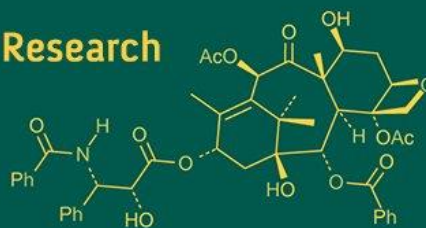
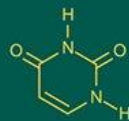


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(7): 571-574
www.biochemjournal.com
Received: 10-05-2026
Accepted: 13-06-2026

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Seasonal incidence of earhead bug, *Leptocoris acuta* thunberg (Coreidae: Hemiptera) infesting rice

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i7h.9086>

Abstract

The present study on the seasonal incidence of rice earhead bug, *Leptocoris acuta*, was conducted at the Main Rice Research Centre, Navsari Agricultural University, Navsari on the rice variety, Gujarat Rice-11 during *Kharif* 2023. The earhead bug population began from the 37th Standard Meteorological Week (SMW) and continued until the 45th SMW, ranging from 1.33 to 42.33 bugs per twenty hills. The peak population (42.33 bugs/20 hills) was observed during the 42nd SMW, while the lowest (1.33 bugs/20 hills) was observed during the 37th SMW. Maximum temperature showed a significant positive correlation ($r=0.533^*$), while wind speed had a significant negative correlation ($r=-0.629^*$).

Keywords: Earhead bug, rice gundhi bug, *Leptocoris acuta*, seasonal incidence, weather parameters, correlation

Introduction

Rice (*Oryza sativa* L.) is the staple food for more than 60% of the world's population and serves as a major source of dietary energy, particularly in Asia. Rice grains contain approximately 78.2 g carbohydrates, 6.8 g protein, 0.5 g fat, 0.2 g crude fibre, 0.6 g mineral matter, 10 mg calcium, and 160 mg phosphorus per 100 g of edible portion (Mangalarai and Mauria, 1999). Owing to its high nutritional value and adaptability to diverse agro-climatic conditions, rice plays a crucial role in ensuring global food and nutritional security. Globally, rice is cultivated over approximately 167.1 million hectares with an annual production of about 527.7 million metric tonnes (milled basis) during 2024-25. India and China are the two largest rice-producing countries, followed by Bangladesh, Indonesia, and Vietnam. The average global rice productivity is about 4.71 t ha⁻¹ (USDA, 2024) [12].

India has the largest area under rice cultivation, covering approximately 51.42 million hectares, with an estimated production of 150.0 million metric tonnes (milled basis) during 2024-25, resulting in an average productivity of 4.38 t ha⁻¹ (USDA-FAS, 2025) [13]. Rice is cultivated in almost all states of the country. Among the states, West Bengal continues to occupy the largest area under rice cultivation, whereas Punjab records the highest productivity due to the adoption of improved production technologies, assured irrigation, and intensive crop management practices. In Gujarat, rice is cultivated mainly during the *kharif* season in the southern and central agro-climatic regions of the state. According to the latest available statistics, rice occupies about 0.90 million hectares with an annual production of approximately 2.14 million metric tonnes, recording an average productivity of 2.36 t ha⁻¹. Major rice-growing districts of Gujarat include Navsari, Surat, Anand, Kheda, Bharuch, and Vadodara, where favourable rainfall and irrigation facilities support successful rice cultivation (Directorate of Agriculture, Government of Gujarat, 2022) [3].

More than seventy species of insects have been recorded as rice pests in India. Among them, fifteen insect species occurring regularly are of major significance and frequently found to cause severe damage thereby reducing the yield. These key pests are rice yellow stem borer (*Scirpophaga incertulas* Walker), rice brown plant hopper (*Nilaparvata lugens* Stal), rice leaf folder (*Cnaphalocrocis medinalis* Guenee), rice hispa (*Dicladispa armigera* Olivier), rice gall midge (*Orseolia oryzae* Wood-mason), rice horned caterpillar (*Melanitis leda ismene* Cran), rice skipper (*Pelopidas mathias* Fabricius), rice caseworm (*Nymphula depunctalis* Guenee), rice white backed plant hopper

(*Sogatella furcifera* Horvath), rice green leaf hopper (*Nephotettix nigropictus* Stal), (*Nephotettix virescens* Distant), rice blue beetle (*Leptispa pygmaea* Baly), army worm (*Mythimna seperata* Walker), cut worm (*Spodoptera mauritia* Boisduval) and rice earhead bug (*Leptocorisa acuta* Thunberg) (Deore, 2002)^[2].

