5.69%. To effectively manage the pigeonpea pod fly (*Melanagromyza obtusa*), farmers can use chlorantraniliprole 18.5% SC at a rate of 0.3 ml/l of water to achieve higher yields and net returns.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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