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Population dynamics of pigeonpea pod fly (*Melanagromyza obtusa*) and their correlation with abiotic factors in pigeonpea

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Abstract
The present investigations entitled "Population dynamics of pigeonpea pod fly (*Melanagromyza obtusa*) and their correlation with abiotic factors in Pigeonpea" was carried out at Students' Instructional Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad during *Rabi*, 2017. The pest activity started with the initiation of pod formation and continued though at varying level, throughout the reproductive stage of the crop. The presence of maggots of *M. obtusa* was noticed for the first time in 5th standard week. The maximum maggot population (37 maggots /100 pods) were recorded during 9th SW and the highest pupal population of (21pupae /100 pods) were recorded in 12th SW. It is evident from data that during 2017-18, maggots population showed non-significant negative correlation with minimum temperature (-0.261) and maximum temperature (-0.243) while relative humidity showed non-significant positive correlation (0.529) and pupal population had non-significant positive correlation with minimum temperature (0.195) and maximum temperature (0.389) while relative humidity showed non-significant negative correlation (-0.196).

Keywords: Population dynamics, pigeonpea pod fly, *Melanagromyza obtusa*, correlation, abiotic factor and pigeonpea

1. Introduction
Pigeonpea [*Cajanus cajan* (L.) Millsp.] is also known as red gram or arhar or tur in vernacular, the most important delicious pulse of the entire country. After gram, pigeonpea is the second most important pulse crop of India, which contributes about 90 per cent of the world's pigeonpea production. Area under pigeonpea in India is about 53.87 lakh hectare with an annual production of 45.99 lakh tons and productivity of 854 kg/ha. Pod fly being an internal feeder, both the maggot and pupal stages are present inside the pods. The white maggots feed on the developing seed and pupate inside the pod. The pod fly infested pods do not show any external symptom of damage until the fully grown larvae chew the pod wall leaving a thin papery membrane intact known as window through which adults exit the pods and thus it becomes hard to manage the pest in time. Pod fly, *Melanagromyza obtusa* (Malloch) is a key pest of pigeonpea (*Cajanus cajan*) throughout South-east Asia. It attacks the crop from pod filling to pod maturity. The oviposition of pod fly takes place on the inner surface of the pod walls. Females deposit the eggs singly under the epidermis in the green pods and the larvae after hatching mines into the pods and feeds on the soft seed thus making it unfit for human consumption as well as seed purposes (Lal and Yadav, 1993) [7]. Pulse are important components of over daily dietary requirements as they are cheapest sources of protein, vitamin, energy and minerals, production of pulse increase at a much slower rate compare to cereal, oil seeds and other crops over the two decades. Just like other crops, include of red gram in cropping pattern repair soil health and soil fertility. It plays an important role in human diet and also improving soil fertility through the biological nitrogen fixation. Arhar is one of the most important pulse crop, to be cultivated in 25 countries of the world on 5.8 million ha with 4.4 million tons of production, whereas in Asia it is grown in 5.07 million ha and producing 3.07 million tons in 2011 (FAO, 2013) [4]. Pigeonpea is a most important *Kharif* pulse crop grown in India. Area under pigeonpea in India is about 53.87 lakh hectare with an annual production of 45.99 lakh tons and productivity of 854 kg/ha (Anonymous, 2017) [1]. Pod fly incidence was started from the second week of January (2.0 to 2.8%) and continues till harvest, with a peak of 15.6 per cent in the first and 13.7 per cent in the second year during the third week of January and the incidence showed significant negative correlation with the

relative humidity (Subharani and Singh 2009) [9]. The present study was done to observe the "Population dynamics of pigeonpea pod fly (*Melanagromyza obtusa*) and their correlation with abiotic factors in Pigeonpea"

2. Materials and Methods

The incidence of pod fly (*Melanagromyza btusa*) infesting pigeonpea pods was studied in plots each measuring 4 m x 3 m replicated three times. All recommended management practices were followed for raising the crop except plant protection measures. The pigeonpea variety Narendra Arhar-1was sown in second of July, 2017-18. One hundred pods, pods plucked from 5 randomly selected plants at weekly interval in each replication.

