



Seasonal incidence of major insect pests of bottle gourd (*Lagenaria siceraria*) in South-western Haryana

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Summary

Bottle gourd is an important vegetable crop that fetches recurrent income from farmers. The present investigation was carried out during the kharif season of 2019 to study the incidence of prevailing four insect pests of bottle gourd in relation to weather. The seasonal incidence of major insect pests such as *Aulacophora foveicollis* Lucas, *Bactrocera cucurbitae* Coquillett, *Aphis gossypii* Glover and *Bemisia tabaci* Gennadius was studied. The fruit infestation by *Bactrocera cucurbitae* was initiated in the 34th SMW, and the maximum infestation was noticed in the 36th SMW. The fruit fly infestation was significant and positively correlated with evening relative humidity and rainfall. *Aulacophora foveicollis* incidence in bottle gourd was maximum in the 38th SMW. The beetle population was significantly and negatively correlated with minimum temperature and evening relative humidity. The maximum infestation of aphids and whitefly was noticed in the later stage of the crop during the 39th SMW, and the aphid population was significantly correlated with minimum temperature, evening relative humidity and rainfall, whereas the whitefly population was correlated significantly with evening relative humidity and rainfall.

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Introduction

Bottle gourd is a popular annual climbing vine cultivated in the tropics and subtropics for its edible fruits. In India, bottle gourd was cultivated under an area of 1.92 lakh hectares, with 31.71 lakh MT productions, whereas, in Haryana, it occupied an area of 20.9 thousand hectares, with 3.03 lakh MT productions (Anonymous 2021). The edible portion in bottle gourd contains 95 per cent water, 0.65 per cent protein, 0.02 per cent fat, 3.4 per cent carbohydrates, 0.5 per cent fibre and 0.4 per cent ash. It is also rich in minerals, thiamine, niacin and vitamin C (0.02, 0.02, 0.32 and 10.1 mg per 100 g of edible fruit, respectively) (USDA 2014). Bottle gourd is known to be damaged by a wide range of insect pests, mainly fruit fly, red pumpkin beetle, whitefly and aphids. The infestation of these pests and the heavy losses caused by them is one of the significant constraints to sustaining the increasing productivity of bottle gourd. The infestation of various insect pests of cucurbits caused a yield loss of 30 to 100 per cent depending upon the host and season in different parts of the world (Dhillon et al. 2005; Haldhar et al. 2015a&b). The majority of the pest attack starts in the early stage of the crop that lasts up to the harvesting, and the extent of damage caused by a pest depends upon the prevailing weather conditions. Among these, temperature, relative humidity and rainfall play a vital role in population dynamics and seasonal incidence of the pest (Haldhar et al. 2018). Such information helps

in deciding the most suitable time for adopting the management technology and pest forecasting. Keeping this in view, the present was undertaken to generate the basic information on the effect of weather parameters on insect pests of bottle gourd, which would be helpful to develop management strategies for suppressing the pest population.

Materials and Methods

To study the seasonal incidence of insect pests of bottle gourd, the crop was sown at the research farm of CCSHAU, Regional Research Station, Bawal (latitude 76°50' E, longitude 28°10' N and altitude 266 meters above mean sea level). The crop variety Pusa Summer Prolific Long was replicated three times in a plot size of 30m² (5m × 6m) with a spacing of 60 cm between plants and 200 cm between rows. All post-sowing recommended agronomic practices were followed except plant protection measures. Five plants per plot were selected randomly and tagged, and observations on pest incidence were recorded at weekly intervals throughout the crop period.

Direct count of the red pumpkin beetle (adults) and number of leaf damage were taken from five randomly selected plants in each plot, and the percentage of leaf damage was calculated. For fruit fly, the total number of fruits and number of damaged fruits were recorded at weekly intervals from randomly selected plants of each plot and the incidence of fruit fly was expressed in terms of percent fruit infestation by using the equation as mentioned below;

$$\text{Percent fruit infestation} = \frac{\text{No. of infested fruits}}{\text{Total no. of fruits}} \times 100$$

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The population of aphids (both nymphs and adults) was recorded on five randomly selected whole plants. Whitefly population was recorded on entire plants in the early stage of the crops, while in the later stage, observations were taken from the plants' basal, middle and terminal leaves. The meteorological data regarding weather parameters viz. maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall were collected from the Agro-meteorological observatory of CCSHAU, Regional Research Station, Bawal. The data recorded on the incidence of insect pests of bottle gourd were subjected to statistical analysis to find the coefficient of correlation with maximum temperature, minimum temperature, morning relative humidity, evening relative

humidity and rainfall using statistical analysis software SPSS version 23.0 (IBM Corp 2015).

