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Population dynamics of phytophagous pest *Epilachna vigintioctopunctata* (Coccinellidae: Coleoptera) and natural enemy *Rhynocoris fuscipes* fab on selected brinjal cultivars in Virudhunagar

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Abstract
Epilachna vigintioctopunctata cause heavy threat to brinjal each year. For efficient control of insect pests, study of population dynamics of pests and its natural enemies is very important. *Rhynocoris fuscipes* is insect predator which is also employed in biological control of insect pests, these are present in agricultural fields as pest control agent. Study on both of them is clearly states the status of them in agricultural fields this will helpful to get better yield of Agri products. In present study the population dynamics of *E. vigintioctopunctata* and *R. fuscipes* were studied in brinjal fields of Virudhunagar District. Results revealed that the pest population is more than the predator population in brinjal field which is due to the presence of more suitable habitat.

Keywords: brinjal, predator, pest, population dynamics

Introduction
Solanum melongena L., or brinjal, is an essential crop in the subtropics and tropics. The fruits mostly consist of water, a small amount of protein, fibre and carbohydrates, which are low in calories and fat. The most widely grown vegetable crop in India is the brinjal. It is made specifically for a variety of climatic conditions (Thamuraj and Singh, 2001) [12]. Brindavan has been grown in India for the past 4,000 years, producing 8.7 million MT of food on an area of 0.53 million hectares. The three notable brinjal species, *S. melongena, S. aethiopicum, and C. macrocarpum*, are cross-fertile with their respective wild relatives (Daunay *et al.*, 1991) [3]. Even though many different varieties of brinjal are grown, crop damage from insect pests has prevented the crop from yielding as much as it should have thus far. Insect pests are the main obstacles to increasing crop productivity. The several insect pests that harm brinjal crops include fruit and stem borers, defoliators, cell sap suckers, stem girdlers, etc. The incidence of these pests fluctuates from season to season dependent on environmental circumstances in most tropical nations, including India, during different phases of its growth (Gangwar and Sachan, 1981) [5]. (Konar and Mohasin, 2002) [6]. Reduviidae members are numerous predators of numerous economically significant insect pests (Sahayaraj, 2014) [11]. In cotton agro-ecosystems, reduviids are widespread (Sahayaraj and Sahayaraj, 2012) [10]. *E. vigintioctopunctata* is a significant insect pest of Solanaceae plants in and around the Indian subcontinent. It has a greatly extended exterior morphology. In Jammu and Kashmir and other parts of India, *E. vigintioctopunctata*, a plant-eating herbivore, damages and destroys a variety of cultivated and wild crops from the Solanaceae, Cucurbitaceae, Fabaceae, Convolvulaceae, and Malvaceae families, including brinjal, tomato, potato, tobacco, melon, cucumber, gourds, and pumpkin. (Ahmad *et al.*, 2001) [1] (L.K. Rath, 2005) [8] Every year, the hadda beetle, *E. vigintioctopunctata* (Coccinellidae: Coleoptera), poses a significant danger to brinjal. Studying the population densities of insect pests that affect brinjal is crucial for efficient pest control. In this work, the population dynamics of the photophagous pest *E. vigintioctopunctata* and the insect predator *R. fuscipes* were estimated, as well as how their populations related to temperature.

Materials and methods
Experimental design
The study was conducted in six selected brinjal cultivars in Virudhunagar district from August 2021 – October 2021. The study was carried out using Randomized Complete Block Design (RCBD) method. Ten brinjal fields were selected in each Taluk to study the population dynamics of predator and pests. Ten plants per field were selected randomly for insect survey and the results were notes.

Population dynamics
In each field, three randomly chosen leaves—one from the top, middle, and bottom sections of the ten randomly selected crops used to collect the data on *R. fuscipes* and *E. vigintioctopunctata*. The two boarder rows being ignored. The data was collected on a weekly basis.

Statistical analysis
Statistical evaluation was carried out on the data obtained for each parameter using the Spss software programme.

