Original Research Article

Assessing the Effectiveness of Supervisory Management Strategies for Pod Fly, *Melanagromyza obtusa* in Pigeonpea

ABSTRACT

A field experiment was conducted during kharif 2019-20 at Zonal Agricultural Research Station, Kalaburagi, University of Agricultural Sciences, Raichur, Karnataka, India to assess supervisory management strategies for pod fly in pigeonpea variety TS 3R sown on different dates viz., 20-07-2019, 05-08-2019 and 20-08-2019. In protected plots, pod fly was managed by spraying insecticides recommended in package of practices i.e., Imidacloprid 17.8 SL @ 0.20 ml + jaggary 10 g l^{-1} as first spray at 10 days after pod formation and second spray with Thiamethoxam 25 WG @ 0.2 g + jaggary 10 g l^{-1} at 15 days after first spray with additional sprays as needed based on the damage. First spraying was done based on the incidence of pod fly i.e., when the seed damage due to pod fly crossed 5%. Subsequent sprays were taken up on need basis at 15 days interval whenever seed damage crossed 5%. Present study revealed that the protected plots had significantly lower pod and seed damage compared to unprotected plots and the need-based application of recommended chemicals effectively controlled pod fly in crop sown on 20th July. However, crops sown on 5th August and 20th August faced higher pest pressure and required three sprays, indicating that late planted crops are more susceptible to pod fly infestations and may need additional treatments to manage the increased pest load.

Keywords: Supervisory management, pod fly, pigeonpea, protected plots, unprotected plots.

1. INTRODUCTION

Pigeonpea (*Cajanus cajan*), also known as red gram or tur, is a crucial leguminous crop cultivated extensively in tropical and subtropical regions, particularly in South Asia, Africa and the Caribbean. It is a vital source of protein, dietary fiber and essential amino acids, making it a staple food for millions of people in developing countries [1]. Pigeonpea's importance extends beyond its nutritional value. It is a multipurpose crop, providing food, fodder, fuelwood and income to small holder farmers. Its deep root system helps in soil conservation and improves soil structure, making it highly suitable for rainfed farming systems [2]. The crop is also known for its drought tolerance and adaptability to marginal environments, which is crucial for ensuring food security in regions prone to climate variability [3].

However, pigeonpea production is severely constrained by various biotic and abiotic stresses, with insect pests being the most significant threat. Among these, the pod fly, *Melanagromyza obtusa* is particularly devastating, as it infests developing pods and causes significant damage. Pod fly infestation in pods does not exhibit visible external damage symptoms until fully grown larvae chew the pod wall, leaving behind a delicate papery membrane, a "window" through which the adult flies exit. This concealed lifestyle within the pods makes it challenging for farmers to detect pod fly attacks at very early stage, complicating pest management efforts. This is becoming a critical barrier in enhancing both the production and productivity of pigeonpea, especially in subsistence farming conditions. Extensive research over the past three decades has focused on controlling pod fly attacks using chemical methods. It has become a significant concern in major pulse cultivation regions, leading to yield losses, particularly in long-duration varieties [4,5,6]. It has been responsible for

inflicting damage ranging from 21.00 to 38.50% on pods and 12.29 to 19.87% on grains [7]. Notably, pod fly infestations have resulted in yield losses of 60 to 80% in pigeonpea [8].

Farmers often attempt to control pod fly infestations through frequent insecticide applications. Shanower *et al*. [9] observed that farmers in southern India needed to spray insecticides 3 to 6 times per season, with limited success and minimal economic benefit. While insecticides can be effective in managing pests, their excessive use can result in environmental contamination, harm non-target organisms and lead to the development of insecticide resistance in pest populations. These practices not only increase production costs but also pose significant risks to human health and the sustainability of ecosystems. Additionally, the timing of sowing plays a crucial role in pest incidence, likely due to variations in weather conditions [10]. Early planted crops tend to experience lower pest populations and consequently yield more than late planted crops [11]. Therefore, selecting the appropriate sowing period is an essential, cost-effective and eco-friendly strategy for pest management. To address these challenges more sustainably, there is increasing emphasis on need-based insecticide application strategies in pigeonpea farming systems. Need-based application involves judicious use of insecticides based on pest thresholds and crop growth stages, optimizing their effectiveness while minimizing environmental impact. This approach not only improves pest management efficiency but also supports integrated pest management (IPM) practices, promoting long-term agricultural sustainability. Therefore, the current study aimed to evaluate the efficacy of recommended chemicals against pod fly in pigeonpea sown across different dates.

