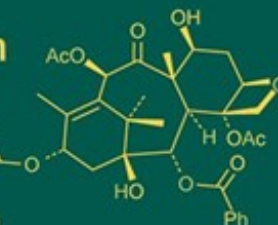
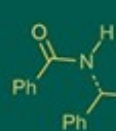


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Studies on population dynamics of lady bird beetle on chilli

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ABSTRACT

The present investigation was undertaken to study the population dynamics of the ladybird beetle (LBB), an important natural enemy associated with chilli agroecosystems, during Kharif 2025 at the College of Agriculture, Badnapur, Maharashtra. Weekly observations were recorded from standard meteorological week (SMW) 30 to 41 and expressed as number of ladybird beetles per plant. The population increased gradually from 0.25 beetles per plant during SMW 30 to 2.08 beetles per plant during SMW 38, followed by a decline to 1.35 beetles per plant by SMW 41. The highest population was therefore recorded during SMW 38, while the lowest population occurred at the beginning of the observation period. Correlation analysis showed non-significant relationships between ladybird beetle population and maximum temperature ($r = 0.251$), minimum temperature ($r = -0.228$), morning relative humidity ($r = -0.074$), evening relative humidity ($r = 0.080$) and rainfall ($r = -0.087$). The results indicated a clear seasonal pattern in which ladybird beetle abundance increased during the middle part of the crop season and subsequently decreased. The observations provide useful information for understanding the seasonal occurrence of this natural enemy in chilli and for planning conservation based pest management.

Keywords: Ladybird beetle, Population dynamics, Seasonal incidence, Chilli, Natural enemy, Kharif

Introduction

Chilli (*Capsicum annum* L.) is an important spice and vegetable crop widely cultivated in India and plays a significant role in domestic consumption and export. India is one of the leading producers, consumers and exporters of chilli in the world. Maharashtra is an important chilli-growing state, where the crop is mainly cultivated during the *Kharif* season. However, chilli production is affected by several insect pests, particularly thrips, aphids, whiteflies and other sucking pests, which adversely affect plant growth, fruit quality and yield. Lady Bird beetles (Coccinellidae) are important predatory insects associated with chilli and play a significant role in the natural regulation of sucking pest populations. Their abundance may vary with pest availability, crop growth and prevailing weather conditions. Knowledge of their seasonal abundance is therefore useful for understanding their role as natural enemies and for developing effective and eco-friendly Integrated Pest Management (IPM) strategies. The population dynamics of ladybird beetles in relation to meteorological factors can provide valuable information regarding their seasonal occurrence and activity in chilli. Hence, the present investigation was undertaken to study the population dynamics of lady Bird beetle in chilli under field conditions and to determine its relationship with major meteorological parameters.

Materials and Methods

The field experiment was conducted to study the population dynamics of major insect pests of chilli during the *kharif* season of 2025. The locally available variety of chilli, Teja-4, was transplanted in a non-replicated area of 100 m², adopting a spacing of 60 X 45 cm. The experimental plot was kept untreated throughout the crop period to assess the maximum potential multiplication of Lady Bird beetle prevailing on chilli under natural conditions. Surveillance of the chilli crop was carried out throughout the growing season and continued until the final harvest. Observations on the population dynamics of Lady Bird beetle was recorded at weekly intervals, starting from 15 days after transplanting. Lady Bird beetle was recorded by randomly selecting 10 plants from the experimental area, and the number of insects was recorded from the selected plants at each observation. Meteorological observations, including maximum and minimum temperature, relative humidity, rainfall and other relevant weather parameters, were recorded simultaneously throughout the crop period to study their relationship with pest population dynamics.

Results and Discussion

The study of population dynamics of insect pests in chilli was conducted during *Kharif* 2025 on research farm of College of Agriculture, Badnapur. The crop was grown on 100 m² area and kept untreated till harvest to record the activities of major insect pests and natural enemies. The population dynamics of ladybird beetles showed a distinct seasonal progression during the observation period. The population was 0.25 beetles per plant in SMW 30 and increased progressively through SMW 31 (0.35), SMW 32 (0.48), SMW 33 (0.62) and SMW 34 (0.80). It further increased to 1.05 beetles per plant in SMW 35 and 1.35 in SMW 36. A continued rise was observed during

SMW 37, when the population reached 1.72 beetles per plant. The maximum population of 2.08 ladybird beetles per plant was recorded during SMW 38. Thereafter, the population declined to 1.95 beetles per plant in SMW 39, 1.70 in SMW 40 and 1.35 in SMW 41. Thus, the seasonal incidence pattern consisted of a gradual build-up, a peak during SMW 38 and a subsequent decline towards the end of the observation period.

The weather variables showed considerable week-to-week variation, particularly rainfall and relative humidity. Despite these fluctuations, the correlation analysis reported in the source dataset did not show a significant association between ladybird beetle population and any of the five weather parameters considered.

Table 1. Weekly population dynamics of ladybird beetle and weather parameters

SMW	LBB (No./plant)	Max. Temp. (°C)	Min. Temp. (°C)	Rainfall (mm)	RH Morning (%)	RH Evening (%)
30	0.25	29.20	23.30	98.40	100	99
31	0.35	31.70	23.00	1.00	100	92
32	0.48	31.50	23.30	17.00	100	96
33	0.62	28.40	22.80	122.00	99	92
34	0.80	30.90	22.20	7.20	100	96
35	1.05	30.60	23.30	37.00	100	99
36	1.35	30.20	22.40	27.80	100	97
37	1.72	30.80	23.10	60.80	100	98
38	2.08	31.60	23.00	91.20	100	100
39	1.95	30.20	22.40	20.20	100	100
40	1.70	30.80	23.10	0.60	100	93
41	1.35	31.60	23.00	0.00	91	73

Table 2. Correlation of ladybird beetle population with weather parameters

Parameter	Correlation coefficient (<i>r</i>)
Maximum temperature	0.251 NS
Minimum temperature	−0.228 NS
Morning relative humidity	−0.074 NS
Evening relative humidity	0.080 NS
Rainfall	−0.087 NS

The present findings are in close conformity with the observations of Dhandge *et al.* (2018) [1], who reported that the abundance of natural enemies, including ladybird beetles, was positively associated with maximum temperature, whereas minimum temperature and relative humidity showed a negative relationship. Similarly, Rawat *et al.* (2020) [2] observed that the activity of coccinellid predators was only weakly influenced by the prevailing weather conditions and that the correlations with different meteorological parameters were statistically non-significant. In line with these findings, Yadav *et al.* (2022) [3] also reported that ladybird beetle populations exhibited non-significant positive correlations with maximum temperature alongside negative non-significant relationships with minimum abiotic parameters under field conditions. In the present investigation, maximum temperature and evening relative humidity exhibited positive but non-significant associations, while minimum temperature, morning relative humidity and rainfall recorded negative but non-significant correlations with the ladybird beetle population.

Conclusion

Ladybird beetle population on chilli exhibited a clear seasonal pattern during *Kharif* 2025. The population increased from 0.25 beetles per plant in SMW 30 to a peak of 2.08 beetles per plant in SMW 38, followed by a decline to 1.35 beetles per plant in SMW 41. Correlations

with maximum and minimum temperature, morning and evening relative humidity, and rainfall were all non-significant. The population dynamics observations provide a useful seasonal baseline for understanding the occurrence of ladybird beetles and for incorporating conservation of natural enemies into chilli integrated pest management programmes.

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