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Effect of Meteorological Parameters on Population Fluctuation of Fruit Fly (*Bactrocera cucurbitae* Coq.) Infesting Cucumber (*Cucumis sativus* L.)

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ABSTRACT: Population dynamics of fruit flies *Bactrocera cucurbitae* (Coquillett) was studied on cucumber (*Cucumis sativus* L.) variety Cucumber Gautam-910, during *summer* season 2020-21 and 2021-22 at College of Horticulture, Mandsaur (M.P.). The studies revealed that, for seasonal incidence, the fruit fly was found damaging and remained active on cucumber attaining peak population in the 18th SMW (52.62%) in 2020-21 and 17th SMW (30.29%) during 2021-22. The correlation studies showed that the fruit fly population was significant and positively correlated with Maximum temperature (r= 0.7246, r= 0.7454) and minimum temperature (r= 0.5367, r= 0.7871), significant and negatively correlated with relative humidity (r= -0.5949, r= -0.5598) whereas, rainfall (r= -0.0870, r = 0.1846) and rainy days (r= -0.1158, r =1.000) exhibited non-significant positive correlation in both year respectively.

Keywords: Cucumber, correlation, fruit fly, meteorological parameters, incidence.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is a popular and widely grown vegetable all over the country, reported to have originated in India. Cucumber cultivation has been as old as three thousand years in India, (Rai and Yadav 2005). In Hindi, cucumber (*Cucumis sativus* L.) a member of Cucurbitaceae family, is referred to as "Kheera", considered one of the world's oldest cultivated vegetable crop. Cucumber is the quickest maturing vine vegetable crops and the second most widely cultivated crop after watermelon. It is grown in high-temperature, humidity and light-intensity environment, requires frequent irrigation along with constant nutrients supply.

In relation to nutritious value it contains Moisture (96.3%), Protein (0.4g), Fat (0.1g), Minerals (0.3g), Fiber (0.4g), Carbohydrate (2.5g), Calcium (10 mg), Phosphorus (25 mg), Iron (1.5 mg), Thiamine (0.03 mg), Niacin (0.2 mg), Vitamin-C (7 mg) and Energy (13 Kcal) in 100 g of its edible part (Rai and Yadav 2005).

In India, cucumber is cultivated in an area of 117.05 million ha. With a production of 1650 million tons. In Madhya Pradesh, In Madhya Pradesh total area under cucumber cultivation is 15.22 million ha with 252.26 million tones production (Horticultural Statistics at a glance, 2020-21).

Like other vegetables the major limiting factors in causing considerable damage to the crops at different stages from nursery rising to the harvest are insect pests. Among these, fruit fly, *Bactrocera cucurbitae* (Coq.), is one of the most serious and destructive pests of cucumber (Sapkota *et al.,* 2010). *Bactrocera cucurbitae* (Coq.) is the major species infesting cucurbits (Sunil *et al.,* 2016). This serious pest causes destructive damage to cucurbits including cucumber which leads to considerable reduction in the yield, quality and marketable value. As per a report, near about 50 per cent of cucurbits are partially or completely damaged by the pest every year in India (Agarwal *et. al*, 2020). The extent of losses inflicted by these dipteran flies is varying from 30 to 100 per cent depending upon cucurbit species and environmental conditions (Dhillon *et al.,* 2005). Their attack not only reduces the yield but also affect fruit quality and rendering them unfit for the consumption and unprofitable farming.

MATERIALS AND METHODS

The study on population dynamics of cucumber (*Cucumis sativus* L.) fruit flies *Bactrocera cucurbitae* (Coq.) on variety "cucumber Gautam-910", during *summer* season 2020-21 and 2021-22 at College of Horticulture, Mandsaur (M.P.). Seasonal incidence of *Bactrocera cucurbitae* was studied on crop sown in 6

plots each measuring 5×3 m^2 on cucumber in relation to abiotic factors. Each plot was separated by irrigation channel and all agronomical practices were followed as per recommended package and practices. The crop was raised without any insecticidal spray, so that the population of the pests could build up freely. Taken observation of fruit fly damage from the day of fruit formation, damage of fruit fly was observed till the last picking of the fruits. The fruit fly damage was judged on the basis of per cent fruit infestation which was worked out on number and weight basis of five tagged plants per plot. The marketable size fruits of cucumber were picked and examined for fly puncture and healthy fruits. Infested and healthy fruits were counted separately and per cent of fruit damage were calculated.

