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Seasonal incidence of mustard aphid (*Lipaphis erysimi* Kalt.) and its natural enemies in relation to weather parameters under different sowing conditions

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Abstract
A field study was conducted during the Rabi season 2025–26 to investigate the seasonal incidence of Mustard aphid, *Lipaphis erysimi* (Kalt.) and its associated natural enemies in relation to weather parameters under two different sowing dates. Mustard variety TAM 108-1 was sown on 30th October 2025 (early) and 30th November 2025 (late) under non-replicated, pesticide-free conditions. Aphid population was recorded weekly as the number of aphids per 10 cm terminal twig, while ladybird beetles and the parasitoid *Diaeretiella rapae* (Mummified aphid) were recorded simultaneously. Under the 30th October sowing, aphid population increased from 1.8 aphid's/10 cm twig in SMW 50 and reached a maximum of 130.0 aphids/10 cm twig during SMW 4 (26th January 2026). Under the 30 November sowing, the population increased from 0.8 aphid's/10 cm twig in SMW 1 and attained a comparatively lower peak of 88.4 aphid's/10 cm twig during SMW 6 (11th February 2026). The maximum populations of ladybird beetles were 3.2 and 3.0 beetles/plant, while Mummified aphid populations reached 4.4 and 3.6 parasitoids/10 cm twig under 30th October and 30th November sowings, respectively. Pearson correlation analysis revealed a strong positive association of aphid population with ladybird beetles (r = 0.906 and 0.981) and *D. rapae* (r = 0.926 and 0.959) under the two sowing dates, respectively. Weather variables also showed differential associations with aphid abundance between sowing dates. The findings indicated that sowing time substantially influenced the magnitude and timing of mustard aphid incidence, with the 30th October sowing experiencing an earlier and higher aphid peak.

Keywords: Mustard aphid *Lipaphis erysimi*, seasonal incidence, sowing date, natural enemies, *Diaeretiella rapae*, weather parameters

1. Introduction
Evidence of the production of brassica crops dates back to about 5000 BC, making it one of the earliest crops ever cultivated. In the past, various Brassica plants were utilized as oil sources and condiments, and mustard still plays a significant role in Indian cuisine. As edible oilseeds, mustard and rapeseed are widely consumed and continue to play a significant role in the Indian agricultural economy (Prakash and Hinta, 1980) [18].

Among the seven main edible oilseed crops cultivated in India, rapeseed-mustard (Brassica spp.) makes up around 28.6% of the nation's total oilseed production, ranking second only to groundnuts, which account for 27.8% of the country's oilseed economy. The genus Brassica and family Brassicaceae include the oilseed Brassica crops. In India, these crops are frequently grown in the winter under both rainfed and irrigated circumstances. Although it may be cultivated well in both tropical and temperate climates, mustard is generally a cool-season crop. (Shekhawat and others, 2012) [20].

A significant source of edible oil with high concentrations of erucic and linolenic acids, mustard seeds have a high oil content (about 40%). The seeds' high fat, protein, carbohydrate, mineral, and fiber content makes them nutritious as well. Mustard seeds and oil are frequently used in pickles, curries, sauces, and vegetable preparations because of their strong flavor. Additionally, mustard oil has a number of industrial and medical uses, such as in the production of soap, lubricant, hair oils, and conventional remedies for a range of illnesses (Anonymous, 2023) [2].

Seven distinct mustard and rapeseed species can be found in India: *Brassica juncea* and *Brassica rapa* (yellow sarson), *Eruca sativa* (Taramira), *Brassica nigra*, *Brassica rapa* var. toria, *Brassica compestris*, and *Brassica tournefortii*. It is a crop that requires less water to develop and can tolerate moderate salt. Its seed and oil are fragrant due to the presence of sinigrin and a high percentage of glucosinolate (Nagraj, 1995) [12].

Even though mustard aphid seasonal incidence has been extensively researched, knowledge of its population dynamics under various sowing dates and their relationship to natural enemies and meteorological factors is still crucial for accurate pest predictions and management. Aphid appearance, population growth and decline can all be impacted by variations in sowing time, which in turn can impact pest risk. Therefore, during the *Rabi* season 2025–2026, the current study was conducted to evaluate the impact of sowing dates on the seasonal incidence of *Lipaphis erysimi* (Kalt.) and its related natural enemies in relation to climatic parameters.

