



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(8): 1004-1006
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www.thepharmajournal.com
Received: 10-06-2023
Accepted: 13-07-2023

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Studies on major insect pests of French bean (*Phaseolus vulgaris* L.) and bio-efficacy evaluation of newer insecticides

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Abstract

At Raipur's Research and Instructional Farm, which is part of the College of Agriculture, the field experiment was conducted. Rabi 2022–2023 at the Indira Gandhi Krishi Vishwavidyalaya in Raipur (Chhattisgarh). According to the study, the aphid population peaked between the third week of December and the third week of March. With a peak aphid population of 42.32 per three branches of 10 cm, the fourth week of February (8th SMW) saw the highest pest activity of all the months of the crop cycle. The findings showed a substantial positive connection between aphid population and maximum temperature ($r=0.778^{**}$). The remaining abiotic factors, such as minimum temperature ($r=0.503$), maximum relative humidity ($r=0.180$), and minimum relative humidity ($r=0.390$), however, did not significantly differ in their correlations with each other or with rainfall ($r=-0.152$).

Keywords: Aphid, seasonal incidence, correlation, abiotic factors

Introduction

In India pulses are second most important constituent diet after cereals and pulses are rich source of proteins. French bean (*Phaseolus vulgaris* L.) is an annual diploid ($2n=2x=22$) herbaceous plant belongs to the family Fabaceae and genus Phaseolus. *Phaseolus vulgaris* may have been developed in Brazil and North Argentina. The genus Phaseolus contains more than 50 species, with the common bean (*Phaseolus vulgaris* L.) comprising for 90 % of cultivated species worldwide. In India, the green pods used as vegetable are called fanasi and the dry grains are called Rajmah. On hills, French bean is typically grown during the kharif season. However, the crop has also been planted in the northern plains during rabi season as a result of the creation of new genotypes.

Crop productivity is impacted by both biotic and abiotic causes. Throughout its lifespan, the crop is attacked by a variety of insect pests. French bean has been observed to be harmed by about 30 different bug species. Aphid (*Aphis craccivora* Koch), leafhopper (*Empoasca dolichi* Paoli), thrips (*Megalurothrips sjostedti* Trybom), whitefly (*Bemisia tabaci* Gennadius), and mite (*Tetranychus urticae* Koch) are some of the more frequent sucking insect pests among them.

Therefore, the current study was conducted to examine the seasonal occurrence of the aphid, *Aphis craccivora* Koch, on French beans and its relationship to several abiotic parameters in the dominant agro-climate of the Chhattisgarh plain.

Materials and Methods

The experiment was conducted at during the Rabi 2022-23 at Research cum Instructional Farm, College of Agriculture and Research Station, Raipur (C.G.), Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). To study the Seasonal incidence of Aphid, *Aphis craccivora* Koch on French bean during Rabi 2022, The recommended variety of French bean, Falguni bean was sown in $3 \times 2.2 \text{ m}^2$ (6.6 m^2) area with spacing of $50 \text{ cm} \times 40 \text{ cm}$. There was adherence to the recommended package of practices (RPP). From November's second week through March's second week, observations were made at weekly intervals. Observations with the exception of plant protection measures and the revised suggested package of practices for crop raising. Aphids were counted from nymph and adult/10 cm twigs/plant to document the observation on the aphid population infesting the French bean crop. The COA Raipur (C.G.) meteorological observatory provided weekly data on temperature,

relative humidity, rainfall, and sunlight hours throughout the duration of the cropping season. The acquired data were connected with various abiotic parameters, and correlation

coefficients were calculated in accordance with recommendations. The graphical representation was used to show the aphid's seasonal occurrence. (Fig. 1)

Table 1: Seasonal incidence of aphid, *Aphis craccivora* Koch on French bean at COA Raipur during Rabi 2022-23