Results and Discussion

Red pumpkin beetle (*Aulacophora foveicollis* Lucas)

The infestation of the Red pumpkin beetle was observed throughout the cropping period with highest population (52.33 beetles/5 plants) during the 38th standard meteorological week (Table 1), which was in accordance with the findings of Rathod and Borad (2010) who reported the maximum infestation of beetle during August to September in *Kharif* season crop. The maximum leaf damage caused by *A. foveicollis* was noticed in 40th SMW with 28.40 per cent damage which was in alignment with the results of Bhowmik & Saha (2017), who observed that the maximum per cent leaf damage by red pumpkin beetle was during the month

Table 1. Seasonal incidence of major insect pests of bottle gourd during *Kharif*, 2019-20

SMW	Max. Temp. (°C)	Min. Temp. (°C)	Morning R.H. (%)	Evening R.H. (%)	Rainfall (mm)	No. of RPB/ 5 plant	Leaf damage by RPB (%)	Fruit fly infestation (%)	Aphid / plant	Whitefly / plant
31	33.30	27.20	92.00	66.00	7.30	6.00	0.00	0.00	0.00	0.50
32	33.70	26.00	91.00	66.00	10.20	9.33	4.20	0.00	0.00	0.58
33	31.80	25.20	92.00	75.00	92.60	7.67	4.90	0.00	0.00	0.62
34	34.60	25.10	84.00	53.00	6.00	21.33	10.40	12.35	0.98	1.57
35	35.60	26.10	89.00	57.00	0.70	28.00	14.30	17.02	1.83	2.25
36	34.80	26.10	95.00	63.00	101.9	15.33	14.80	49.75	0.20	0.67
37	36.20	25.30	91.00	52.00	1.70	36.67	19.70	31.46	1.46	2.84
38	33.60	23.40	78.00	57.00	12.40	52.33	25.60	40.18	1.50	2.56
39	35.70	23.00	94.00	58.00	0.00	42.67	26.90	22.16	3.02	2.61
40	32.60	20.50	92.00	47.00	7.80	49.00	28.40	20.11	2.10	2.40
41	33.60	18.80	81.00	34.00	0.00	40.00	24.20	10.41	2.03	2.36
42	34.10	18.70	84.00	32.00	1.40	29.33	19.70	8.43	1.56	1.84

Table 2. Correlation coefficient (r) of major insect pests on bottle gourd with prevailing weather parameters

Weather parameters		Insect pests				
		Red pumpkin beetle	Leaf damage by RPB (%)	Fruit infestation by fruit fly (%)	Aphid	Whitefly
Temperature	Maximum	0.220	0.250	0.156	0.411	0.457
	Minimum	-0.618*	-0.699*	0.564	-0.611*	-0.511
Relative Humidity	Morning	-0.432	-0.302	0.306	-0.231	-0.384
	Evening	-0.583*	-0.631*	0.715*	-0.608*	-0.598*
Rainfall		-0.448	-0.266	0.740 *	-0.577*	-0.595 *

of October. The results of the present study revealed that the population of the red pumpkin beetle was hostile and

significantly correlated with the minimum temperature (-0.618) and evening relative humidity (-0.583), which are

supported by earlier findings of Bhowmik & Saha (2017) who reported that the maximum temperature showed a significant positive correlation while the minimum temperature was negative and significantly correlated with red pumpkin beetle population. Likewise, the leaf damage was negative and significantly correlated with minimum temperature (-0.699) and evening relative humidity (-0.631), and the results are in close agreement with previous reports of Kumar & Saini (2018), who

reported that the red pumpkin beetle population reached its peak during 40th standard meteorological week and had a significant negative correlation with rainfall and relative humidity.

Fruit fly (*Bactrocera cucurbitae* Coquillett)

The infestation of the fruit fly was started in 34th SMW with 12.35 per cent bottle gourd fruit infestation, and the maximum infestation was noticed in 36th SMW with 49.75 per cent fruit infestation.

