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Seasonal incidence of red pumpkin beetle *Raphidopalpa foveicollis* (Lucas) on bottle gourd, *Lagenaria siceraria* (Molina) Stand. in relation to weather parameters

Manoj Kumar Gurjar, BL Jat, Rohit Kumar Nayak, Gopal Choudhary and Kanhaiya Lal Prajapat

Abstract

A field experiment was carried out on seasonal incidence of red pumpkin beetle, *Raphidopalpa foveicollis* (Lucas) on bottle gourd, *Lagenaria siceraria* (Molina) Stand. in relation to weather parameters on variety PSPL (Pusa Summer Prolific Long) were conducted at Horticulture farm, S.K.N. College of Agriculture, Jobner during *Kharif*, 2018. The population of red pumpkin beetle on bottle gourd and leaf damage initiated from the first week of August (32nd SMW) and reached to maximum (5.8 beetles/ plant and 28.6% leaf damage) in the first week of October (40th SMW). The population of red pumpkin beetle had significant positive correlation with maximum temperature ($r = 0.575$) and significant negative correlation with relative humidity ($r = -0.557$), while non-significant correlation with minimum temperature and rainfall. The significant positive correlation ($r = 0.944$) was found between leaf damage of bottle gourd and population of red pumpkin beetle.

Keywords: Bottle gourd, red pumpkin beetle, correlation, leaf damage

Introduction

Bottle gourd, *Lagenaria siceraria* (Molina) Stand. belong to family, Cucurbitaceae is one of the important vegetable crop grown throughout the India and has got several vernacular names in different regions, viz., *Lauki* or *Ghia*. It is grown in tropical and sub-tropical parts of the world. Bottle gourd prevents excess loss of sodium and reduces fatigue especially during summer. It is low calories diet, good for peoples suffering from diabetes and jaundice. The fruits have medicinal values and used as cardio-tonic, aphrodisiac, hepato protective, analgesic, anti-inflammatory, expectorant, diuretic and antioxidant agents. The edible portion of bottle gourd fruit contains 96.3 per cent moisture, 63 kJ (15 kcal) energy, 5.87 g carbohydrates, 0.02 g fat, 0.6 g protein, 10.10 mg vitamin C, 3.77 mg zinc, 3320.0 mg potassium, 162.33 mg magnesium (Milind and Satvir 2011) [10].

Cucurbits are grown in most of the states of India, but Rajasthan provides optimum agro climatic conditions for their cultivation. In India bottle gourd was mainly grown in states viz., Gujarat, Uttar Pradesh, Haryana, Rajasthan, Punjab and plains of North India in an area of 1.56 lakh hectares with the total production of 26.83 lakh tonnes (Anonymous 2017a) [2]. In Rajasthan bottle gourd is cultivated in an area of 4,673 hectares with an average production of 27,168 metric tonnes and productivity of 5,814 Kg/ hectares (Anonymous 2017b) [3]. There is a challenge to achieve the target of 182 million tonnes of vegetables to fulfill the requirement by 2020 and also their recommended requirement of 300 g per capita per day of vegetables for a balanced diet (ICMR). However, in past three decades, India has made a quantum jump in vegetable production in the world.

The red pumpkin beetle, *R. foveicollis* is a widely distributed polyphagous pest of cucurbit crops (Butani and Jotwani, 1984) [6]. The beetles feed voraciously on leaves, flower buds and flowers which may reach up to 35-75 percent at seedling stage. In some cases the losses of this pest have been reported to 30-100 percent in the field (Rashid *et al.* 2014) [12]. The knowledge on the seasonal incidence of the pest is essential tools for sustainable management practices against the target pests. For use of effective dose of insecticides, it is imperative to find out the optimum time of application of the pesticide for better control of the pest. Hence keeping this in view the present investigation on the incidence of the red pumpkin beetle was conducted.

Materials and Methods

The present investigations on seasonal incidence of red pumpkin beetle on bottle gourd, were carried out at Horticulture farm, S.K.N. College of Agriculture Jobner, Jaipur during *Kharif*, 2018. To record the seasonal incidence of red pumpkin beetle on bottle gourd variety PSPL (Pusa Summer Prolific Long) was sown on 28th June, 2018 in the five plots of 4.0 m x 0.5 m size keeping row to row and plant to plant distance 2.5 m and 0.5 m, respectively. All the agronomical practices were followed as per recommended in the package and practices. The crop was raised without any insecticidal spray.

Method of observations

The population of red pumpkin beetle, was recorded on five randomly selected and tagged plants per plot early in the morning hours on whole parts of the plants. The observations were recorded from initiation of the pest at weekly interval till last picking. The damaged leaves of plants were also be recorded on five selected and tagged plants from each plot. For this fifteen leaves per plant were observed, five each from lower, middle and top parts of the plant at weekly interval. The per cent damage of leaves by the red pumpkin beetle was determined using the following formula given by Ali *et al.* (2011) [1].

$$\text{Per cent leaf damage} = \frac{\text{Number of damaged leaves}}{\text{Total number of leaves}} \times 100$$

Correlation with weather parameters

The observation taken on pest incidence were correlated with, weather parameters *viz.* minimum and maximum temperatures, relative humidity and total rainfall. The following formula as suggested by Fowler, *et al.*, (1998) [7] was used to calculated correlation.

