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On Farm Assessment of Technology Options against Pod borer and Pod fly in Pigeonpea

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ABSTRACT

Pigeonpea is widely cultivated pulse crop in India during the *Kharif* season. Pod borer and pod fly cause adequate economic damage to the pigeonpea. Field experiments were carried out to assess the different technology options against the pod borer and pod fly in pigeonpea during the *Kharif* season of 2019 - 20 and 2020 - 21. The results on efficacy of technology options revealed that during both the years the minimum pod damage by pod borer (12.2 and 13.3% during the year 2019 - 20 and 2020 - 21, respectively) was recorded in TO - I(1st spraying with NSKE 5% followed by 2nd application with lambda cyhalothr in 5 EC) followed by TO - II(14.8 and 16.6% during the year 2019 – 20 and 2020 – 21, respectively) in which 1stand 2nd spraying was done with Spinosad 45 SC and farmers' practice (22.4 and 23.1 during the year 2019 – 20 and 2020 – 21, respectively) where no any insecticide was sprayed. Pod damage by pod fly was also recorded minimum in TO - I (14.2 and 10.5% in the year 2019 - 20 and 2020 - 21, respectively) followed by TO - II (16.2 and 13.7% in the year 2019 - 20 and 2020 - 21, respectively) and farmers' practice (23.6 and 20.3% in the year 2019 - 20 and 2020 - 21, respectively) in pigeonpea. Maximum yield (10.2 and 11.3 q/ha during the year 2019 - 20 and 2020 - 21, respectively) was also recorded in TO - I with the highest BC(Benefit:Cost) ratio 1.81:1 and 2.00:1in the year 2019 - 20 and 2020 - 21, respectively. The overall results of the present study indicating the overall superiority of TO - I(1st spraying with NSKE 5% at 50% flowering followed by 2nd application with lambda cyhalothrin 5 EC at 75% pod formation stage) in all the aspects i.e. pod damage, grain damage, yield and BC ratio.

Keywords: Insecticides, Pigeonpea, Pod borers.

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INTRODUCTION

India grows a variety of pulse crops under a wide range of agro climatic conditions and has a pride of being the world's largest producer of pulses. Unique characteristics like high protein content, nitrogen fixing ability, soil ameliorative properties and ability to thrive better under harsh conditions make pulses an integral component of sustainable agriculture particularly in dryland areas. Pigeonpea, *Cajanus cajan* (L.) Millspaugh is a widely cultivated pulse crop in India during the *Kharif* season. The average productivity of pigeonpea in India is rather low as compared to world's average productivity. Many factors are responsible for low yield of pigeonpea in India, insect pests are major ones (Maurya *et al.*, 2017). More than 300 insect species belonging to 8 orders and 61 families have been found to infest pigeonpea starting from seedling stage and continuous till harvesting and even during the storage condition (Keval *et al.*, 2010). However, about 60% damage is solely caused by the pod borer complex (Wadaskar *et al.*, 2013).

In the past major emphasis on insect pest management was chemical control. But in our district (Godda) majority of the farmers grow the pigeonpea crop without any application of insecticides against insect pests resulting a significant loss in yield. The basic idea of the on farm trial is to minimize the yield loss due to pod borer and pod fly in pigeonpea. In this context present study was planned to assess various technology options including botanical, microbial and chemical methods either in combination or alone for the management of pod borer and pod fly in pigeonpea.

MATERIALS AND METHODS

The experiments were carried out during the *Kharif* season of 2019 – 20 and 2020 – 21 at 10 farmer's field in the village Beldiha (Boarijore block) and Kerabadi (Pauriahaat block) of the district Godda (Jharkhand) by GVT – Krishi Vigyan Kendra, Godda under on farm testing (OFT) activity of the KVK. Three suggested pest management technology options including farmers practice were assessed against gram pod borer, *Helicoverpa armigera* Hubner and red gram pod fly, *Melanagromyza obtusa* Malloch in pigeonpea (Table 1). The trials were laid out in RBD with 03 treatments (modules) and

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10 replications during both the years. The local variety of pigeonpea was sown in the first week of July in 20 rows maintaining distance of 60 cm (row to row) and 30 cm (plant to plant) in plots measuring 6 x 4 meter. All the other agronomical practices were followed to raise a good and healthy crop as suggested by Neharkar *et al.* (2018).