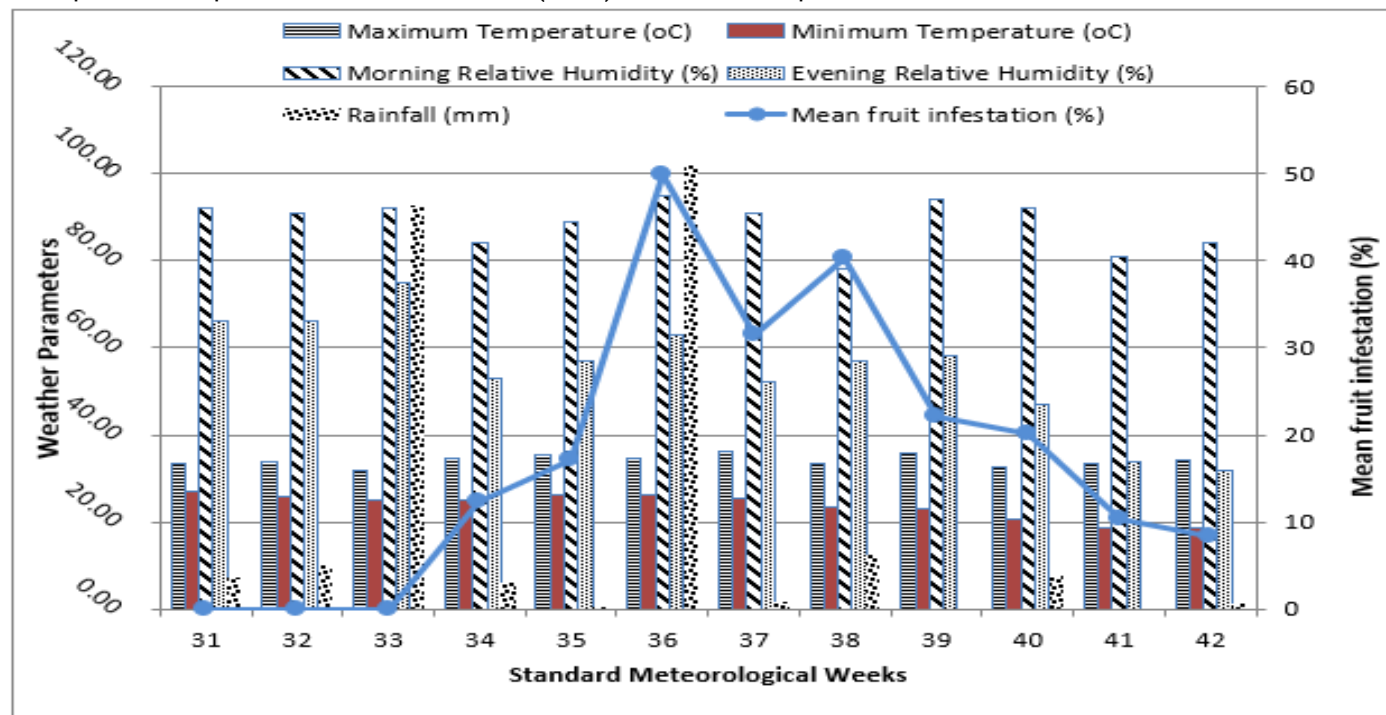


Figure 1. Correlation between abiotic factors and infestation of melon fruit fly on bottle gourd

The fruit fly infestation was positive and significantly correlated with evening relative humidity ($r = 0.715$) and rainfall ($r = 0.740$). The results of the present investigation conform with the findings of Wazir, Singh, & Ramana (2019), who reported that the fruit fly population on summer squash was highly significant and positively correlated with morning relative humidity, evening relative humidity and rainfall. The results are also supported by the findings of Vignesh & Viraktamath (2015), Mandal et al. (2006) and Rajitha & Viraktamath (2010), who found that *B. cucurbitae* was positive and significantly correlated with minimum temperature and relative humidity while it was non considerably correlated with maximum temperature.

Aphid (*Aphis gossypii* Glover)

Aphid infestation in bottle gourd was initiated in 34th SMW, and peak infestation was recorded in 39th SMW with a population of 3.02 aphids per plant. Aphid infestation was negative and significantly correlated with minimum temperature ($r = -0.611$), evening relative humidity ($r = -0.608$) and rainfall ($r = -0.577$). These

observations are in conform with the outcomes of (Sunil et al. 2016), who reported that the aphid population had a significant negative correlation with minimum temperature, maximum relative humidity and minimum relative humidity. Chakraborty (2011) and Haldhar et al. (2014) also reported that maximum temperature, minimum temperature and minimum relative humidity significantly impacted aphid incidence in tomato crops.

