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Incidence and intensity of melon fly, *Zeugodacus cucurbitae* (Coquillett) under different weather regimes of semi arid region of Rajasthan

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ABSTRACT: A field experiment was conducted during crop seasons (Feb to May 2017) and (Feb to May 2018) at Rajasthan Agricultural Research Institute, Durgapura, Jaipur, India to study the influence of weather parameters on melon fly, *Zeugodacus* (= *Bactrocera cucurbitae* (*Coquillett*). The population of fruit fly first appeared on the crop during second fortnight of March (12th Standard Meteorological Week) during both (2017-18 and 2018-19) years. The peak level of fruit fly adults (92 per trap) was observed in last week of April (17th Standard Meteorological Week) during 2017 and in first week of May (18th Standard Meteorological Week) during 2018 (104 per trap). The weather parameters, maximum and minimum temperature had positive influence on population of fruit fly which was significant during 2017 and highly significant during 2018. The influence of relative humidity morning and evening and total rainfall was non-significant during both the years.

Keywords: Fruit fly, long melon, Rajasthan, population dynamics, incidence, weather

INTRODUCTION

Long melon, *Cucumis melo* var. *utilissimus* (family cucurbitaceae) commonly known as *Kakri* is an annual vine trailing or climbing in habit. During the recent years, interest in vegetable production is increasing rapidly as a result of greater appreciation of the food value of vegetables and the important place in the nation economy. *Kakri* is commercially cultivated in the Indo- Gangatic plains of North India as summer and rainy season crops, especially in Rajasthan, Punjab and Western U.P. India is the second largest vegetable producer in the world next to China. In Rajasthan the area under the cultivation of long melon during 2016-17 was 2240 hectare, with annual production of 10193 Metric tones and productivity of 4550 kg/ha (National Horticulture Board, 2018). Among these pests, the fruit fly, *Zeugodacus* (= *Bactrocera*) *cucurbitae* (Coquillett) (Diptera: Tephritidae) is the most serious constraints in long melon cultivation in all over the country. The pest is active throughout the year except in severe cold. The adults of the fruit fly puncture the soft and tender fruits with their stout ovipositor and lay eggs below the rind of the fruits, after hatching the maggots bore into the ripening fruits begin to rot and drop thereby reducing the yield and quality. Depending on the environmental conditions and susceptibility of the crop species, the extent of losses varies between 30 to 100% (Dhillion *et al.*, 2005). . It prefers to infest young, soft skinned ovaries even before anthesis. When the humidity is high, intensity of cucurbit fruit fly damage becomes severe. Its abundance increases with increase in daily temperatures, however higher than 31°C is not ideal for its growth and reproduction (Dhillion *et al*., 2005).

MATERIALS AND METHODS

The present investigations were carried out at Rajasthan Agricultural Research Institute, Durgapura located geographically at longitude 75°47 East, latitude of 26°51 and at the elevation of 390 meters from Mean Sea Level (MSL) in Jaipur district of Rajasthan. To record the seasonal incidence of fruit fly, *Z. cucurbitae* on long melon in relation to environmental factors, the most grown local variety was sown in the month of mid February in three plots of 3 m x 4 m size keeping row to row and plant to plant distance of 1.5 m and 0.50 m, respectively. The meteorological data was obtained from meteorological observatory, RARI, Durgapura and correlate the population of melon fruit fly with abiotic factors.

Method of observations

The trap consisted of a transparent mineral water bottle containing five drops of 0.1% methyl eugenol, five drops of cue lure and five drops of dichlorvos. The attractant was in the slow-releasing polymeric plug form. The plugs were dispensed in the mineral water bottle traps with two windows (3×2 cm) made on opposite sides of the bottles 7 cm from the top. The lid of the trap was perforated and a nylon thread was knotted and passed through to prevent the thread from slipping through,. A thin cotton thread was fastened to the nylon thread from the knotted end, and the polymeric lure plug was tied at the opposite end of the cotton thread. The suspended plug on the cotton thread was held inside the trap at 7 cm from the knot, this charge was replenished at 15- day intervals. Traps were hung in fields and got emptied at weekly interval. A strip with five drops of

