

**EFFECT OF WEATHER PARAMETER ON INCIDENCE OF FRUIT FLY,
Bactrocera cucurbitae COQUILLETT IN SPONGE GOURD**

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ABSTRACT

The experiment on effect of weather parameter on incidence of fruit fly, B. cucurbitae Coquillett in sponge gourd was carried out during two consecutive years kharif 2014 and 2015 at Agronomy Farm, Junagadh Agricultural University, Junagadh. It was observed during the study that the male fruit flies of B. cucurbitae was started catches in the fruit fly traps at one week after seed germination (WAG) i.e. 32 standard meteorological week (SMW). The number of fly per trap was increase continues during 33 to 37 SMW and it's ranged from 23.50 to 55.00 flies per trap. However, from 38 to 42 SMW (7th to 11th WAG) the fly catches increased very fast. The maximum 117.50 male flies catches per trap were noted in 42 SMW. Thereafter, the fruit fly density was decreased continue from 43 SMW (12th WAG) to 46 SMW (15th WAG). The fruit infestation was commenced in 3rd week of September (7th WAG) with 21.88 per cent fruit damage. The infestation of fruit increased continue from 40th SMW (9th WAG) to 42th SMW (11th WAG) and reached peak level with 35.81 per cent fruit damage on 42th SMW. The maximum temperature, bright sunshine and evaporation had highly significant and positive correlation with fruit fly population, while wind speed and relative humidity had highly significant and negative correlation with fruit fly population.

KEY WORDS: Fruit fly, *Bactrocera cucurbitae*, Sponge gourd, Weather parameter

INTRODUCTION

Cucurbits, a common name given to a number of vegetable crops belonging to botanical family cucurbitaceous which mostly possess trailing habit, are extensively grown all over the tropical and sub-tropical countries and include the largest number of summer and rainy season vegetables. The different insect pest damage was found at different stages of crop. These include melon fruit fly (*Bactrocera cucurbitae* (Coq.)), aphids (*Aphis gossypii* Glower), white fly (*Bemisia tabaci* Gennadius), leaf miner (*Liriomyza trifolii* Burgess), jassid

(*Amrasca biguttula biguttula* Ishida) and pumpkin beetles (*Raphidopalpa foveicollis* Lucas) that causes varying degrees of damage to the crop. Among these, melon fruit fly is a serious pest and was first described by Coquillett (1899) as *Dacus cucurbitae* on cucurbit from Hawaii. Later on, it was reported in different parts of the world viz., Australia, Myanmar, China, East Africa, Taiwan, Hawaii, Malaysia, Nepal, Pakistan, Philippines and Sri Lanka (Narayanan and Batra, 1960). In India, the incidence of the melon fly was first reported by Lefroy (1907) on cucurbits. Melon fruit

fly damages over 81 plant species, but plants belonging to the family cucurbitaceae are most preferred hosts (Allwood *et al.*, 1999). Depending on the environmental conditions and susceptibility of the crop species, the extent of losses varies between 30 to 100 per cent (Dhillon *et al.*, 2005; Shooker *et al.*, 2006). This pest is reported to cause 80 per cent infestation in cucumber and bottle gourd, 60 per cent in bitter gourd and 50 per cent in sponge gourd (Gupta and Verma, 1992). Before attempting for control strategy of any insect pests, the basic information on incidence of insect pest on host plant carry over in different season is necessary. Hence, the present investigation was carried on seasonal incidence of fruit fly, *B. cucurbitae* on sponge gourd.

MATERIALS AND METHODS

In order to study on effect of weather parameter on incidence of fruit fly, *B. cucurbitae* in sponge gourd, study was carried out during two consecutive years *kharif* 2014 and 2015 at Agronomy Farm, Junagadh Agricultural University, Junagadh. For recording observations, whole plot was divided into ten equal parts. From each part five plants were selected randomly and tagged, thus total 50 plants selected in which observations were recorded. The observations on infested fruits and healthy fruits as well as number of maggots from infested fruits were recorded at each picking and continue still last picking. Total twelve fruit pickings were made during cropping period. In order to catch the male flies of *B. cucurbitae*, a single cue-lure baited trap was installed and observations on catches of male flies were made at weekly intervals throughout the crop season. Plot was kept completely free from the insecticidal spray. Data, thus, obtained were correlated with abiotic factors to determine effect on fluctuation of *B. cucurbitae*. In order to study the instantaneous effect of weather parameters on population fluctuation of *B.*

cucurbitae, the data of physical factors of environment were analyzed for correlation coefficient values.

