www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(5): 716-718

www.thepharmajournal.com
Received: 12-03-2021
Accepted: 15-04-2021

Ravi Shanker
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

RB Singh
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

SP Singh
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

Sushant Kumar
SVBPUAT, Department of Entomology, Modipuram, Meerut, Uttar Pradesh, India

PK Patel
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

AK Singh
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Ravi Shanker
ANDUAT, Department of Entomology, Kumarganj, Ayodhya, Uttar Pradesh, India

Seasonal activity of tur pod fly, *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae) and its relation with agro-climatic conditions of eastern Uttar Pradesh

Ravi Shanker, RB Singh, SP Singh, Sushant Kumar, PK Patel and AK Singh

Abstract
The present investigation on seasonal activity of pod fly, *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae) and its relation with agro-climatic conditions of eastern Uttar Pradesh in pigeonpea, NDA-2 crop during *Kharif*, 2018-19 revealed that pod damage and grain damage per cent by pod fly attained peak level during 15th standard week with 14.33 per cent and 18.98 per cent respectively. The activity of pod fly, *M. obtusa* showed that the larval population attained peak level during 8th standard week with 8.66/100 pods and pupal population during 11th standard week with 24.66/ 100 pods. The simple correlation between pod fly (larvae and pupae) with weather parameter revealed that maggot population showed non-significant positive correlation with minimum temperature and maximum temperature (0.279 and 0.111) and pupal population manifested significant positive correlation with minimum temperature (0.650) and maximum temperature (0.667).

Keywords: *Melanagromyza obtusa*, weather parameter and Narendra Deva Arahar-2

Introduction
Pigeonpea, *Cajanus cajan* (L.) Millsp. is an important pulse crop grown extensively for its rich protein content and forms an important constituent of our daily diet and often referred to as "poor man's meat" in developing countries. The per capita availability of pulses decreased from 60.7 gram per day in 1951 to 35.9 gram per day during 2008 (Franklin *et al.*, 2008) [5]. The pigeonpea also has widely grown throughout the tropics in Africa, America, Australia, Hawaii, West Indies, Sri Lanka, China, Myanmar and Malaysia (Thakur *et al.*, 1975) [13].
Pigeonpea, *Cajanus cajan* (L.) Mill. belong to the family Fabaceae. The term 'pigeonpea' was coined in Barbados, where its seeds were considered an important pigeon-feed (Gowda *et al.*, 2011) [6]. In India, among the pulses, pigeonpea, *Cajanus cajan* (L) Millsp. is one of the major pulse crop occupying the second position in area and production. The area under pigeonpea was 4.459 million hectares with the production of 4.18 million tonnes and productivity of 937 kg/ha (Anonymous, 17-18).
The productivity of pigeonpea is constrained by various biotic and abiotic stresses, resulting in a drastic reduction in yields. Among biotic stresses, insect pests, diseases and weeds pose a serious threat in the realization of targeted yields. (Shanower *et al.*, 1999) [11].
The damage caused by the immature stages of *M. obtusa* is much beyond the economic level. A single larva destroys one complete seed in its lifetime and sometimes it has been seen to move to the adjacent seed of the same pod to continue the feeding. (Saidappa S. M., 2012) [10]. It was observed that 22.5 per cent pigeonpea pods had damaged in North India, 21 per cent in central India and 13.2 per cent in South India. (Lateef and Reed, 1981) [9].
Correlation of pest population with weather parameters provide valuable information based on which we forecast pests population build-up and ultimately farmers can plan for plant protection strategies. Keeping all these in view, present investigation on seasonal incidence of pod fly of pigeonpea (*Cajanus cajan* [L.] Millsp.) was carried out.

Material and Methods
In order to study the seasonal activity of pod fly in pigeonpea under field conditions in relation to biotic and abiotic factors, pigeonpea (NDA-2) was sown at Students' Instructional Farm of A N D U A T, Kumarganj, Ayodhya during season *Kharif*, 2018-19 (July, 2018). The experiment was carried out at with 240m^2 experimental area.

The total experimental area was divided into 3 equal plots (4m × 15m each). The pigeonpea variety Narendra Deva Arhar-2 was sown 4th July during 2018 with 60cm × 30cm spacing. Between the two plots 1.0 meter wide strip were left to serve as irrigation channels.The crop was raised successfully by adopting recommended agronomical practices.

Methodology of observations

The observations were started to record just after initiation of pod formation. One hundred pods were plucked from 10 randomly selected plants from each replication at weekly intervals and brought to the laboratory in the department of entomology. After that the number of damaged pods and damaged grain were recorded to work out pod and grain damage per cent by dissecting individual pod. The numbers of larvae/pupae of pod fly present in each pod were also recorded. Then find out correlation between population of pod fly (maggot/pupae) and abiotic factors i.e. minimum temperature, maximum temperature, relative humidity, sunshine hours and rainfall.