The rice earhead bug (*Leptocorisa acuta*) is an emerging pest of concern nationwide, primarily targeting rice crops during the milky stage of the panicle. It feeds by piercing and sucking the milky content from developing grains, resulting in discoloured and chaffy kernels, which can lead to significant yield loss. Although numerous studies have explored the seasonal incidence and population dynamics of the rice earhead bug globally, the existing research remains limited. A significant gap persists in understanding how weather parameters influence population density and behavior across various seasons and climatic conditions on the earhead bug. Therefore, a comprehensive investigation was essential to gain deeper insights into this pest and to formulate effective management strategies. In light of this, the present study was undertaken.

Material and Methods

The present study was conducted at the Main Rice Research Centre, Navsari Agricultural University, Navsari, in the *Kharif* season 2023-2024. The “Gujarat Rice-11” rice variety was sown on 3rd July 2023 and transplanted into main plots on 26th July 2023. The crop was planted with a spacing of 20 x 15 cm in a large block of 40 x 15 m (600 m²) and all the standard agronomic practices were followed.

Method of observation

The entire field was divided into six equal quadrants and twenty hills were randomly selected from each section. Weekly observation of Nymphs and adult insects was taken from these hills throughout the crop season. No insecticidal sprays were applied to the plots during this period to ensure natural pest incidence. Weekly environmental data including maximum and minimum temperatures, morning and evening relative humidity, wind speed, bright sunshine hours, rainfall, and the number of rainy days was collected from the Meteorological Observatory at the College Farm of N.M. College of Agriculture, Navsari Agricultural University, Navsari, during the year 2023. This environmental data was then used to calculate the correlation coefficient with the incidence of the rice earhead bug.

Results and Discussion

Seasonal Incidence of Rice Earhead Bug, *L. acuta*

Results revealed that the infestation of earhead bug was started just before the initiation of flowering of the crop with 1.33 bugs per twenty hills in the 37th SMW (2nd week of September) and gradually reached to the peak with 35.83 and 42.33 bugs per twenty hills in 41st and 42nd SMW (2nd and 3rd week of October), respectively during milking stage of the crop. Thereafter, the population declined to 21.66 bugs per twenty hills during the grain hardening stage in the 43rd SMW (4th week of October), and later declined to 2.66 bugs per twenty hills in the 45th SMW (1st week of November). It was observed that the population ranged from 1.33 to 42.33 bugs per twenty hills. The population was at its peak level (42.33 bugs/20 hills) during the 42nd SMW (3rd week of October), while the lowest population (1.33 bugs/20 hills) was observed in 37th SMW (2nd week of September) (Table 1).

Table 1: Seasonal incidence of rice earhead bug, *L. acuta* during *Kharif*, 2023.

Sr. No.	SMW	Month	Week	Bugs (Nymphs and adults/20 hills)	Temperature (°C)		Relative Humidity		wind speed (km/h)	sunshine hours (hrs.)	Rainfall (mm)	Rainy days
					Maximum	Minimum	Morning	Evening				
1	31	July	V	0	29.7	25.2	91	88	8.1	0.8	41.0	3
2	32	August	I	0	30.5	25.7	89	77	7.7	1.2	11.0	2
3	33		II	0	30.1	25.4	91	77	6.1	3.8	4.0	1
4	34		III	0	30.9	24.9	94	78	4.3	2.7	12.0	3
5	35		IV	0	32.3	24.4	93	58	2.7	8.3	1.0	0
6	36	September	I	0	32.0	24.2	92	70	1.6	3.7	57.0	3
7	37		II	1.33	31.5	25.0	94	74	3.1	6.8	16.0	2
8	38		III	6.16	30.4	24.5	96	83	3.1	2.3	93.0	4
9	39		IV	19.33	32.7	23.4	96	72	1.0	4.3	123.0	3
10	40	October	I	27.50	33.8	23.9	94	66	1.0	7.8	0.0	0
11	41		II	35.83	34.9	23.2	97	58	0.4	8.1	0.0	0
12	42		III	42.33	35.6	22.3	92	43	0.8	8.0	0.0	0
13	43		IV	21.66	36.1	19.6	88	35	0.5	8.5	0.0	0
14	44		V	11.50	35.3	18.1	82	31	1.0	9.3	0.0	0
15	45	November	I	2.66	35.5	20.3	76	37	1.0	8.1	0.0	0

The result of the present investigation was closely associated with Kalita *et al.* (2015)^[5], who reported that the percentage of damaged grain caused by the rice earhead bug reached its peak during the second fortnight of October, with a recorded maximum of 14.80 to 16.40 gundhi bugs per 10 hills. Sulagitti *et al.* (2017)^[10] reported that the gundhi bug was initially detected during the second week of September (37th SMW), with a count of 1 bug per 5 sweep nets. Its activity increased during the third week of September (38th SMW) and peaked during the fourth week of October (43rd SMW), with 16 bugs per 5 sweep nets. Gupta (2018)^[4] reported that the initial incidence of the rice gundhi bug was observed during the 38th SMW (the third week of September) with an infestation of an average of 0.40 gundhi bug per hill and reached its peak level of 3.80 gundhi bug per hill during the

43rd SMW (the fourth week of October). Tigga *et al.* (2018)^[11] observed that the occurrence of gundhi bug commenced from the 37th SMW (2nd week of September) with an average of 0.57 gundhi bug per hill. The gundhi bug infestation increased and gradually reached a peak level of 3.02 gundhi bugs per hill at the 41st SMW (2nd week of October). The reports were more or less in accordance with the present findings, but some differences might be due to changes in geographical location and climatic conditions.