Table 1. Incidence of fruit fly on long melon in relation to abiotic factors during summer 2017

Standard week	Date of observation		Temperature (°C)		Relative humidity (%)		Total rainfall (mm)	Sunhsine	Trap Observation
	From	To	Maxi.	Mini.	Morning	Evening			
12	19.03.2017	25.03.2017	33.6	18.2	56	17	0.0	9.0	6
13	26.03.2017	01.04.2017	38.6	21.2	39	11	0.0	10.1	19
14	02.04.2017	08.04.2017	38.2	23.5	26	11	0.0	10.2	23
15	09.04.2017	15.04.2017	37.4	19.8	25	8	0.0	10.6	45
16	16.04.2017	22.04.2017	42.1	27.2	30	11	0.0	10.8	71
17	23.04.2017	29.04.2017	38.7	23.1	36	17	3.2	9.2	92
18	30.04.2017	06.05.2017	39.3	26.0	34	13	0.0	8.9	84
19	07.05.2017	13.05.2017	43.3	28.4	28	9	0.0	8.7	69
20	14.05.2017	20.05.2017	41.5	26.4	34	16	1.2	10.4	52

Table 2. Incidence of fruit fly on long melon in relation to abiotic factors during summer 2018

Standard week	Date of observation		Temperature (°C)		Relative humidity (%)		Total rainfall (mm)	Sunshine	Trap Observation
	From	To	Maxi.	Mini.	Morning	Evening			
12	19.03.2018	25.03.2018	32.2	17.3	53	20	0.0	8.3	2
13	26.03.2018	01.04.2018	37.5	18.2	40	8	0.0	10.0	13
14	02.04.2018	08.04.2018	38.3	23.0	40	15	1.4	9.0	34
15	09.04.2018	15.04.2018	36.1	23.9	44	24	5.0	8.7	53
16	16.04.2018	22.04.2018	38.2	25.0	28	12	0.0	9.0	65
17	23.04.2018	29.04.2018	39.6	25.0	27	8	0.0	11.1	98
18	30.04.2018	06.05.2018	41.5	27.1	44	14	0.0	9.9	104
19	07.05.2018	13.05.2018	40.7	26.1	33	12	0.0	9.9	82
20	14.05.2018	20.05.2018	41.5	27.2	33	18	2.0	7.9	61

Table 3. Correlation coefficient of fruit fly population with weather parameters

Abiotic factor	r value	
	2017	2018
Maximum temperature (°C)	0.609*	0.775*
Minimum temperature (°C)	0.661*	0.882*
Relative humidity (%)	-0.428	-0.570
Relative humidity (%)	0.031	-0.281
Total rainfall (mm)	0.496	-0.089
Sunsine	-0.218	0.501

*Significant at 5 per cent level of probability

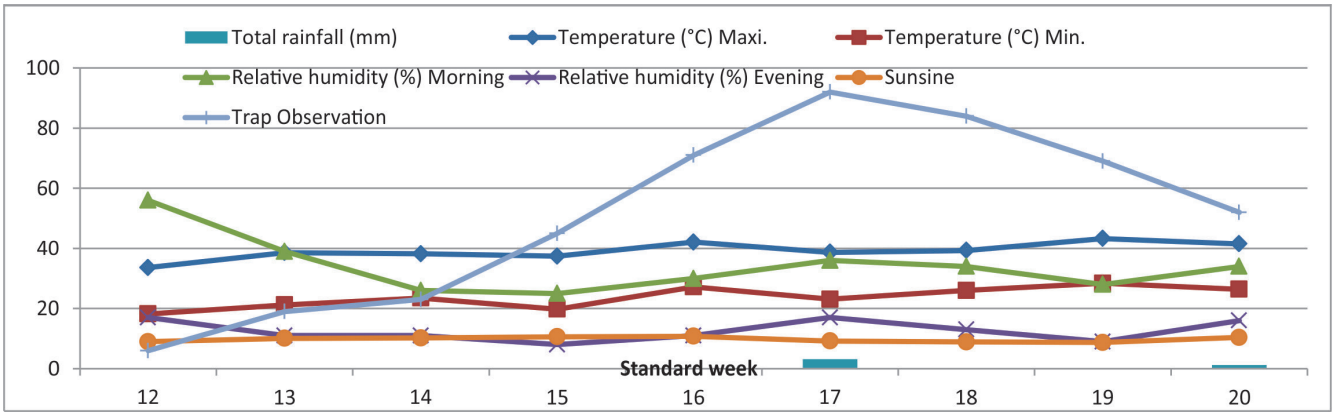

Fig. 1. Trap observations of fruit fly on long melon in relation to abiotic factors during summer 2017

dichlorvos was placed at the bottom of the trap to kill insects that entered the trap.