SMW	Date of observation	Mean population (no.) of Aphid (per 10 cm twig/plant)
50	15/12/22	4.56
51	22/12/22	13.11
52	29/12/22	14.22
01	05/01/23	14.57
02	12/01/23	15.24
03	19/01/23	16.13
04	26/01/23	20.16
05	02/02/23	21.25
06	09/02/23	35.30
07	16/02/23	9.36
08	23/02/23	42.32
09	02/03/23	33.24
10	09/03/23	39.22
11	16/03/23	25.46

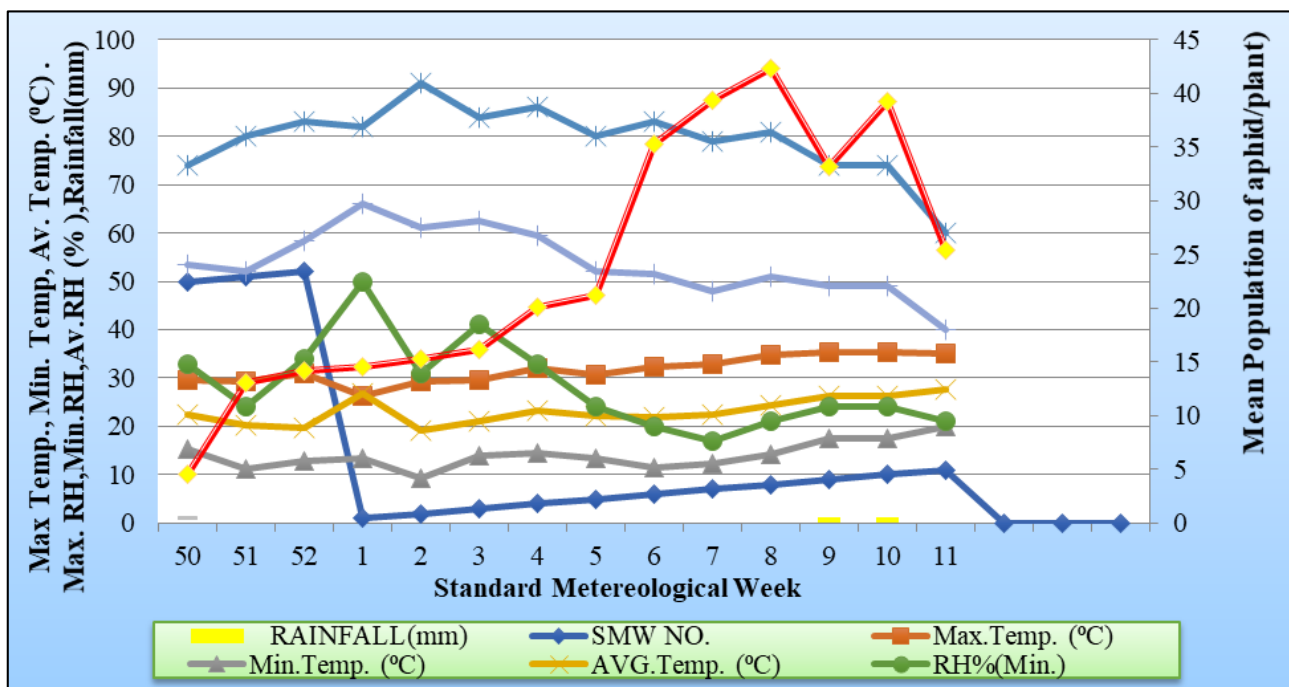


Fig 1: Seasonal incidence of aphid, *Aphis craccivora* Koch on French bean

Table 2: Correlation (r) and regression (byx) coefficient between meteorological parameters and population of aphid on French bean.