Five plants selected earlier randomly from each plot were observed for pod damage at the time of harvesting. Number of damaged and healthy pods were counted. The pods were opened and examined for grain damage. Per cent pod and grain damage were calculated by following formula as suggested by Warad *et al.* (2021):

Per cent pod damage = (No. of damaged pods/Total no. of pods) x 100

Per cent grain damage = (No. of damaged grains/Total no. of grains) x 100

Grain yield was recorded in each plot and converted to q/ha. The data on per cent damaged pods and grains were transformed in to arc sine values to reduce the variation in different treatments and then subjected to statistical analysis. The significance of treatments was assessed by determining critical difference (CD) at 5 per cent level of significance.

Table 1: Details of technology options for the management of pod borer and pod fly in pigeonpea

Technology options	Details
Farmers' practice	No use of insecticides
TO - I	1st spray with NSKE (5%) followed by 2nd application with Lambda cyhalothrin 5 EC (1 ml/litre water)
TO - II	1st and 2nd spray with Spinosad 45 SC (0.2 ml/litre water)
1st spray at 50% flowering stage followed by 2 nd application at 75% pod formation stage	

RESULTS AND DISCUSSION

The results of the field experiments conducted by GVT – Krishi Vigyan Kendra, Godda revealed that all the technology

options were significantly effective in reducing the incidence of pod borer and pod fly as compared to the farmers' practice in pigeonpea (Table 2). The per cent pod damage by pod borer was recorded minimum (12.2 and 13.3 during the year 2019 – 20 and 2020 – 21, respectively) in TO - I (1st spraying with NSKE 5% followed by 2nd application with lambda cyhalothrin 5 EC) followed by TO - II (14.8 and 16.6 during the year 2019 – 20 and 2020 – 21, respectively) in which 1st and 2nd spraying was done with Spinosad 45 SC and farmers' practice (22.4 and 23.1 during the year 2019 – 20 and 2020 – 21, respectively) where no any insecticide was sprayed. In case of pod fly minimum pod damage (14.2 and 10.5 per cent during the year 2019 – 20 and 2020 – 21, respectively) was also observed in TO - I (1st spraying with NSKE 5% followed by 2nd application with lambda cyhalothrin 5 EC) followed by TO - II (16.2 and 13.7 per cent during the year 2019 – 20 and 2020 – 21, respectively) and farmers' practice (23.6 and 20.3 per cent during the year 2019 – 20 and 2020 – 21, respectively).

The pigeonpea grain damage by pod borer and pod fly recorded in different technology options are presented in Table – 2. The minimum grain damage due to pod borer (15.8 and 12.6 per cent during the year 2019 – 20 and 2020 – 21, respectively) and pod fly (17.4 and 15.1 per cent during the year 2019 – 20 and 2020 – 21, respectively) was recorded in TO - I(1st spraying with NSKE 5% followed by 2nd application with lambda cyhalothrin 5 EC) followed by TO - II (18.2 per cent during both the years in case of pod borer while it was 18.9 and 18.5 per cent by pod fly during the year 2019 – 20 and 2020 – 21, respectively) in which 1st and 2ndspraying was done with Spinosad 45 SC and farmers' practice (23.6 and 28.2 per cent by pod borer while it was 24.4 and 23.8 per cent by pod fly during the year 2019 – 20 and 2020 – 21, respectively).