RESULTS AND DISCUSSION

The data in Tables 1-3 and depicted in Fig. 1 and 2 inferred that during 2017, the population of fruit fly, *Z. cucurbitae* first appeared on the crop during second fortnight of March (12th Standard Meteorological Week). Initially, the mean population of fruit fly in trap catches was quite low and recorded to be 6 per trap. An increasing trend was observed in the trap catches of fruit fly and the maximum mean number of fruit fly adults (92 per trap) was observed during last week of April (17th Standard Meteorological Week). Thereafter, the population of fruit fly in trap catches started declining and at the time of last picking, 52 fruit fly adults were recorded per trap in long melon.

It is evident from the data in Table 4.1 on correlation coefficient between fruit fly population in trap catches and weather parameters that maximum and minimum temperature (r= 0.609 and 0.661) had significant positive influence on the population buildup of fruit fly in long melon. The effect of relative humidity was non-significant with the population of fruit fly in trap catches at weekly interval but it was negative (r= -0.428) morning relative humidity and positive (r= 0.031) with evening relative humidity. Further, total rain fall and sun shine hours also did not show significant correlation with fruit fly population. However, the influence was positive (r= 0.496) for rain fall and negative (r= -0.218) for sun shine hours.

In the consecutive year (2018), the activity of fruit fly in long melon was also recorded from second fortnight of March ((12th Standard Meteorological Week). Though, the fruit fly incidence in trap catches was observed low at initial stage where only 2 fruit fly adults were recorded per trap (Table 4.2). After initiation of the activity, the population of fruit fly increased in long melon and reached the peak during first week of May (18th Standard Meteorological Week) with 104 fruit fly adults per trap. The population of fruit fly in trap catches declined thereafter and soon before last picking of the crop i.e. third week of May (20th Standard Meteorological Week), 61 fruit fly adults per trap were recorded in long melon.

The data on correlation coefficient between fruit fly population in trap catches and weather parameters for 2017-18 presented in Table 4.2 clearly indicated that the maximum (r=0.775) and minimum (r=0.882) temperature showed highly significant positive association with the population buildup of fruit fly. The correlation coefficient between morning (r= -0.570) and evening (r= -0.281) relative humidity and fruit fly population was negative and non significant. Likewise, the association of total rain fall and fruit fly population was also negative and non significant (r= -0.089). The influence of bright sunshine hours (r= 0.501) was positive on the fruit fly population build up but it was non-significant (Table 3).

In the present investigation, seasonal incidence of fruit fly on long melon for two consecutive years (2017 and 2018) was studied using fruit fly traps and per cent fruit damage caused by the pest. Results of trap catches of fruit fly adults in long melon revealed that the pest started movement in crop from second fortnight of March during both the years (2017 and 2018) and remained active till harvest of the crop. The peak catches of fruit fly adults in trap were recorded in last week of April to first week of May during 2017 and 2018, respectively.

The present results are in agreement with the findings of Abdaul *et al*., (2012) who recorded the seasonal variances of melon fly, *Z .cucurbitae* in three different habitats of Bangladesh from January 2007 to December 2008. They found that the population of melon fly was prevalent at high level during the two-year surveillance period except in October and November in both the years, the highest capture was recorded in April to June, while the lowest was in October to November. The study