RESULTS AND DISCUSSION

The data (Table 1) (Figure 1) revealed that the catches of male fruit flies of *B. cucurbitae* was started on installation of cue lure baited fruit fly traps in the field after one week of seed germination. The number of fly per trap was increased continue and 23.50, 28.00, 41.50, 48.50 and 55.00 flies per trap recorded in 33, 34, 35, 36 and 37 SMW, respectively. However, from 38 to 42 SMW, the fly catches increased very fast and recorded 68.00 to 117.50 male flies per trap and reached peak on 42 SMW. Thereafter, the fruit fly density was fast decreased with 90.50, 57.50, 43.50 and 32.00 flies per trap during the 43, 44, 45 and 46 SMW, respectively. The similar trend was observed in fruit infestation (%).

The male fruit fly recorded in the traps (16.50 to 55.00 flies/trap/week) during 1st to 6th WAG was before fruit setting on the sponge gourd plants, which might be attracted from surrounding or left over host plants. The fruit fly population increased from 7th WAG to 11th WAG, when fruits of sponge gourd were available in the field (during reproductive stage of the crop). The fly population was decreased from 12th WAG to 15th WAG, when the crop was towards maturity stage. The percentage of fruit infested was also increased 24.76 to 35.81 per cent with increased fly population (85.50 to 117.50 flies/trap/week). Ravi *et al.* (1998) noted that fruit fly was serious pest of cucumber between June and October. However, Sanja (2005) reported that infestation of melon fruit fly on bitter gourd commenced in 3rd week of September and increased during next three weeks and found peak in 2nd week of October during 2004 at Juagadh. In present study, also the population of *B. cucurbitae* was higher during 3rd week of September to 3rd week of

October on sponge gourd at Junagadh. Thus, the period of higher activities of *B. cucurbitae* is varied from location to location as reported by above scientists. This may be due to variation in the distribution and abundance of hosts, climatic conditions, topography, inter-specific competition between the flies and other biotic factors.

The data of Correlation coefficient (Table 2) (Figure 1) showed that maximum temperature, bright sunshine, evaporation and per cent fruit infestation had highly significant positive correlation with *B. cucurbitae* population. Wind speed had highly significant, while maximum relative humidity had significant negative correlation with fruit fly population ($r = -0.749^{**}$ and -0.574^{*}). The population of the melon fruit fly on sponge gourd was increased significantly with increase in maximum temperature from 31.90°C to 37.32°C , bright sunshine from 5.84 to 9.22 hr per day, evaporation from 3.47 to 5.25 mm per day and fruit infestation from 21.88 to 35.81 per cent. Raghuvanshi *et al.* (2012) found that the temperature had a significant positive correlation with adult abundance, fruit damage and pupal population of fruit fly on bitter gourd, while other abiotic factors viz., relative humidity (maximum and minimum) and rainfall had a non-significant effect on fruit fly adult activity, fruit damage and pupal population on bitter gourd. Ganie *et al.* (2012) noted that population of fruit fly was significantly correlated with minimum and maximum temperature. In present study, population density of fruit fly showed highly significant positive correlation with maximum temperature as well as mean temperature, bright sunshine, evaporation and per cent fruit infestation, however highly significant and significant negative correlation with wind speed and maximum relative humidity, respectively. Thus, the correlation of fly catches with meteorological factors varied at different

locations as reported by above scientists. This may be due to variation in the distribution and abundance of hosts, climatic conditions, topography, inter-specific competition between the flies and other biotic factors.

CONCLUSION

From the results and discussion, it can be concluded that the male fruit flies of *B. cucurbitae* was started catches in the fruit fly traps at one week after seed germination (WAG) i.e. 32 standard meteorological week (SMW). The maximum 117.50 male flies catches per trap were noted in 42 SMW. The fruit infestation was commenced in 3rd week of September (7th WAG) with 21.88 per cent fruit damage. The infestation of fruit increased continue from 40th SMW (9th WAG) to 42th SMW (11th WAG) and reached peak level with 35.81 per cent fruit damage on 42th SMW. The maximum temperature, bright sunshine and evaporation had highly significant and positive correlation with fruit fly population, while wind speed and relative humidity had highly significant and negative correlation with fruit fly population.