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n} \right] \left[\sum Y^2 - \frac{(\sum Y)^2}{n} \right]}}$$

Where,

R = Simple correlation coefficient

X = Variable *i.e.* abiotic component. (Maximum and minimum temperature, relative humidity and total rainfall)

Y = Variable *i.e.* mean number of insect pests (Population of red pumpkin beetle)

N = Number of paired observations

Results and Discussion

Seasonal incidence of red pumpkin beetle on bottle gourd in relation to weather parameters gives (Table 1 and Fig. 1) an idea about the most susceptible stage as well as peak period of pests which would help in developing the pest management strategy. During the investigation *i.e.* *Kharif*, 2018, the

population of red pumpkin beetle, *R. foveicollis* and leaf damage in bottle gourd were observed.

Population of red pumpkin beetle

The incidence of red pumpkin beetle on bottle gourd commenced from the first week of August (32nd SMW) and reached to its peak (5.8 beetles/ plant) in the first week of October (40th SMW) at 36.7 °C maximum temperature, 18.9 °C minimum temperature, 51.0 per cent relative humidity and 0.00 mm rainfall. The correlation studies indicated that the population of red pumpkin beetle on bottle gourd crop had significant positive correlation with maximum temperature ($r = 0.575$) and significant negative correlation with relative humidity ($r = -0.557$), while non-significant correlation with minimum temperature ($r = -0.350$) and rainfall ($r = -0.309$). These results were partially corroborate with Kumar and Saini (2018) [9] who reported that population of red pumpkin beetle on cucumber began in the last week of August and peaked (4.80 beetles/ five plant) during the first week of October. They also reported that population of red pumpkin beetle had positive correlation with mean temperature and significant negative correlation with mean relative humidity and rainfall. The result are in conformity with Rathod and Borad (2010) [13] who reported highest incidence of red pumpkin beetle during August to September in *kharif* season. Yadav *et al.* (2017) [16] observed that the population of red pumpkin beetle on bottle gourd initiated in the first week of June and peaked in the first week of July. Further the population of red pumpkin beetle evinced significant positive correlation with mean atmospheric temperature support the present findings. Ghule *et al.* (2014) [8] reported the peak incidence of red pumpkin beetle on pointed gourd during third week of April. They revealed at beetle population had significant positive correlation with both maximum and minimum temperatures and negative significant with maximum relative humidity. Takhtsinh (2006) [15] noticed higher incidence of red pumpkin beetle on cucurbitaceous vegetables (bottle gourd, pumpkin, cucumber, ridge gourd and smooth gourd) during August to September in *Kharif* season.