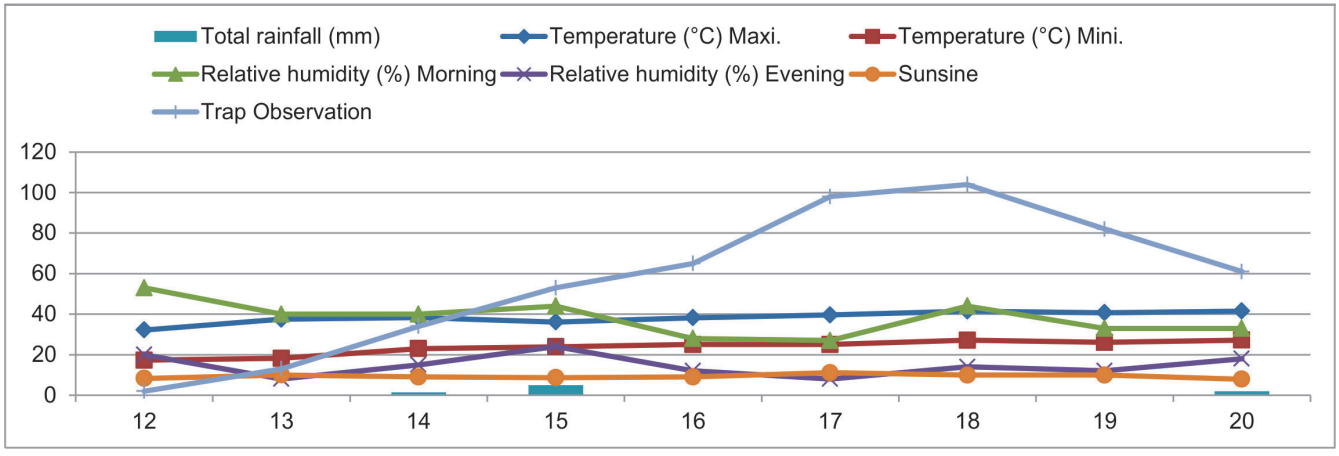

Fig. 2. Trap observations of fruit fly on long melon in relation to abiotic factors during *summer* 2018

showed that the seasonal rise of melon fly population coincided with air temperature, availability and fruiting period of the host plants. Though, Raghuvanshi *et al*., (2012) studied the abundance of fruit flies in cure lure baited traps in bitter gourd and recorded two peaks in summer and Kharif coincided with the 14 Standard Week and 43 Standard Week, respectively. The variation in peak population of fruit fly in trap catches might be due to crop season, agro-climatic conditions of the are where experiments were conducted.

During the present investigation, correlation between fruit fly population in trap catches and weather parameters indicated that maximum and minimum temperature showed signification positive association and other factors were found non significant which is in close conformity of the findings of Inyatullah *et al.* (1991), Laskar and Chatterjee (2010), Raghuvanshi *et al.* (2012), Abdaul *et al.* (2012), Vignesh and Viraktamath (2015), Stanley *et al*. (2015) and Saha *et al.* (2018) who also found significant positive influence of maximum and minimum temperature on melon fruit fly incidence in trap catches.

SUMMARY

The population of fruit fly, *Z. cucurbitae* first appeared on the crop during second fortnight of March (12th Standard Meteorological Week) and the maximum mean number of fruit fly adults (92 per trap) was observed during last week of April (17th Standard Meteorological Week). Thereafter, the population of fruit fly in trap catches started declining and at the time of last picking, 52 fruit fly adults were recorded per trap in long melon. Correlation coefficient between fruit fly population in trap catches and weather parameters showed that maximum and minimum temperature (r= 0.609 and 0.661) had significant positive influence. The effect of relative humidity morning and evening and rainfall was non-significant with the population of fruit fly in trap catches at weekly interval In the consecutive year (2018), the activity of fruit fly in long melon was also recorded from second fortnight of March ((12th Standard Meteorological Week). The population of fruit fly increased in long melon further and reached the peak during first week of May (18th Standard Meteorological Week) with 104 fruit fly adults per trap. The population of fruit fly in trap catches declined thereafter and soon before last picking of the crop i.e. third week of May (20th Standard Meteorological Week), 61 fruit fly adults per trap were recorded in long melon. The correlation coefficient between fruit fly population in trap catches and weather parameters indicated that the maximum (r= 0.775) and minimum (r= 0.882) temperature showed highly significant positive association with the population buildup of fruit fly. The association of morning and evening relative humidity and total rain fall with fruit fly population was also found non significant.

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