Results and Discussion
Population density of *Rhynocoris fuscipes* (Table I)
R. fuscipes first arrived on brinjal on August 8 and persisted in population until November 11, while its density peaked on Sattur on September 27 with 2.00 individual leaves per leaf. Because more habitats, such as agricultural fields and human disturbances, are available on Srivilliputur than on Sattur, the overall mean density of the insect was much greater on Srivilliputur (0.86 individual's leaf-1) and lower

on Sattur (0.76 individual's leaf-1).The overall mean density of *R.fuscipes* was correlated with maximum mean temperature and minimum mean temperature, the results showed that the population density was not affected by the temperature and they show the very strong negative correlation between the population density of predatory bug and temperature this may be due to the presence of more pests species in the habitat, wide range of availability of pests species. The results where comparable to those of few early studies. Subramanian and Kitherian, (2012) [13] reported that rainfall level and temperature (either minimum or maximum) had negatively influence distribution of reduviids in Tirunelveli, Thoothukudi, Theni, Sivagangai and Madurai districts. Durkga *et al.*, 2019 [4] stated that the population dynamics of reduviids were negatively correlated with maximum and minimum temperature in semi-arid area of Sivakasi.

Table 1: Mean density of *Rhynocoris fuscipus* leaf^{-1} in different brinjal cultivars of Virudhunagar

Study site	Mean density of *Rhynocoris fuscipus* leaf^{-1}														Over all mean
	W-1 02/8	w-2 09/8	w-3 16/8	w-4 23/8	w-5 30/8	w6 6/9	w-7 13/9	w-8 20/9	w-9 27/9	w10 4/10	w-11 11/10	w-12 18/10	w-13 25/10	w-14 1/11	
Svk	0.00	0.33	0.39	0.67	0.78	1.00	1.00	1.33	1.33	1.33	1.67	1.33	1.00	0.67	0.82
Sat	0.00	0.00	0.33	0.33	0.33	0.67	1.00	1.67	2.00	1.67	1.67	1.00	0.00	0.00	0.76
Srivi	0.33	0.33	0.33	0.67	0.78	0.78	1.00	1.00	1.33	1.33	1.67	1.00	0.78	0.67	0.86

Population dent of *Epilachna vigintioctopunctata* (Table II)

E. vigintioctopunctata appeared on the brinjal cultivars from August 2021 – October 2021 where its maximum mean density was 1.40 in Srivilliputur Taluk and minimum mean density is 0.87 in Sivakasi Taluk this was because of the presence and absence of more number of host plants and the presence and absence of human and animal disturbances leads to the fluctuation in ladybird beetle density. The results emphasise that *E. vigintioctopunctata* population dynamics were negatively linked with minimum and maximum mean temperature in Virudhunagar District brinjal cultivars, indicating that the population of *E. vigintioctopunctata* was not influenced by the minimum and maximum temperature. According to Jamwal *et al.*, (2017), *Henosepilachna vigintioctopunctata* abundance is significantly influenced by lowest temperature and relative humidity.

Bhowmik and Saha reported a negative relationship between rainfall and relative humidity and the number of epilachna beetles (2017). Epilachna beetle infestation was found to significantly positively correlate with the maximum air temperature, according to Raghuraman and Veeravel (1999) [7]. Sagarika (2017) [9] found that while minimum relative humidity held a positive link with Epilachna beetle incidence but was not statistically significant, maximum relative humidity held a negative correlation with the insect.

Table 2: Mean density of *Epilachna Vigintioctopunctata*leaf^{-1} in different brinjal cultivars of Virudhunagar

Study site	Mean density of *Epilachna Vigintioctopunctata* leaf^{-1}														Over all mean
	w-1 02/8	w-2 09/8	w-3 16/8	w-4 23/8	w-5 30/8	w6 6/9	w-7 13/9	w-8 20/9	w-9 27/9	w10 4/10	w-11 11/10	w-12 18/10	w-13 25/10	w-14 1/11	
Svk	0.00	0.00	0.67	0.67	1.33	1.33	1.33	1.67	1.67	2.00	1.67	1.00	0.00	0.00	0.87
Sat	0.00	0.22	0.33	0.78	0.78	0.78	1.33	1.33	1.67	1.72	2.00	1.67	0.78	0.78	1.01
Srivi	0.00	0.67	0.67	1.33	2.00	3.00	3.00	2.00	2.00	0.00	1.67	1.00	0.67	0.00	1.40

Conclusion

The population dynamics of predator species *Rhynocoris fuscipus* and the pest species *Epilachna Vigintioctopunctata* in different brinjal cultivars of Virudhunagar district and also the results were statistically analysed.

Conflict of interest

The authors (C. Sundareswari, D. N. P. Sudarmani and S. Jaya Durkga) have no conflict of interest.

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