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Table 1: Numbers of fruit fly catches/trap and fruit infestation of caused by *B. cucurbitae* in sponge gourd ecosystem

Month and Weeks (SMW)	WAG	Fruit Fly Catches/ Trap		Pooled	Fruit Infestation (%)		Pooled
		2014	2015		2014	2015	
Aug. 1 st (32)	1	18	15	16.50	--	--	--
2 nd (33)	2	25	22	23.50	--	--	--
3 rd (34)	3	31	25	28.00	--	--	--
4 th (35)	4	45	38	41.50	--	--	--
Sep. 1 st (36)	5	52	45	48.50	--	--	--
2 nd (37)	6	65	45	55.00	--	--	--
3 rd (38)	7	88	48	68.00	22.54	21.21	21.88
4 th (39)	8	96	75	85.50	25.30	24.22	24.76
Oct. 1 st (40)	9	105	80	92.50	32.99	31.06	32.02
2 nd (41)	10	111	96	103.50	33.00	33.82	33.41
3 rd (42)	11	120	115	117.50	36.84	34.78	35.81
4 th (43)	12	85	96	90.50	34.88	33.33	34.11
5 th (44)	13	53	62	57.50	31.58	29.63	30.84
Nov. 1 st (45)	14	39	48	43.50	30.12	28.57	29.35
2 nd (46)	15	28	36	32.00	28.21	22.58	25.40

WAG : Week After Germination,

SMW: Standard Meteorological Week

Table 2: Correlation coefficient (r) between fruit infestation (%) and population density of fruit fly in relation to abiotic factors

Weather Parameters	Correlation coefficient (r)		
	2014	2015	Pooled
Fruit infestation (%) and population density	0.682**	0.787**	0.746**
Maximum Temperature (0C) (Max T)	0.545*	0.806**	0.722**
Minimum Temperature (0C) (Min T)	-0.242	-0.120	-0.150
Mean Temperature (0C) (Mean T)	0.574*	0.519*	0.674**
Maximum Relative Humidity (%) (Mo RH)	-0.669**	-0.520*	-0.574*
Minimum Relative Humidity (%) (Eve RH)	-0.444	-0.330	-0.417
Mean Relative Humidity (%) (Mean RH)	-0.520*	-0.409	-0.472
Vapour Pressure (mm of Hg) (VP)	-0.380	-0.058	-0.196
Wind Speed (km/hr) (WS)	-0.556*	-0.753**	-0.749**
Bright Sunshine (hr/day) (BSS)	0.635*	0.735**	0.713**
Rainfall (mm) (RF)	-0.266	-0.139	-0.219
Evaporation (mm) (Evap)	0.632*	0.631*	0.691**

Appendix 1: Weather Data (Pooled data of the two years 2014 and 2015)

Month and Weeks (SMW)	Temperature (°C)			Relative Humidity (%)			Mean VP (mm)	WS (km/hr)	BSS (hr/day)	RF (mm)	Evap. (mm)
	Max.	Min.	Mean	Max.	Min.	Mean					
Aug. 1st (32)	31.36	24.12	27.74	91.65	78.36	85.00	24.49	4.81	0.98	1.29	2.42
2nd (33)	31.92	24.10	28.01	91.14	70.72	80.93	24.41	5.09	1.98	1.93	2.82
3rd (34)	32.67	24.60	28.63	89.00	68.86	78.93	23.84	3.51	3.40	0.64	3.86
4th (35)	31.82	23.73	27.77	88.14	72.22	80.18	23.19	3.14	1.33	11.40	3.35
Sep. 1st (36)	32.31	23.74	28.03	83.79	60.43	72.11	21.33	3.22	4.55	6.50	3.80
2nd (37)	31.79	23.62	27.71	86.79	65.72	76.25	22.45	2.08	3.86	14.88	3.31
3rd (38)	31.90	23.58	27.74	87.29	71.22	79.25	23.35	2.48	5.84	8.56	3.47
4th (39)	33.71	22.94	28.32	83.50	60.72	72.11	23.19	2.63	9.44	0.00	4.96
Oct. 1st (40)	36.29	23.57	29.93	76.00	47.36	61.68	21.83	1.96	8.90	0.87	5.21
2nd (41)	36.50	23.02	29.76	79.86	52.36	66.11	22.06	2.11	7.80	0.75	5.04
3rd (42)	37.32	21.04	29.72	76.00	44.72	60.36	19.77	1.47	9.22	0.00	5.25
4th (43)	36.42	20.24	28.33	69.22	36.00	52.61	16.53	1.50	6.86	0.00	4.59
5th (44)	35.24	19.11	27.17	71.50	36.79	54.15	25.26	1.78	7.54	0.00	5.17
Nov. 1st (45)	34.95	17.75	26.35	76.72	33.36	55.04	15.24	2.52	8.75	0.00	4.97
2nd (46)	35.39	19.52	27.46	76.57	37.29	56.93	16.52	2.24	7.87	2.47	4.72