The per cent pod damage and per cent grain damage was calculated using the following formula

$$\text{Pod/Grain damage per cent} = \frac{\text{No. of damage pods/grains}}{\text{Total no. of pods/grains}} \times 100$$

Results and Discussion

The pod fly activity (Table 1) was started to record at 52 SW with the 50 per cent of pod formation and continued up to the harvesting of crops.The pod damage started from 2nd SW and ranged between 1.33 to 14.33. The damage per cent start to increase from 3rd SW and reach to the level of 14.33 in 15th SW.

This is in accordance with the finding of Subharani and Singh (2007) [12] who reported that the damage of *M. obtusa* commenced in the pod filling stage (1.33 to 2.00 %) in the third week of January during year. The maximum infestation of the pest (15.56 %) was recorded during third week of February during mention year whereas, it was observed week earlier, i.e. the second week of February as (13.72 %) during same year.

The table 1 reveled that grain damage started from 3rd SW and their damage per cent ranged between 0.33 to 18.98. The damage per cent started to increase from 4rh SW and reached to the level of 18.98 in 15th SW.

This findings was accordance with the results of Chandra (2014) [2].

The mean of maggot population (0.33/100 pods) of *M. obtusa* was noticed first time in 5th standard week (SW) at minimum temperature of 7.1 ^{0}C, maximum temperature of 21.7 ^{0}C, relative humidity 74.90 per cent, rain fall 0 mm and sunshine 7.4 hrs. The mean maggot population of pod fly/100 pods ranged between 0.33 to 8.66. The maximum mean maggot population 8.66 maggots/100 pods was recorded during 8th SW and reached to the level of 3.00/100 pods in 15th SW.

These result are accordance with the Keval and Srivastava (2011) [6] who reported that the highest mean population of pod fly was recorded in the 10th SW (8.93 maggots) followed by 9th SW (7.60 maggots) while the lowest was recorded in the 4th SW (0.73 maggots). Jaisal *et al*. (2010) [7] also noticed peak pod fly population from 8th SW to 12th SW.

The pupal population (0.33 pupae/100 pods) of *M. obtusa* was noticed for the first time in 5th SW and the mean pupal population of pod fly/100 pods ranged between 0.33 to 24.66. Its population increased in next successive weeks and reached highest of 24.66/100 pods was recorded in 11th SW. The number of pupal population started to decline from 12th SW and reached to its level of 12 pupae/100 pods in 15th SW.

The present finding are also in partial agreement with finding of Das and Katyar (1998) [4] who reported the temperature between 18 ^{0}C to 20 ^{0}C and 19.0 ^{0}C to 20.5 ^{0}C, respectively were most conducive for larval and pupal development with peaks at 19th and 5th SW for larvae and 50th and 5th SW for pupae. This is accordance with the finding of Dahiya *et al*. (1999) [3] who reported that the mean temperature between 20 ^{0}C – 28 ^{0}C relative humidity of 51-53 per cent as most conductive for the multiplication of *M. obtuse*.

Table 1: Population dynamics of pod fly *M. obtusa* (Malloch) in pigonpea (NDA-2)

S.W.	Pod damage (%)	Grain damage (%)	Number of pod fly population stage/100 pods		Temperature (^{0}C)		RH (%)	Rainfall (mm)	Sun shine (hrs.)
			Maggot	Pupae	Max.	Min.			
52	0.00	0.00	0.00	0.00	23.5	5.3	70.5	00.0	6.6
1	0.00	0.00	0.00	0.00	22.2	5.3	72.2	00.0	5.5
2	1.33	0.00	0.00	0.00	21.8	5.7	72.0	00.0	6.0
3	2.00	0.33	0.00	0.00	22.5	5.0	70.5	00.0	6.9
4	3.00	037	0.00	0.00	21.1	10.6	73.1	41.0	4.2
5	3.66	0.71	0.33	0.33	21.2	7.1	74.9	00.0	7.4
6	6.33	4.55	2.00	0.66	21.8	6.7	72.5	41.0	5.9
7	8.00	8.33	6.33	11.66	21.8	10.5	76.6	00.0	3.6
8	8.33	8.74	8.66	13.66	25.3	11.2	79.1	00.0	6.9
9	9.33	9.00	6.33	10.33	22.9	10.0	72.7	00.0	6.7
10	10.66	9.44	4.66	22.00	22.8	9.8	74.0	00.0	5.5
11	11.00	10.67	1.66	24.66	30.0	12.7	61.4	00.0	7.6
12	11.66	11.86	2.00	22.33	31.9	14.3	7.5	00.0	9.4
13	13.00	14.50	2.66	22.00	34.0	17.3	62.1	00.0	8.8
14	13.66	16.00	3.33	20.66	29.4	13.1	64.3	00.0	8.4
15	14.33	18.98	3.00	12.66	37.5	21.2	56.6	00.0	9.4

S.W. = Standard Week. **Source:** Deptt. of Agromet., ANDUAT, Kumarganj, Ayodhya.