Effect of Weather Parameters on Incidence of Rice Earhead Bug: The correlation between the nymphal and adult population of rice earhead bug, *L. acuta* was worked out with weather parameters *viz.*, maximum temperature, minimum temperature, morning relative humidity, evening

relative humidity, wind speed, sunshine hours, rainfall and rainy days. The results were presented in Table 2. The results on the correlation between the incidence of rice earhead bug and different weather parameters revealed that the maximum temperature ($r=0.533^*$) showed a significant positive correlation (Fig. 1) and wind speed ($r=-0.629^*$) showed a significant negative correlation (Fig. 2), whereas morning relative humidity ($r=0.402$) and bright sunshine hours ($r=0.426$) had a non-significant positive correlation. Minimum temperature ($r=-0.180$), evening relative humidity ($r=-0.222$), rainfall ($r=-0.165$) and rainy days ($r=-0.335$) showed a non-significant negative correlation with the incidence of rice earhead bug (Table 2).

The findings of the present investigation are in close agreement with those reported by Singh and Sharma (2018) [9, 8], who observed that sunshine hours exhibited a significant positive correlation with the incidence of rice earhead bug (*Leptocorisa* spp.) ($r = 0.740$). In contrast, rainfall, morning relative humidity, evening relative humidity, wind velocity, morning vapour pressure, evening vapour pressure, and the number of rainy days showed significant negative correlations with pest incidence, with correlation coefficients of -0.460 , -0.551 , -0.782 , -0.657 , -0.839 , -0.868 , and -0.704 , respectively. Similarly, Sharma *et al.* (2019) [8] reported a significant negative correlation between rice earhead bug population and rainfall ($r = -0.497$). However, the pest population exhibited positive but non-significant correlations with maximum temperature ($r = 0.152$) and morning relative humidity ($r = 0.018$). In contrast, non-

significant negative correlations were observed with minimum temperature ($r = -0.397$), average temperature ($r = -0.255$), evening relative humidity ($r = -0.040$), and average relative humidity ($r = -0.086$). Comparable observations were also made by Das *et al.* (2021) [1], who reported that the incidence of *Leptocorisa oratorius* was significantly and negatively associated with rainfall ($r = -0.606$). The authors further recorded positive but non-significant correlations with maximum temperature ($r = 0.047$) and bright sunshine hours ($r = 0.399$), whereas minimum temperature ($r = -0.200$), morning relative humidity ($r = -0.433$), and evening relative humidity ($r = -0.354$) exhibited non-significant negative correlations with pest incidence. Likewise, Paikra *et al.* (2021) [6] found that the population of gundhi bug was significantly and positively correlated with sunshine hours ($r = 0.767$). Conversely, significant negative correlations were observed with minimum temperature ($r = -0.668$), average temperature ($r = -0.547$), morning relative humidity ($r = -0.671$), evening relative humidity ($r = -0.853$), average relative humidity ($r = -0.859$), and rainfall ($r = -0.616$). Overall, the findings of the present study corroborate the results of earlier investigations, indicating that weather parameters, particularly sunshine hours and rainfall, play a crucial role in influencing the population dynamics of rice earhead bug. Minor variations among studies may be attributed to differences in geographical location, agro-climatic conditions, rice cultivars, crop management practices, and seasonal weather variability.

Table 2: Correlation between weather parameters and rice earhead bug, *L. acuta* (nymph and adult) population

Sr. No.	Weather parameters		Correlation coefficient (r)
1	Temperature ($^{\circ}\text{C}$)	Maximum	0.533*
		Minimum	-0.180
2	Relative humidity (RH) (%)	Morning	0.402
		Evening	-0.222
3	Wind speed (km/hr.)		-0.629*
4	Bright sunshine hours (BSSH) (hrs/day)		0.426
5	Rainfall (mm)		-0.165
6	Rainy days		-0.335

Note: *r value at 0.05 and 0.01 level of significance is 514 and 641, respectively.