The pigeonpea crop was regularly monitored for the number of healthy and damage pods were recorded by dissecting individual pod. Larvae/ pupae of pod fly and their numbers present in each pod was recorded locale wise. At maturity stage, weight of healthy and damaged seeds along with number was also recorded and per cent pod fly incidence calculated. The mode of observations for Population dynamics of pigeon pea pod fly with abiotic factors. Weekly meteorological data on temperature, relative humidity, rainfall were taken from the Agro-meteorology Department of the university (Table 1 and Fig.1) and simple correlations were worked out between population build up and meteorological factors for the same period.

Table 1: Population of Pod fly (*M. obtusa*) on Pigeonpea Variety Narendra Arhar-1 during *Kharif* 2017-18

Standard week	Narendra Arhar-1			Temperature (°C)		RH (%)	Rainfall (mm)
	Pod damage/100 pods	Population of pod fly stage/100 pods		Min.	Max.		
		Maggots	Pupae				
5	7	2	0	7.2	24.3	70.0	0.0
6	13	5	2	8.1	24.3	60.7	0.0
7	25	12	4	10.7	24.7	72.2	0.0
8	40	30	5	11.8	28.7	66.3	0.0
9	43	37	7	14.1	30.1	67.3	0.0
10	47	30	11	12.3	31.1	64.7	0.0
11	51	16	19	13.7	32.8	58.2	0.0
12	53	13	21	14.2	34.2	54.5	0.0
13	56	9	13	15.5	35.2	54.4	0.0
14	56	6	9	18.7	35.3	58.0	0.0
15	58	4	7	18.3	35.4	53.2	0.0
16	59	2	5	20.5	39.2	41.9	0.0
17	59	0	3	19.7	37.6	46.4	0.0

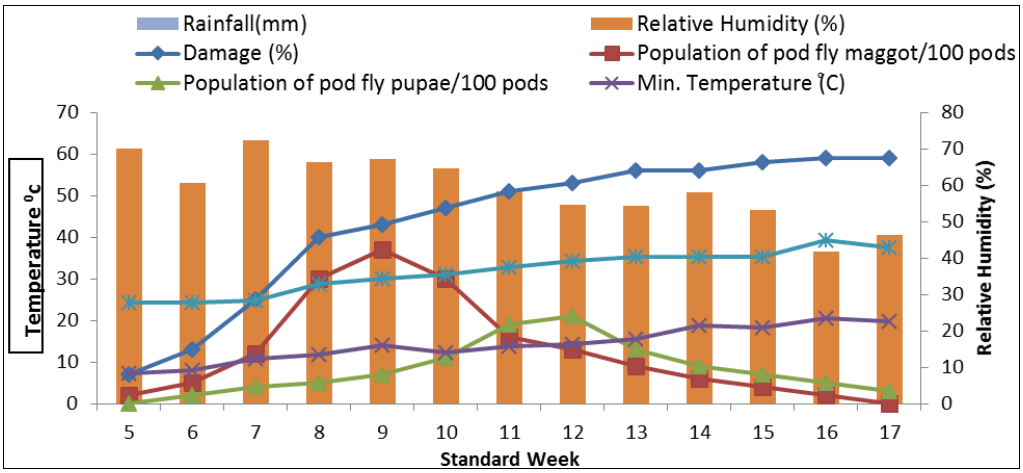

Fig 1: Population of Pod fly (*M. obtusa*) on Pigeonpea Variety Narendra Arhar-1 during *Kharif* 2017-18.

Table 2: Correlation between maggot and pupal population with abiotic factors

Correlation factor	Temperature (°C)		RH (%)	Rainfall (mm)
	Min.	Max.		
Maggot	NS (-0.261)	NS (-0.243)	NS (0.529)	NS (0.0)
Pupae	NS (0.195)	NS (0.389)	NS (-0.196)	NS (0.0)