RESULT AND DISCUSSION

The fruit fly population appeared during 11th SMW (7.51%), (5.3%) during 2020-21 and 2021-22 respectively (Table 1, 2 and Fig. 1, 2). The peak population of fruit fly (52.62%) was recorded on 18th SMW, when the minimum and maximum temperature, relative humidity, Rain fall (mm) and rainy days were 38.7°C, 21.6°C, 31.7 %, 0.0 mm and 0 day, respectively during 2020-21. The peak population of fruit fly (30.29%) was recorded on 17th SMW, when the minimum and maximum temperature, relative humidity, rain fall (mm) and rainy days were 40.31°C, 21.76°C, 25.29 %, 0.0 mm and 0 day, respectively during 2021-22. The population dynamics of cucumber insect- pest. The maximum fruit infestation by melon fruit fly was recorded of 56.67 per cent in 18th SMW. Solanki *et al.* (2022) studied on incidence of cucumber fruit fly. Fruit fly (*Bactrocera cucurbitae)* infestation started from 12th SMW (16.35%), with peak (45.03%) during the 18th SMW. Leaf miner (*Liriomyza trifolii)* infestation started from the 10th SMW (0.66%), with peak (4.45%) at the 15th SMW. Maximum and minimum temperature showed significant positive correlation with *B. cucurbitae*, whereas positive non-significant correlation with relative humidity.

Correlation and regression studies. Correlation studies carried out between meteorological parameters and fruit fly population. Maximum temperature (r= 0.7246**) showed highly significant positive correlation, minimum temperature (r = 0.5367*) showed significant positive correlation and relative humidity (r = -0.5949) showed significant negative correlation whereas, rainfall (r = -0.870) and rainy days (r = -0.1158) exhibited non-significant negative correlation in 2020-21. The finding after the next year recorded, maximum temperature (r = 0.7454**) and minimum temperature (r = 0.7871**) showed highly significant positive correlation and relative humidity (r = -0.5598) showed significant negative correlation whereas, rainfall (r = 0.1846) and rainy days (r =1.000) exhibited non-significant positive correlation. Regression equation between the population of fruit fly and maximum temperature, minimum temperature, relative humidity, rainfall and rainy days were (y= 5.178x + 31.42), (Y = 8.190x + 14.69), (Y = -5.409x + 48.46), (Y = -016x + 0.51) and (Y = -0.005x + 0.405) respectively during first year of study. Whereas the next year regression equation between the population of fruit fly and maximum temperature, minimum temperature, relative humidity, rainfall and rainy days were (y = 5.611x+27.07), (Y = 6.429x+13.40), (Y = -5.443x+63.39), (Y = -0.832x+16.79) and (Y = -006x + 0.134) respectively (Table 3).

Present finding concurrence with the Lascar and Chatterjee (2010), they observed *Bactrocera cucurbitae* incidence had significant positive correlation (r) with minimum temperature (r = +0.7596) and maximum temperature (r = +0.7376), whereas significant negative correlation with humidity (r = -0.4249). Rainfall and sunshine hour showed significant positive (r = +0.4367) and non significant negative (r = -0.3123) correlation with the fly incidence respectively. Tushar *et al.* (2014) recorded fruit fly incidence had positive significant association with maximum (r = +0.870) and minimum (r = +0.730) temperature, whereas negatively significant correlation with relative humidity (r = -0.738) and rainfall. Impact of weather parameters on population dynamics of fruit fly (*Bactrocera* spp.) in cucurbits. *B. cucurbitae*, showed highly significant positive correlation with minimum temperature and maximum temperature, while the relative humidity showed significantly negative correlation and rainfall showed non-significantly negative correlation respectively.