2. METHODOLOGY

Pigeonpea variety TS 3R was sown in plots of 5.4 m × 4.8 m on three dates viz., 20-07-2019, 05-08-2019 and 20-08-2019 under both protected and unprotected conditions during kharif 2019-20 at Zonal Agricultural Research Station, Kalaburagi, University of Agricultural Sciences, Raichur, Karnataka, India. Kalaburagi is situated in North eastern dry zone of Karnataka between 16º 16' latitude and 77º 20' longitudes and at 389 meters above mean sea level. The crop was raised by following the standard agronomic practices as per the package of practices of UAS Raichur [12]. In protected plots, pod fly was managed by spraying with the recommended chemicals in package of practices *i.e*., Imidacloprid 17.8 SL @ 0.20 ml + jaggary 10 g l^{-1} as first spray at 10 days after pod formation and second spray with Thiamethoxam 25 WG @ 0.2 g + jaggary 10 g l^{-1} at 15 days after first spray [12]. First Spraying was done based on the incidence of pod fly *i.e*., when the seed damage due to pod fly crossed 5%. Subsequent sprays were taken up on need basis at 15 days interval whenever seed damage crossed 5%.

For recording observations on pod and seed damage, fifty pods were randomly collected from each unprotected and protected plots at weekly intervals and seeds were separated. These seeds were examined for healthy and infested one and accordingly, the pod and seed damage caused by pod fly was calculated using the formula mentioned below [13].

$$\text{Per cent pod/seed damage} = \frac{\text{Number of damaged pods/seeds}}{\text{Total number of pods/seeds}} \times 100$$

The data on pod and seed damage recorded at weekly interval from pod formation to maturity from unprotected and protected plots was subjected to statistical analysis and the significance was tested by “t” test.

3. RESULTS AND DISCUSSION

The pod fly incidence in TS 3R variety was observed from 45th SMW to 2nd SMW. The damage was insignificant in all sowing dates till first spray in both protected and unprotected plots. However, the damage in protected plots reduced significantly compared to unprotected plots after first and subsequent sprays (Table 1). Spaying was done twice on 20th July sown crop. Whereas, three sprayings were given to 5th and 20th August sown crop. The pod damage at maturity was 24.00, 28.80 and 33.60% in unprotected plots; and 9.60, 13.60 and 16.80% in protected plots in the crop sown on

20th July, 5th August and 20th August, respectively. Similarly, seed damage was 15.14, 19.33 and 28.24% in unprotected; and it was 5.67, 7.07 and 11.55% in protected plots at maturity in the crop sown on 20th July, 5th August and 20th August, respectively.

Table 1. Supervisory management of pod fly in pigeonpea variety (TS 3R) sown on different dates

Date of observation	SMW	Pod damage (%)		t_{cal}	Seed damage (%)		t_{cal}
		Unprotected	Protected		Unprotected	Protected	
Crop sown on 20-07-2019							
10-11-2019	45	5.60	4.80	0.63	1.68	1.67	0.02
17-11-2019	46	7.20	7.20	0	2.72	2.68	0.12
24-11-2019 (I)	47	10.80	10.40	0.22	5.69	5.78	0.46
01-12-2019	48	13.60	7.20	3.50*	6.78	3.45	12.57*
08-12-2019	49	17.60	8.80	6.95*	9.11	4.85	12.79*
15-12-2019(II)	50	21.60	10.40	8.08*	12.16	6.32	16.91*
22-12-2019	51	24.00	9.60	9.00*	15.14	5.67	19.43*
Mean		14.34	8.34		7.61	4.34	
Crop sown on 05-08-2019							
24-11-2019	47	7.20	6.40	0.44	3.39	3.43	0.05
01-12-2019 (I)	48	10.40	10.40	0	5.81	5.77	0.17
08-12-2019	49	13.60	7.20	5.06*	9.65	4.67	13.21*
15-12-2019(II)	50	18.40	11.20	5.69*	12.62	6.44	17.17*
22-12-2019	51	21.60	9.60	8.66*	15.08	5.54	17.72*
29-12-2019 (III)	52	24.80	12.0	8.55*	17.68	7.38	19.32*
05-01-2020	1	28.80	13.60	8.49*	19.33	7.07	19.23*
Mean		17.82	10.05		11.93	5.75	
Crop sown on 20-08-2019							
01-12-2019	48	7.20	8.00	0.53	3.88	3.94	0.78
08-12-2019 (I)	49	11.60	11.60	0	7.78	7.81	0.57
15-12-2019	50	15.20	9.60	4.42*	12.37	5.88	17.78*
22-12-2019 (II)	51	20.00	11.20	5.88*	16.70	7.35	19.96*
29-12-2019	52	24.80	10.40	8.05*	21.97	6.98	21.44*
05-01-2020 (III)	1	28.00	13.60	9.00*	25.52	9.40	24.38*
12-01-2020	2	33.60	16.80	9.39*	28.24	11.55	23.20*
Mean		20.05	11.60		16.63	7.55	

SMW: Standard Meteorological Week
*Significant at 5 % level of significance; $t_{tabulated}$ = 2.30.
I- First spray, II- Second spray, III-Third spray