The grain yield data (Table 3) also revealed that all the technology options were significantly superior over farmers' practice. The grain yield data showed that TO - I(1st spraying with NSKE 5% followed by 2nd application with lambda cyhalothrin 5 EC) recorded the highest yield (10.2 and 11.3 q/ha during the year 2019 – 20 and 2020 – 21, respectively) followed by TO - II (8.6 and 9.4 q/ha during the year 2019 – 20 and 2020 – 21, respectively) in which 1st and 2nd spraying was done with Spinosad 45 SC and farmers' practice (7.4 and 6.9 q/ha during the year 2019 – 20 and 2020 – 21, respectively). Benefit cost ratio (BC ratio) was also calculated (Table 3) and

Table 2: Efficacy of technology options on the infestation of pod borer and pod fly in pigeonpea during the year 2019 – 20 and 2020 - 21

Technology options	Pod damage (%)				Grain damage (%)			
	2019 - 20		2020 - 21		2019 - 20		2020 - 21	
	Pod borer	Pod fly	Pod borer	Pod fly	Pod borer	Pod fly	Pod borer	Pod fly
Farmers' practice	22.4 (28.0)	23.6 (29.3)	23.1 (28.6)	20.3 (26.8)	23.6 (29.3)	24.4 (29.3)	28.2 (32.0)	23.8 (29.2)
TO – I	12.2 (20.3)	14.2 (22.0)	13.3 (21.1)	10.5 (18.8)	15.8 (23.6)	17.4 (24.3)	12.6 (20.8)	15.1 (22.8)
TO - II	14.8 (22.8)	16.2 (23.6)	16.6 (24.3)	13.7 (21.7)	18.2 (25.1)	18.9 (25.8)	18.2 (25.1)	18.5 (25.4)
CD (P = 0.05)	0.62	0.81	2.06	2.50	0.58	0.85	2.12	2.24

Figures in parentheses are arc sine transformed values.

Table 2: Efficacy of technology options on the infestation of pod borer and pod fly in pigeonpea during the year 2019 – 20 and 2020 - 21

Technology options	Yield (q/ha)		Cost of cultivation	Gross Return (Rs./ha)		Net Return (Rs./ha)		BC Ratio	
	2019 - 20	2020 - 21	(Rs./ha) for both years	2019 - 20	2020 - 21	2019 - 20	2020 - 21	2019 - 20	2020 - 21
Farmers' practice	7.4	6.9	26364	37000	34500	10636	8136	1.40:1	1.31:1
TO – I	10.2	11.3	28239	51000	56500	22761	28261	1.81:1	2.00:1
TO - II	8.6	9.4	27364	43000	47000	15636	19636	1.57:1	1.72:1
CD (P = 0.05)	0.42	1.81							

the maximum BC ratio (1.81:1 and 2.00:1) was obtained in TO - I followed by TO - II (1.57:1 and 1.72:1) and farmers practice (1.40:1 and 1.31:1) during the year 2019 – 20 and 2020 – 21, respectively.

Thus, it is quite clear from the present study that TO - I (1st spray with NSKE 5% and 2nd spray with lambda cyhalothrin 5 EC) exhibited the minimum pod and grain damage as well as highest yield and BC ratio. It is in agreement with the Jagtap *et al.* (2023) who reported Azadirachtin (1500 ppm) most effective followed by NSE 5% among biopesticides in controlling pod borers in pigeonpea and in obtaining maximum yield. Priyadarshini *et al.* (2013) found flubendiamide 480 SC to be the most effective followed by lambda cyhalothrin 5 EC with a maximum reduction in pod borers with pod damage and grain damage and the highest net profit. Pal *et al.* (2022) found spinosad the most effective against the pod borers and for getting higher benefit cost ratio. Warad *et al.* (2021) reported Chlorantraniliprole 18.5 SC as most promising treatment for the management of pod borers in pigeonpea.

CONCLUSION

Pigeonpea is the most popular pulse crop of Godda district during *Kharif* season. In the district the productivity is low due to several limiting factors and one of the important factors is infestation of pod borer and pod fly. Thus, it has been concluded from the present study that in pigeonpea 1st spraying should be done with NSKE 5% at 50 per cent flowering stage followed by 2nd application with lambda cyhalothrin 5 EC (1 ml/litre water) at 75 per cent pod formation stage for the management of pod borer and pod fly in pigeonpea.

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CONFLICT OF INTEREST

All the author both individually and collectively, affirms that they do not possess any conflicts of interest either directly or indirectly related to the research being reported in the publication.

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