Where,

Min.: Minimum,
VP: Vapour Pressure,

Max.: Maximum,
RF: Rainfall,

BSS: Bright Sun Shine Hours,
WS: Wind Speed,

SMW: Standard Meteorological Week,
Evap.: Evaporation

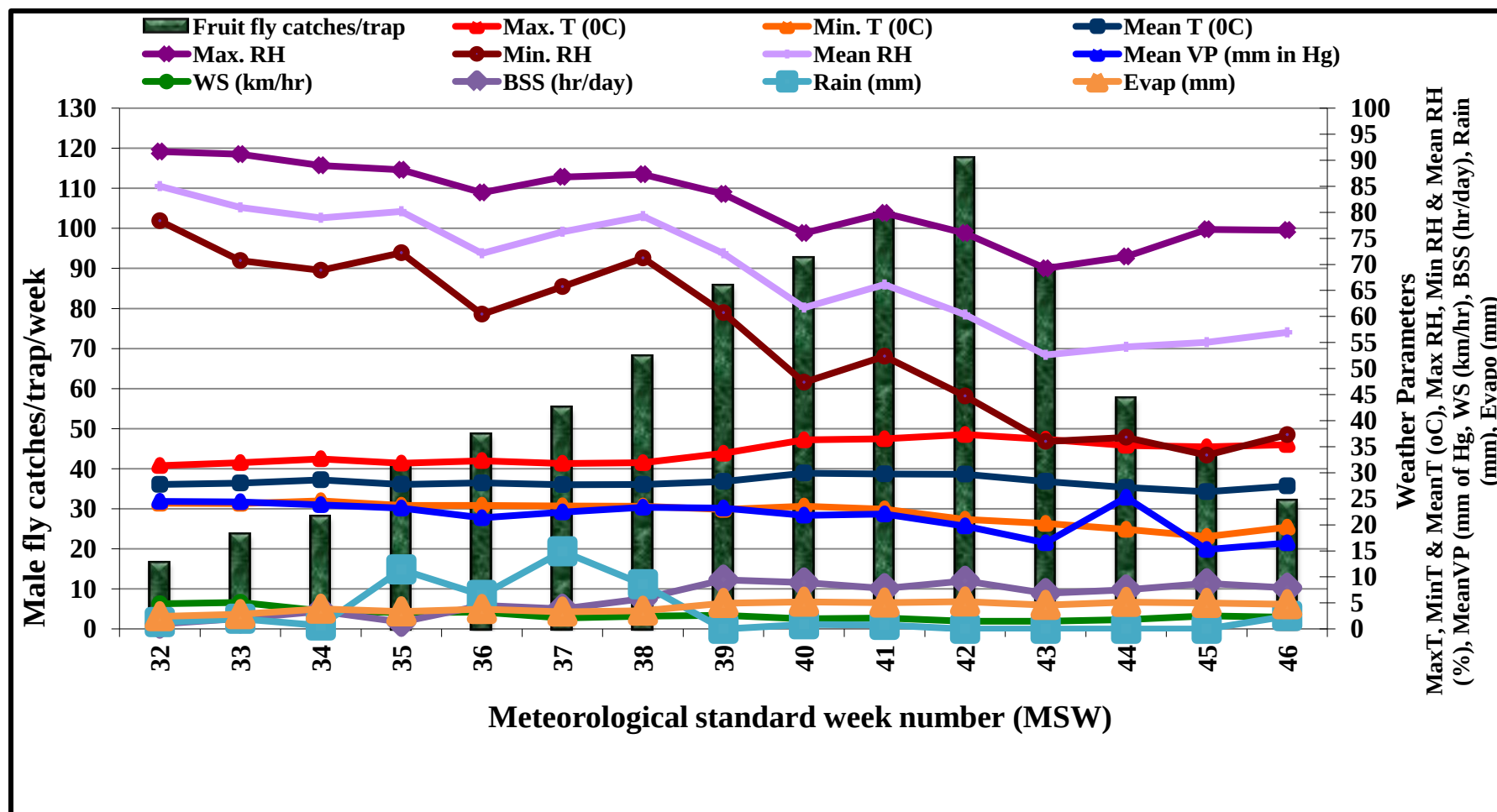


Fig. 1: Population fluctuation of *B. cucurbitae* on songe gourd and its correlation with weather parameters (pooled)