The results indicated that the crop sown on 20th July required two sprays to manage pod fly. Whereas, late sown crop needed more than two sprays. Pathade *et al*. [13] opined that, in order to manage pod fly in pigeonpea, the crop need to be sprayed with newer insecticides twice from pod initiation stage at an interval of fifteen days. Results were also in close agreement with Reddy *et al*. [14] who found that two sprayings (one at 50% flowering, another at pod filling stage) of fenvalerate 0.02 percent was effective in managing pod fly. Where in, dimethoate 0.03% (first spray) and endosulfan 0.07% (second spray) as strip application was recommended by Sachan *et al*. [15] to manage pod fly. In present study, pod fly was effectively managed by three applications in 5th and 20th August sown crop. Similar reports were made by Srujana and Keval [16] who reported Thiamethoxam 25 WG @ 75 g a.i. /ha to be effective chemical in managing pod fly when applied thrice (1st at 50% flowering stage, 2nd and 3rd at 15 days interval after first spraying). Three applications of Quinalphos at 0.5 kg a.i/ha at fortnightly interval was found to be effective against pod fly as reported by Singh and Rai [17].

4. CONCLUSION

The need-based application of recommended insecticides effectively controlled pod fly in crop sown on 20th July. However, crops sown on 5th August and 20th August faced higher pest pressure and required three sprays, indicating that late sown crops are more susceptible to pod fly infestations and may need additional sprays to manage the increased pest load.

Disclaimer (Artificial intelligence)

Option 1:

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 manuscripts.

REFERENCES

1 Gowda CL, Saxena KB, Srivastava RK, Upadhyaya HD, Silim SN. Pigeon pea: From an Orphan to a Leader in Food Legumes. Biodiversity in Agriculture Domestication, Evolution and Sustainability. 2012;1:361.

2 Saxena KB. Genetic improvement of pigeon pea-a review. Tropical plant biology. 2008;1:159-178.

3 Turner NC, Wright GC, Siddique KHM. Adaptation of grain legumes (pulses) to water-limited environments. Advances in Agronomy. 2001;71: 193-231

4 Gopali JB, Teggelli R, Mannur DM, Yelshetty S. Web-forming lepidopteran, *Maruca vitrata* (Geyer): An emerging and destructive pest in pigeonpea. Karnataka Journal of Agricultural Sciences. 2010;23(1): 35-38.

5 Gopali JB, Sharma OP, Yelshetty S, Rachappa V. Effect of insecticides and biorationals against pod bug, *Clavigralla gibbosa* in pigeonpea. Indian Journal of Agricultural Sciences. 2013;83(5): 582–585.

6 Sharma OP, Bhosle BB, Kamble KR, Bhede BV, Seeras NR. 2011. Management of pigeonpea pod borers with special reference to pod fly (*Melanagromyza obtusa*). Indian Journal of Agricultural Sciences. 2011;81(6): 539.

7 Khan M, Srivastava CP, Sitanshu. Screening of some promising pigeonpea genotypes against major pests. Ecoscan. 2014;6: 313-316.

8 Durairaj C. Evaluation of certain neem formulations and insecticides against pigeonpea pod fly. Indian Journal of Pulses Research. 2006;19(2): 269-270.

9 Shanower TG, Romeis J, Minja EM. Insect pests of pigeonpea and their management. Annual Review of Entomology. 1999;44: 77-96.

10 Cumming G, Jenkins L. Chickpea: Effective crop establishment, sowing window, row spacing, seeding depth and rate. Northern Pulse Bulletin. 2011;7: 6.

11 Prasad D, Bhan C, Sharma V, Prasad H. Effect of various plant geometry on chickpea (*Cicer arietinum*) under different dates of sowing: A Review. Journal of Progressive Agriculture. 2012;3(2): 113-117.

12 Anonymous, 2017, Package of practices, University of Agricultural Sciences, Raichur.

13 Pathade PM, Salunke PB, Borkar SL. Evaluation of some insecticides against pigeonpea pod fly, *Melanagromyza obtusa* Mall. Indian Journal of Agricultural Research. 2015;49(5): 460-463.

14 Reddy NC, Singh Y, Dureja P, Singh SV. Bioefficacy of insecticides, biopesticides and their combinations against podborers in pigeonpea. Indian Journal of Entomology. 2001;63(2): 137-143.

15 Sachan JN, Yadava CP, Ahmad R, Lal SS. Evaluation of strip treatment in pigeonpea with insecticides for the control of borer complex. Indian Journal of Pulses Research. 1993;6: 82-88.

16 Srujana Y, Keval R. Effect of newer insecticides against pod fly, *Melanagromyza obtusa* (Malloch) on long duration pigeon pea. Journal of Agriculture and Veterinary Science. 2013;5(4): 25-27.

17 Singh NN, Rai L. Efficacy of certain insecticides against pod fly, *Melanagromyza obtusa* Mall. under different spraying schedules. Indian Journal of Entomology. 1988;47: 268-273.