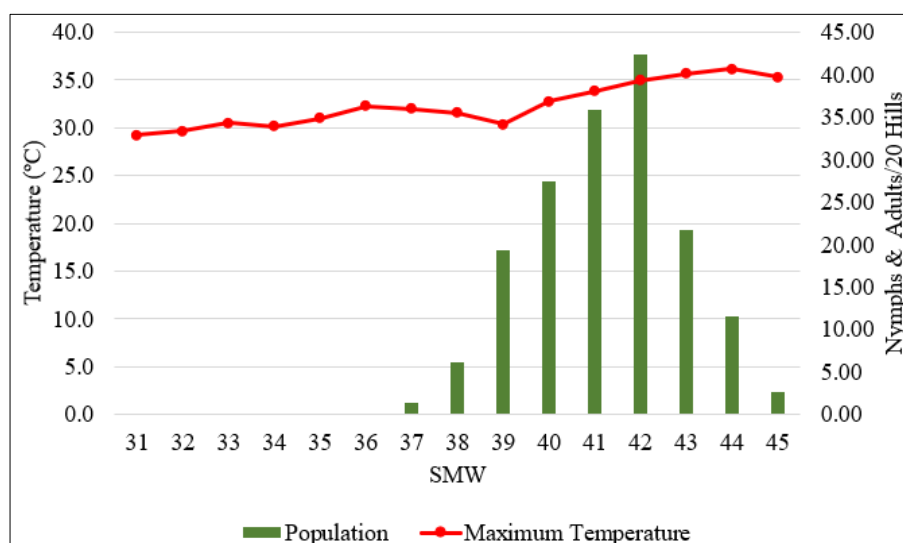


Fig 1: Correlation between Earhead bug population and Maximum temperature.

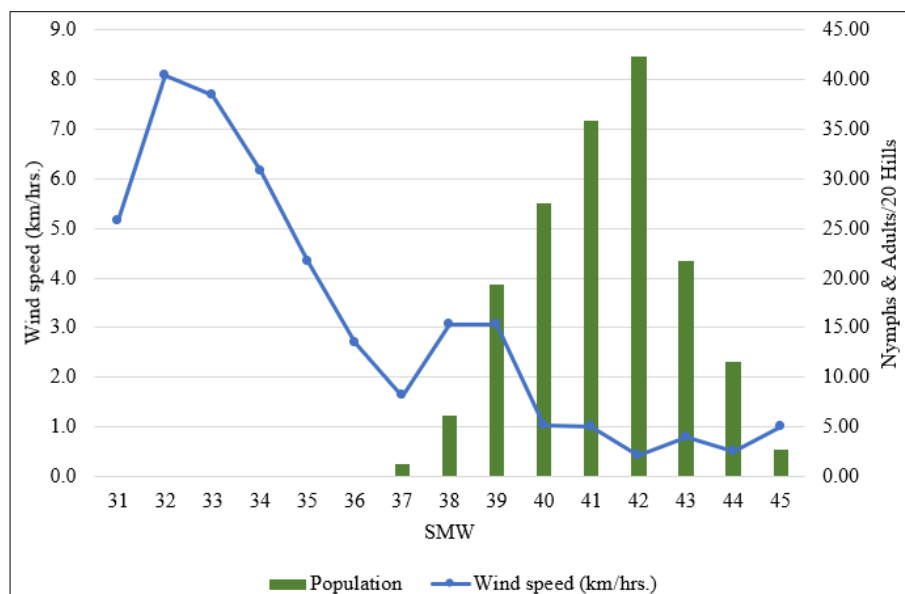


Fig 2: Correlation between Earhead bug population and Wind speed (km/hrs.).

Conclusion: It can be concluded from the above results that the earhead bug population began from the 37th Standard Meteorological Week (SMW) and continued until the 45th SMW, ranging from 1.33 to 42.33 bugs per twenty hills. The peak population (42.33 bugs/20 hills) occurred during the 42nd SMW, while the lowest (1.33 bugs/20 hills) was in the 37th SMW. Maximum temperature showed a significant positive correlation ($r=0.533^*$), while wind speed had a significant negative correlation ($r=-0.629$). The incidence of the rice earhead bug began just before the flowering stage, with the population rising and peaking around the milking stage of grain development. After that it declined steadily during the grain hardening stage, and then as the crop moved into maturity, it kept dropping too. These results provide useful clues about how rice earhead bug numbers change throughout the season, and could serve as a starting point for developing timely, more effective management options suited to the agroecological conditions in South Gujarat.

Disclaimer (artificial intelligence): Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of this manuscript.

Acknowledgement: Authors are grateful to the Department of Entomology, N.M. College of Agriculture, Navsari Agricultural University, Navsari and Main Rice Research Centre, Navsari Agricultural University, Navsari, Gujarat, India, 396 450.

Competing interests: Authors have declared that no competing interests exist.

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