Meteorological parameters	Aphid	
	(r)	(byx)
Maximum Temperature(°C)	0.778**	0.182
Minimum Temperature (°C)	0.503	
Maximum RH (%)	0.180	
Minimum RH (%)	0.390	
Rainfall(mm)	-0.152	

**significant at 1%

Results and Discussion

The data on population of aphids presented in (Table-1) indicated that the population commenced from 34 Days After Sowing (DAS) i.e., 3rd week of December [50th SMW (Standard Meteorological Week)] and persisted till 3th week of March (11th SMW, 125th DAS) which ranged from 4.56 to 42.32 aphids per three shoots of 10 cm. After 34 DAS negligible aphid population (4.56) was observed. Thereafter,

the population showed increasing trend in 51th and 52th SMW with population of 13.11 to 14.22 aphids per three shoots of 10 cm. From 1st SMW to 3rd SMW the population was in equilibrium trend 14.57 to 16.13 aphids per three shoots of 10 cm. During 4th SMW to the aphid population was suddenly increased to 20.16 per three shoots of 10 cm. Again in 6th SMW to 10th SMW the population are rapidly increased to 35.30 to 42.32 aphid per three shoots of 10 cm. Again in 9th SMW to 11th SMW the population decreased to 33.24 to 25.46 aphid per three shoots of 10 cm respectively. In comparison to all the months of crop period the highest activity of pest was observed in 4th week of February (8th SMW) with peak aphid population of 42.32 per three shoots of 10 cm.

The results shown in (Table-2) showed a substantial positive connection between the aphid population and the highest temperature (r=0.778**). The remaining variables, such as lowest temperature (r=0.503), maximum relative humidity (r=0.180), and minimum relative humidity (r=0.390),

however, did not significantly differ from one another, while rainfall ($r=-0.152$) did not significantly differ from one another. The correlation analyses revealed that only temperature had an impact on aphid incidence, suggesting that

an increase in temperature would reduce the aphid population. Other climatic variables and bug population in the crop of French beans have a non-significant association, but not with maximum temperature.

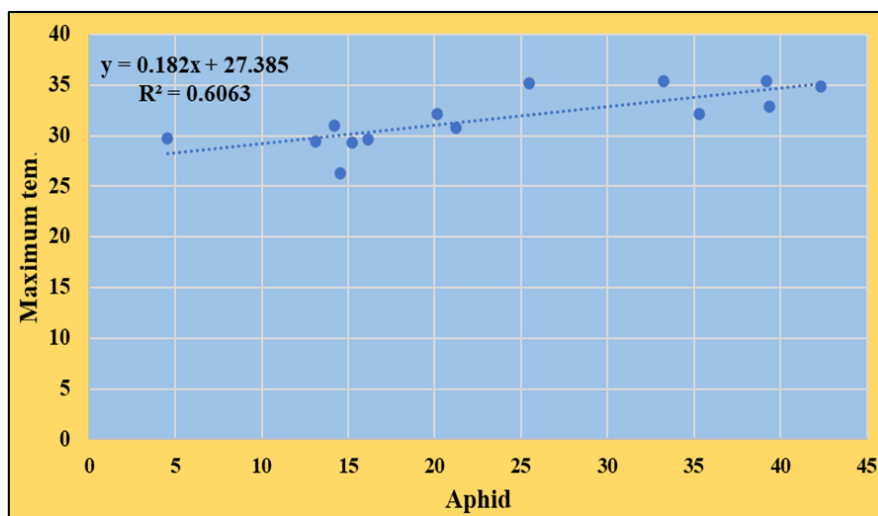


Fig 2: Regression of aphid infestation on maximum temperature (°C)

Conclusion

According to studies on the pest's seasonal incidence, aphids first appeared on French bean plants during the 50th standard week of the vegetative stage and continued to increase with intermediate ups and downs until they reached their peak (42.32 aphid 10 cm. twig/plant) during the fourth week of February (8th SMW) in the pod filling stage. They were then observed up until the crop reached maturity.

The highest temperature ($r = 0.778^{**}$) demonstrated a strong association between the population of aphids and other weather parameters, while no other weather data were significantly correlated with the aphid population.

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