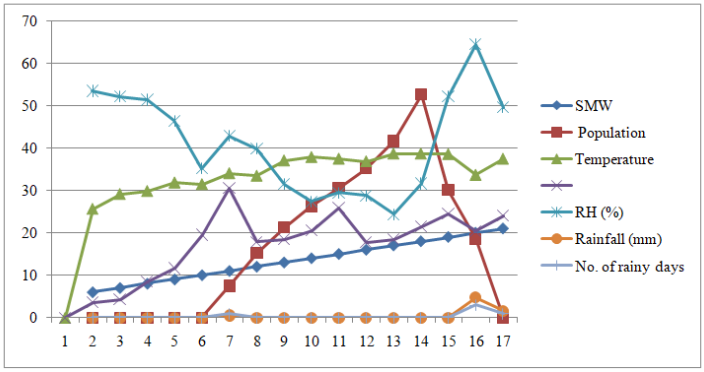

Fig. 1. Population Dynamics of Fruit fly population and weather parameters in Cucumber during *summer*, 2020-21.

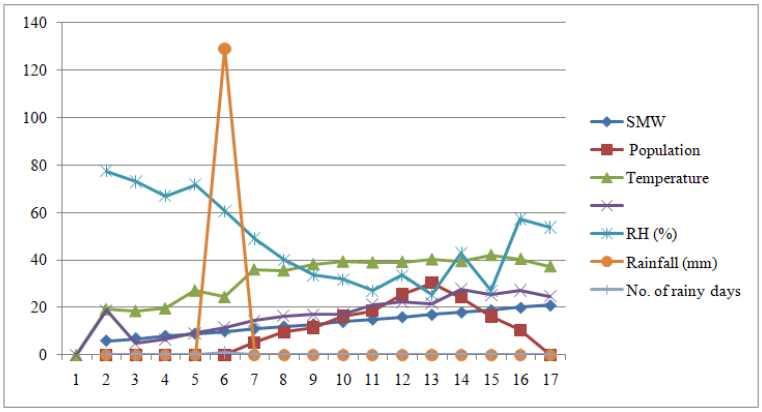

Fig. 2. Population Dynamics of Fruit fly population and weather parameters in Cucumber during *summer*, 2021-22.

Table 1: Population Dynamics of Fruit fly population and weather parameters in Cucumber during *summer*, 2020-21.

Period	SMW	Fruit fly Population (%)	Temperature		Relative humidity (%)	Rainfall (mm)	Rainy days
			Max. (°C)	Min. (°C)			
5 - 11 Faburary	6	0.0	25.7	3.6	53.5	0.0	0
12- 18 Faburary	7	0.0	29.2	4.3	52.2	0.0	0
19- 25 Faburary	8	0.0	29.9	8.5	51.4	0.0	0
26 Faburary - 4 March	9	0.0	31.9	11.7	46.5	0.0	0
5 -11 March	10	0.0	31.5	19.6	35.2	0.0	0
12- 18 March	11	7.51	34.1	30.6	42.9	0.5	1
19 - 25 March	12	15.22	33.5	17.9	39.9	0.0	0
26 March- 1 April	13	21.23	37.1	18.5	31.5	0.0	0
2 - 8 April	14	26.32	37.9	20.6	27.4	0.0	0
9-15 April	15	30.51	37.5	25.9	29.5	0.0	0
16- 22 April	16	35.23	36.9	17.8	28.8	0.0	0
23- 29 April	17	41.64	35.5	18.5	24.4	0.0	0
30 April - 6 May	18	52.62	38.7	21.6	31.7	0.0	0
7 -13 May	19	30.12	38.6	24.6	52.2	0.0	0
14 - 20 May	20	18.61	33.7	20.5	64.5	4.7	3
21-27 may	21	0.0	37.5	24.1	49.6	1.6	1

Table 2: Population Dynamics of Fruit fly population and weather parameters in Cucumber during *summer*, 2021-22.