Significant at 5% Level of significance

3. Results and Discussion

During *Kharif* 2017-18 the pest activity started with the initiation of pod formation and continued though at varying level, throughout the reproductive stage of the crop. The presence of maggots of *M. obtusa* could be noticed for the first time in 5th standard week (SW) at a minimum temperature of 7.2 ^{0}C, maximum temperature of 24.3 ^{0}C and relative humidity 70.0 per cent. The populations at above period of observations were 2 maggots /100 pods on variety Narendra Arhar-1. Its population increased suddenly about 2.5 times (5 maggots/100 pods) in 6th SW at a minimum temperature of 8.1 ^{0}C, maximum temperature of 24.3 ^{0}C and relative humidity of 60.7per cent. The maximum maggot population (37 maggots /100 pods) were recorded during 9th SW at a minimum temperature 14.1 ^{0}C, maximum temperature of 30.1 ^{0}C and relative humidity of 67.3 per cent. Maggot population showed decreasing trend and reached to level of 30 maggots /100 pods in 10th SW at minimum temperature 12.3 ^{0}C, maximum temperature of 31.1 ^{0}C and relative humidity of 64.7 per cent. (Table No. 1) thereafter, further decline in number of maggot population was recorded

in subsequent weeks and reached to its minimum *i.e.* 2maggots /100 pods in 16th SW at minimum temperature of 20.5 ^{0}C maximum temperature of 39.2 ^{0}C and relative humidity of 41.9 per cent in, when the crop was ready to harvest. The present finding are also in accordance with the finding of Meena *et al.* (2010) [8] they reported that maximum incidence of *M. obtuse* in terms of maggot population was recorded in 9th SW with population of 35.6 and 2.6/plant, respectively. The present investigations are in accordance with those of Keval and Srivastava (2011) [6] they also reported the highest mean population of pod fly was recorded in the 10th SW (8.93 maggots), followed by the 9th SW (7.60 maggots), while the lowest was recorded in the 4th SW (0.73 maggots) (2009/10). Jaisal *et al.* (2010) [5] also noticed peak in pod fly population was observed from the 8th SW to 12th SW.
pupal population of *M. obtusa* was noticed for the first time in 6th SW on Narendra Arhar-1 at a minimum temperature of 8.1 ^{0}C, maximum temperature of 24.3 ^{0}C and relative humidity of 60.7 per cent and in 7th SW at minimum temperature of 10.7 ^{0}C, maximum temperature of 24.7 ^{0}C and relative humidity of 72.2 per cent 2 pupae and 4 pupae/ 100 pods are respectively. Increase in pupal number was recorded in next successive weeks and the highest pupal population of (21pupae/100 pods) were recorded in 12thSW at minimum temperature of 14.2 ^{0}C, maximum temperature of 34.2 ^{0}C and relative humidity of 54.5 per cent. The decline in number of pupae (13 pupae/100 pods) recorded from 13th SW and reached to level of 3 pupae in 17th SW at a minimum temperature 19.7 ^{0}C, maximum temperature of 37.6 ˚C and relative humidity of 46.4 per cent. This is in also accordance with the finding of Meena *et al.* (2010) [8] found during 2008-2009, pupal activity of *M. obtusa* was maximum (39.2 pupae) in 12th SW and in 2009-2010 it was 9 pupae in the 11th SW. The present finding are also in partial agreement with the finding of Das and Katyar (1998) [3] reported the temperature between 18 to 20 ^{0}C and 19.0 to 20.5 ^{0}C, respectively were most conducive for larval and pupal development with peaks at 19th and 5th SW for larval and 50th and 5th SW for pupae and also accordance with the finding of Dahiya *et al*. (1999) [2].

4. Conclusion

The maximum maggot population (37 maggot/100 pods on variety Narendra arhar-1) was recorded during 9thstandard week at a minimum temperature 14.1 ^{0}C, maximum temperature of 30.1 ^{0}C and relative humidity of 67.3 per cent. Thereafter, decline in number of maggot population was recorded in subsequent weeks and reached to its minimum *i*.e. 2 maggots/100 pods in 16th SW at minimum temperature of 20.5 ^{0}C, maximum temperature of 39.2 ^{0}C and relative humidity of 41.9 per cent. It is evident from data that maggot population showed non-significant negative correlation with minimum temperature (-0.261) and maximum temperature (-0.529) and pupal population had had non-significant positive correlation (0.529) and pupal population had non-significant positive correlation with minimum temperature (0.195) and maximum temperature (0.389) while relative humidity showed non-significant negative correlation (-0.196).

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