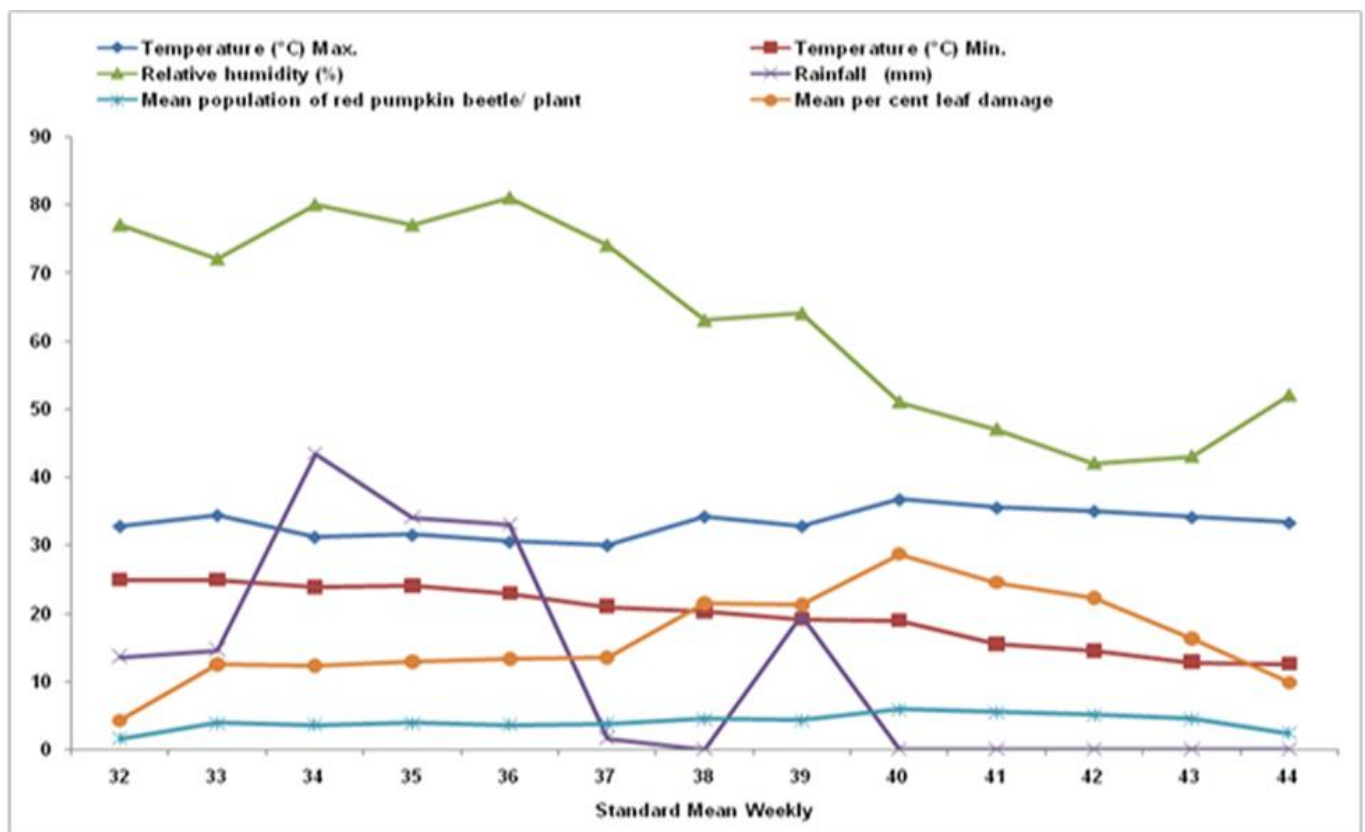
Leaf damage

The leaf damage due to red pumpkin beetle was initiated from the first week of August (4.2%), which was maximum during the first week of October (28.6%). The correlation studies indicated that the leaf damage showed significant positive correlation with maximum temperature ($r = 0.650$) and significant negative with relative humidity ($r = -0.616$), while, non-significant correlation with minimum temperature ($r = -0.425$) and rainfall ($r = -0.415$). The positive significant correlation ($r = 0.944$) was found between leaf damage and population of red pumpkin beetle. These results were corroborate with the finding of Bhowmik and Saha (2017) [4] who reported 6.2 – 35.6 per cent leaf damage on bottle gourd due to red pumpkin beetle. The present results are also partially corroborate with the finding of Roy and Pandey (1991) [14], Borah (1999) [5] and Rajak (2000) [11].

Table 1: Effect of weather parameters on red pumpkin beetle in bottle gourd during *Kharif* 2018

S. No.	SMW	Date of observations	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	Mean population of red pumpkin beetle/ plant	Mean per cent leaf damage
			Max.	Min.				
1	32	06/08/2018	32.8	24.9	77	13.60	1.6	4.2
2	33	13/08/2018	34.4	24.9	72	14.60	3.8	12.4
3	34	20/08/2018	31.2	23.8	80	43.40	3.6	12.2
4	35	27/08/2018	31.5	24.0	77	34.0	3.8	12.8
5	36	03/09/2018	30.5	22.9	81	33.0	3.6	13.2
6	37	10/09/2018	30.0	21.0	74	1.60	3.7	13.4
7	38	17/09/2018	34.2	20.2	63	0.0	4.4	21.4
8	39	24/09/2018	32.8	19.1	64	19.80	4.2	21.2
9	40	01/10/2018	36.7	18.9	51	0.0	5.8	28.6
10	41	08/10/2018	35.5	15.4	47	0.0	5.4	24.4
11	42	15/10/2018	35.0	14.4	42	0.0	5.0	22.2
12	43	22/10/2018	34.1	12.8	43	0.0	4.4	16.2
13	44	29/10/2018	33.3	12.5	52	0.0	2.4	9.8
Correlation coefficient with mean population of red pumpkin beetle (r)			0.675*	-0.350	-0.557*	-0.309		0.944*
Correlation coefficient with mean per cent leaf damage (r)			0.650*	-0.425	-0.616*	-0.415		

* Significant at 5% level of significance

**Fig 1:** Effect of weather parameters on red pumpkin beetle in bottle gourd during *Kharif* 2018

Conclusion

The red pumpkin beetle, *Raphidopalpa foveicollis* was recorded as major insect pest infesting on bottle gourd during *Kharif* 2018. The population of red pumpkin beetle was commenced from the first week of August and peaked during first week of October. The population of red pumpkin beetle on bottle gourd showed significant positive correlation with maximum temperature ($r = 0.575$) and significant negative with relative humidity ($r = -0.557$), while non-significant correlation with minimum temperature and rainfall. The significant positive correlation ($r = 0.944$) was found between leaf damage and population of red pumpkin beetle on bottle gourd.

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