Correlation between maggots and pupae of pod fly, *M. obtusa* with abiotic factors

Correlation between maggot & pupal population and weather parameters *viz.* minimum temperature, maximum temperature, relative humidity, rainfall and sunshine hours have been worked out and presented in Table-2. It is evident from data that during *Kharif* 2018-19 maggot population showed non-significant positive correlation with minimum temperature and maximum temperature (0.279 and 0.111) and negative correlation with relative humidity, rainfall and sunshine hours (-0.005, -0.216 and -0.039). Pupal population showed significant positive correlation with minimum temperature (0.650) and maximum temperature (0.667) and non-significant with sunshine hours (0.484) whereas, significant negative correlation with relative humidity (-0.612) and non-significant negative correlation with rainfall (-0.349).

Table 2: Correlation between biotic factors with abiotic factors during *Kharif*, 2018-19

Biotic factors	Abiotic factors				
	Temperature (^{0}C)		RH (%)	Rainfall (mm)	Sunshine hours (Hrs.)
	Max.	Min.			
Maggot	0.279	0.111	-0.005	-0.216	-0.039
Pupae	0.650*	0.667*	-0.612*	-0.349	0.484

*Significance at 5%

Yadav *et al*., (2011) [14] who recorded the maggot population started build up when the maximum temperature dropped below 32 ^{0}C and attained its peak then after declined. Subharani and Singh (2007) [12] also reported that the infestation of this pest does not governed by environmental significantly factors, except relative humidity, which exerted significant negative effect with pest infestation.

References

1. Annonymous. Ministry of agriculture and farmars' welfare, Annual report, 2017, 16.
2. Chandra N. Studies on population dynamics and management of pigeonpea pod fly, *M. obtusa* Malloch. Ph.D. thesis submitted to the NDUA&T Kumarganj, Ayodhya, Deptt. of Entomology, 2014, 37.
3. Dahiya KK, Chauhan Ombir RR. Effect of abiotic factors on the population dynamics of pod fly, *Melanagromyza obtusa* (Mall.) in pigeonpea. Crop Research, Hisar, 1999;17(2):250-252.
4. Das SB, Katyar NP. Population dynamics and distribution pattern of pod fly, Melanagromyza obtusa and its parasites in medium maturing pigeonpea. Indian Journal of Plant Protection 1998;26(1):30-40.
5. Franklin S, Bekele S, Menale K, Tsedke A, Said S, Moses S *et al*. Assessment of the current situation and future outlooks for the pigeonpea sub-sector in Malawi. International Crop Research Institute for Semi- Arid Tropics, Nairobi. 2008, 5-8.
6. Gowda CLL, Saxena KB, Srivastava RK, Upadhyaya HD, Silim SN. Pigeonpea From amorphan to leader in food legumes. In Biodiversity in Agriculture: Domestication, Evolution and Sustainability (Gepts P, Bettinger RL, Brush SB, Famula TR, McGuire, PE, Qualset CO and Damania AB eds.). Cambridge University Press. University of California, Davis, USA, 2011, 361-373.
7. Jaisal JK, Srivastava CP, Sharma RP. Resistance in long duration pigeonpea against major insect pests. Society of Plant Protection Sciences New Delhi, India, Annuals of Plant Protection Sciences. 2010;18(2):501-502.
8. Keval R, Srivastave SC. Seasonal incidence and pod infestation by tur pod fly *M. obtusa* (Malloch) on pigeonpea. Entomological Society of India, New Delhi, India, Indian Journal of Entomology. 2011;73(1):95-96.
9. Lateef SS, Reed W. Survey of insect pest damage in farmer's field in India. International pigeonpea Newsletter. 1981;1:29-30.
10. Saidappa SM. Bioecology and management of pigeonpea pod fly, *Melanagromyza obtusa* (Malloch). M. Sc. (Ag.) Thesis. University of Agriculture Science, Dharwad (India), 2012.
11. Shanower TG, Lal SS, Bhagawat VR. Biology and management of *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae). Crop Protection, 1999;17(3):249-263.
12. Subharani S, Singh TK. Influence of meteorological factors on population dynamics of pod fly, *Melanagromyza obtusa* Malloch (Diptera: Agromyzidae) in pigeonpea under agro-climatic conditions of Manipur. Indian Journal of Entomology. 2007;69(1):78-80.
13. Thakur BS, Rawat RR, Verma R, Moitra A. Influence of shape and size of pods of pigeonpea on the susceptibility to the pod fly. *Melanagromyza obtusa* (Malloch), and the pod bug *Clavigralla gibbosa* Spinola. Indian Journal of Entomology. 1975;51:159-162.
14. Yadav SK, Ahuja DB, Dhandapani A. Seasonal activity of pod fly, *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae) and effect of aboitic factors on its incidence in pigeonpea. Indian Journal of Entomology 2011;73(2):162-165.