Period	SMW	Fruit fly Population (%)	Temperature		Relative humidity (%)	Rainfall (mm)	Rainy days
			Max. (°C)	Min. (°C)			
5 - 11 Faburary	6	0.0	19.24	18.81	77.5	0	0
12- 18 Faburary	7	0.0	18.49	4.66	73	0	0
19- 25 Faburary	8	0.0	19.6	6.63	67.14	0	0
26 Faburary - 4 March	9	0.0	27.14	9.17	71.93	0	0
5 -11 March	10	0.0	24.37	11.49	60.72	129	1
12- 18 March	11	5.3	35.99	14.5	49	0	0
19 - 25 March	12	9.6	35.63	16.54	40.14	0	0
26 March- 1 April	13	11.5	38.17	17.11	33.57	0	0
2 - 8 April	14	16.23	39.29	17.19	31.93	0	0
9-15 April	15	18.6	39	21.14	27.07	0	0
16- 22 April	16	25.36	39.17	22.43	33.64	0	0
23- 29 April	17	30.29	40.31	21.76	25.29	0	0
30 April - 6 May	18	24.35	39.45	27.8	42.92	0	0
7 -13 May	19	16.21	42.07	25.4	27	0	0
14 - 20 May	20	10.43	40.46	27.19	57.29	0	0
21-27 may	21	0.0	37.31	24.73	53.79	0	0

Table 3: Correlation and multiple regression between weather parameters and Fruit fly population in Cucumber during 2020-21 and 2021-22.

Weather parameters	During 2020-21		During 2021-22	
	Correlation	Re. equation	Correlation	Re. equation
Maximum Temperature (°C)	0.7246	y = 5.178x + 31.42	0.7454	y = 5.611x + 27.07
Minimum Temperature (°C)	0.5367	y = 8.190x + 14.69	0.7871	y = 6.429x + 13.40
Relative humidity (%)	-0.5949	y = -5.409x +48.46	-0.5598	y = -1.443x + 63.39
Rainfall (mm)	-0.0870	y = -0.006x + 0.531	0.1846	y = -5.832x + 16.79
Rainy day	-0.1158	y = -0.005x +0.405	1.0000	y = -0.006x + 0.134

*5% level of significant, **1% level of significant

CONCLUSION

The present study conclude various Abiotic factors like temperature, relative humidity, rain fall and rainy days were affect the sucking insect pest population and their multiplication, whereas temperature and relative humidity showed significant and rain fall, rainy day showed non significant correlation.

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Conflict of Interest. None.

REFERENCES

Agarwal, M. L., Sharma, D. O. and Rahman, O. (2020). Melon fruit fly and its control. *Indian Horticulture, 32*(2), 10-11.

Dhillon, M. K., Singh, R., Naresh. J. S. and Sharma, H. C. (2005). The melon fruit fly, *Bactrocera cucurbitae*: A review of its biology and management. *Journal of Insect Science, 5*(1), 40.

Ghule, Tushar M., Bhajanlaluikey, Pranabbarma and Jha, S. (2014). Incidence studies on some important insect pests of cucumber (*Cucumis sativus* L.). *The Ecoscan Int. J. of Env. Sci., 8*(1&2), 177-180.

Horticultural Statistics at a glance (2020-21). GOI, Ministry of agriculture & farmers welfare department of agriculture, cooperation & farmers welfare, horticulture statistics division: 156.

Lascar, N. and chatterjee, H. (2010). The Effect of Meteorological Factors on the Population Dynamics of Melon fly, *Bactrocera cucurbitae* (Coq.) (Diptera: Tephritidae) in the foot hills of Himalaya. *J. Appl. Sci. Environ. Manage., 14*(3), 53- 58.

Rai, N. and Yadav, D. S. (2005). Advances in Vegetables Production, P: 344-356.

Sapkota, R., Dahal, K. C. and Thapa, R. B. (2010). Damage assessment and management of cucurbit fruit flies in spring-summer squash. *J. of Ento. and Nematology*, *2*(1), 7-12.

Sunil, R., Trippaiah, M. and Jayaram, C. S. (2016) Seasonal incidence of fruit borers with special reference to melon fruit fly, *Bactrocera cucurbitae* (Coquillett) on bitter gourd (*Momordica chorantia* L.). *Indian Journal of Pure and Applied Biosciences*, *4*(3), 87-92.

Solanki, C. B., Patel, J. R., Thomas, A., & Mohapatra, A. R. (2022). Population Dynamics of Major Insect Pests of Cucumber. *Indian Journal of Entomology*, 1-3.

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