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Population dynamics of red pumpkin beetle, *Aulacophora foveicollis* infesting cucumber

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Abstract
Field trial was conducted to find out the "Population dynamics of red pumpkin beetle, *A. foveicollis* (Lucas) in cucumber crops during *Kharif* 2012 at Horticulture Farm, RCA, Udaipur. The result of present investigation revealed that red pumpkin beetle, *A. foveicollis* (Lucas) occurrence began during 35th SMW (27th August to 2 September). The peak population of red pumpkin beetle (4.80 beetles/five plant) was observed during the first week of October, 2012. The population of red pumpkin beetle showed positive correlation with mean temperature but significant negative correlation with mean relative humidity and rainfall.

Keywords: Population dynamics, red pumpkin beetle, peak, correlation, significant

1. Introduction
India is the second largest producer of vegetables in the world, next to China with an annual production of 146.55 million tons from 8.49 million hectares the productivity of 17.3 metric tons [1]. The per capita availability of vegetable is 246 g per day in contrast to the recommended 300 g per day per head as recommended by ICMR. Cucumber (*Cucumis sativas* L. 2n = 14) is one of the important vegetable crops from nutrition as well as an economic point of view. It is a warm season vegetable grown throughout the world under tropical and subtropical conditions and is said to be native to northern India [2]. In India, the total area under this crop is 40,000 hectares with an average production of about 6,07,000 metric tons [1]. In Rajasthan the total area under cucumber is 492 hectares with an average production of 2519 metric tons [3].

Various factors that are attributed for low yield of cucumber include poor quality seeds, incidence of insect pests and diseases and adverse climatic conditions. Among the known factors, insect pests are of prime importance, which adversely affect both quantity and quality of its production. From nursery to maturity the crop is attacked by many insect pests. Important among them are the red pumpkin beetle, *Aulacophora foveicollis* (Lucas) and fruit fly, *Dacus cucurbitae* and *Bactrocera* species (Coquillett) [4] and *Aphis gossypii* (Wlover) [5]. During the initial growth period the pumpkin beetle has been observed as a major constraint for successful cultivation of this crop in south-east Rajasthan [6]. Both grubs and adults of red pumpkin beetle damage by nibbling the cotyledons in early stage. Adults cause more damage by feeding flowers as well as leaves, grubs feed on roots. The losses caused by insect pests are a function of their population dynamics which needs to be thoroughly studied.

2. Material and Methods
2.1 Location
The experiment was conducted during *Kharif*, 2012 at Horticulture farm, RCA, MPUAT, Udaipur to investigate the Population dynamics of red pumpkin beetle, *A. foveicollis* (Lucas) infesting cucumber.

2.2 Variety and Sowing
Cucumber variety "Sedona" was grown under natural conditions with a row to row spacing 1 meter and plant to plant spacing 0.50 meter. The plots measuring 2.5 X 5 m^2 (12.5 sq.m.) were prepared and replicated four times.

2.3 Observation
The population of red pumpkin beetle was recorded at weekly intervals during morning hours

between 6.30 am to 8.30 am on five randomly selected and tagged plants in each plot by the sight count technique, recording the pest incidence for five minutes per plant. The entire plant was carefully observed for adults of the beetle on leaves, buds and flowers. The data were expressed as numbers per plant.

2.4 Statistical Analysis

Observations on the prevailing abiotic conditions of the atmosphere were recorded weekly from the Meteorological Observatory department of Agronomy and the correlation coefficient between the pest populations and the abiotic factors of the environment was computed using standard statistical formulae [7].

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

Where,

r_{xy} = Simple correlation coefficient
X = Variable *i.e.* abiotic component. (Average temperature and relative humidity)
Y = Variable *i.e.* mean number of insect pests
N = Number of paired observations

The correlation coefficient values were subjected to the test of significance using t-test:

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

The calculated t-value obtained was compared with tabulated t-value at 5% level of significance.

3. Results and Discussion

The data presented in Table 1 and depicted in Figure-1 clearly reveal that *Aulacophora foveicollis* (Lucas) population initiated during 35th SMW with a mean population of 1.4 beetles/five plants. The population then increased gradually and reached its peak (4.8 beetles/five plants) during 40th SMW. Thereafter, a decreasing trend was observed till the last week of October, when the mean population of red pumpkin beetle was 1.6 beetles/five plants.

On working out the correlation between the red pumpkin beetle population and the abiotic factors (mean temperature, rainfall and relative humidity) a non significant positive correlation with a mean temperature (r=0.20) while a significant negative correlation with total rainfall (r= -0.29) and mean relative humidity (r= -0.47) was obtained.

Aulacophora foveicollis first appeared from the last week of August and remained active up to November with a peak population (4.80/ten plants) during the first week of October. On the basis of data obtained under the investigation, it was concluded that a temperature range of 20.54 to 26.79°C provided favorable conditions for the multiplication of beetles. The maximum population of red pumpkin beetle observed in the months of December and August [8]. The population of red pumpkin beetle recorded 3.9 per plant in cucumber during rainy season followed by 2.1 in winter season [9]. A positive correlation with pest population and temperature observed, whereas, a negative correlation found with relative humidity [10]. The highest incidence of the pest was noticed during August to September in *Kharif* and March to April in summer [11].

Table 1: Seasonal incidence of red pumpkin beetle on cucumber crop along with abiotic factors.

SMW	Period	Abiotic factor			Mean population per five plant
		Mean temp.	Mean RH	Rainfall	
33	13 Aug-19 Aug	24.31	78.00	57.4	0
34	20 Aug-26 Aug	26.03	75.50	16.4	0
35	27 Aug-2 Sept	26.79	80.36	72.4	1.4
36	3 Sept -9 Sept	25.68	84.79	162.6	1.8
37	10 Sept-16 Sept	25.68	82.57	86.4	2.8
38	17 Sept - 23 Sept	26.19	73.50	0.4	2.9
39	24 Sept- 30 Sept	25.70	62.93	34	4
40	1 Oct – 7 Oct	26.47	52.86	0	4.8
41	8 Oct-14 Oct	25.06	48.29	0	3.7
42	15 Oct-21 Oct	24.56	48.93	0	3
43	22 Oct- 28 Oct	22.69	42.86	0	2.4
44	29 Oct- 4 Nov	20.54	48.21	0	1.6
Correlation	-	0.20	-0.47*	-0.28*	0.00

*'t' value significant at 5% P = 0.05

4. Conclusion

The study revealed that the incidence of red pumpkin beetle, *A. foveicollis* (Lucas) was commenced in 4th week of August and peak in 1st week of October. This will help us in scheduling pest management strategies in cucumber crop.

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