Whitefly (*Bemisia tabaci* Gennadius)

The peak infestation of whitefly was recorded in 37th SMW with an average population of 2.84 whiteflies per plant. The correlation study showed that the whitefly infestation was positively correlated with maximum temperature ($r = 0.457$) and had a significantly negative correlation with evening relative humidity ($r = -0.598$) and rainfall ($r = -0.595$). The results of the present finding are in close agreement with the earlier finding of Kalkal et al. (2013), Saha et al. (2018), who reported that the *B. tabaci* population was positive and significantly correlated with maximum temperature while it was negative and significantly correlated with relative humidity and rainfall.

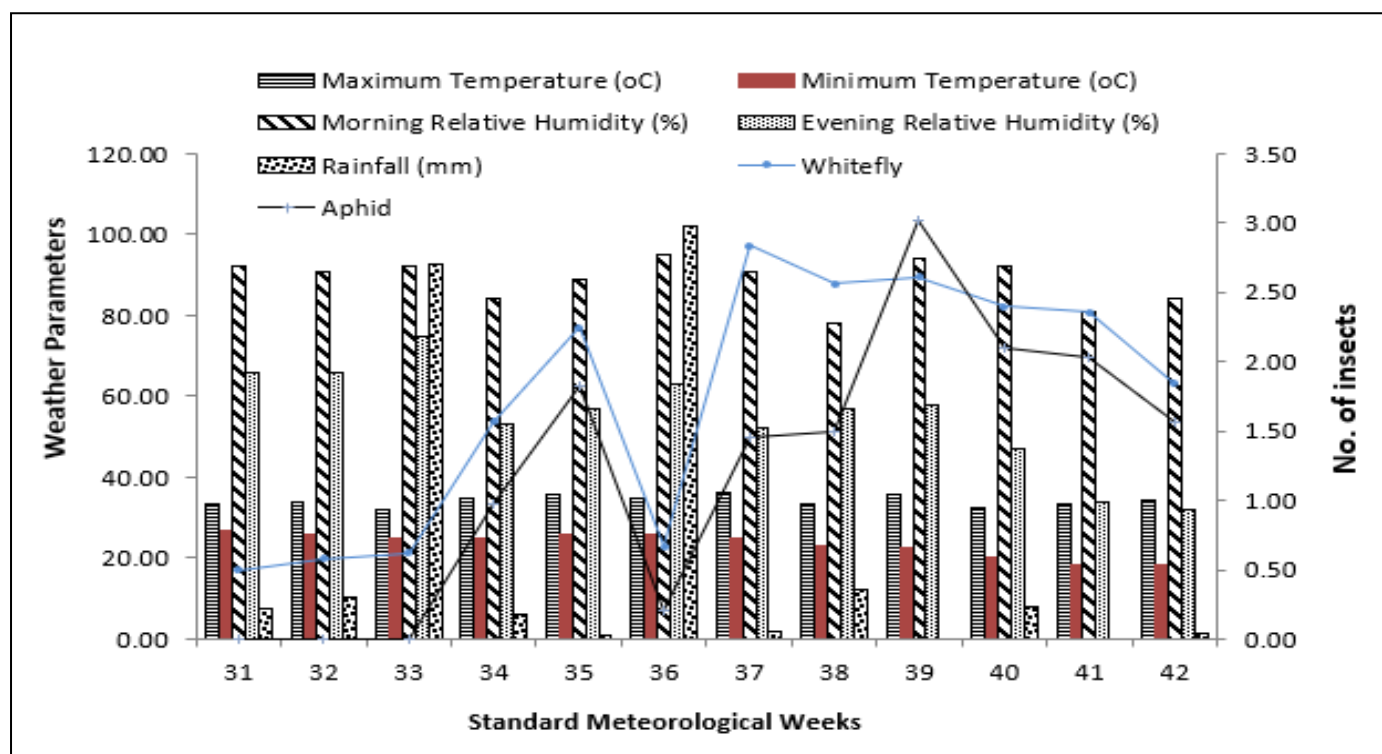


Figure 2. Correlation between abiotic factors and infestation of Aphid and Whitefly on bottle gourd

Conclusion

From the present investigation, it can be concluded that abiotic components of the environment had significant influence on the incidence of melon fruit fly, red pumpkin beetle, aphid and whitefly. A rise in evening relative humidity and rainfall significantly increases the fruit infestation by melon fruit fly, whereas upsurge in minimum temperature and evening relative humidity have a negative impact on the red pumpkin beetle and substantially decreases the population of the beetle. Aphid population was significant and negatively correlated with minimum temperature, evening relative humidity and rainfall. The whitefly population was significant and negatively correlated with evening relative humidity and rainfall, while various other meteorological parameters were found to be non-significant.

Declaration of interests

The authors have no conflict of interest to declare.

Data Sharing

All relevant data are within the manuscript.

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