2. Materials and Methods

The field experiment was conducted during the *Rabi* season 2025–26 at the field of AICRP on Linseed and Mustard, Nagpur (Dr. PDKV, Akola), to study the influence of sowing date on the seasonal incidence of mustard aphid, *Lipaphis erysimi* (Kalt.) and its natural enemies in relation to weather parameters. Mustard variety TAM 108-1 was sown on 30th October 2025 and 30th November 2025 in separate 9 × 9 m plots with a spacing of 45 × 10 cm under non-replicated and pesticide-free conditions.

Five plants were randomly selected and tagged in each plot and observations were recorded at weekly intervals. Aphid population was recorded on a 10-cm terminal central twig and expressed as aphid's/10 cm twig. Ladybird beetles were recorded as beetles/plant, while *Diaeretiella rapae* was recorded as Mummified aphids/10 cm twig.

Weekly weather data, including rainfall, rainy days, maximum and minimum temperature, morning and evening relative humidity, bright sunshine hours, wind speed and evaporation, was obtained from the meteorological observatory at college of agriculture, Nagpur.

The observations were analyzed according to Standard Meteorological Weeks (SMW) to determine population build-up, peak incidence and decline. Pearson's correlation coefficient (r) was used to determine the association of aphid population with natural enemies and weather parameters and significance was tested at the 5% probability level.

3. Results and Discussion

3.1 Seasonal incidence of mustard aphid and associated natural enemies on mustard under different sowing dates.

Based on weekly monitoring of mustard aphid, *L. erysimi* (kalt.) and associated natural enemies *viz*., lady bird beetles and parasitoid (*D. rapae*) in mustard field. The data clearly revealed variations in pest incidence as a function of the difference in date of sowing, most likely due to changing environmental conditions.

3.1.1 Seasonal incidence of mustard aphid (*Lipaphis erysimi*) and associated natural enemies (lady bird beetle and parasitoid of mustard aphid, *Diaeretiella rapae*) for crop sown in last week of optimum sowing period recommended by the university (30th October 2025)

- **Incidence of mustard Aphid (*Lipaphis erysimi*):** On a mustard crop planted on 30th October 2025, the seasonal incidence of mustard aphids was noted. The observation began on 15th December 2025, the 50th Standard Meteorological Week (SMW), and lasted until 9th March 2026, the 10th SMW. Aphid populations increased gradually, peaked during the 4th SMW, and then began to gradually fall.

  At the beginning of the 50th Standard Meteorological Week (SMW) on 15th December 2025, there were 1.8 aphids per 10 cm apical twig. Aphid populations increased dramatically starting in the 1st week of January, reaching 42.6, 66.2, and 89.0 aphids per 10 cm twig during the 1st, 2nd, and 3rd SMWs, respectively. During the 4th SMW (26th January 2026), the aphid population reached its highest density of 130.0 aphids per 10 cm apical twig. After that, during the 5th to 8th SMWs, the population gradually decreased to 87.4 to 7.4 aphids per 10 cm twig, respectively.

  The aphid population further decreased toward the final stage of the cropping season, reaching 1.2 aphids per 10 cm twig during the 9th SMW and 0.6 aphids per 10 cm twig during the 10th SMW, indicating the infestation's natural reduction with crop maturity.

  The present findings are in close agreement with Panda *et al*. (2000) [14], Kulkarni and Patel (2001) [11], and Gauraha *et al*. (2002) [7], who reported peak aphid incidence during favourable winter conditions. The occurrence of ladybird beetles following aphid build-up also agrees with Kulkarni and Patel (2001) [11], indicating a close association between aphid incidence and predator activity.
- **Incidence of Lady Bird Beetle:** With a mean population of 0.4 beetles per plant, the predator ladybird beetle activity was initially observed during the 1st SMW, which coincided with the sharp rise in aphid populations. As the aphid infestation peaked in the 4th SMW, the predator population gradually increased and reached its maximum density of 3.2 beetles per plant.
- **Incidence of parasitiod of mustard aphid, *Diaeretiella rapae*:** The population of mummified aphids was observed from 1st SMW to 10th SMW *rabi* 2025-26. The population of mummified aphids ranged from 1.2 to 4.4 parasitized aphids/ 10 cm apical shoot. Peak infestation of *D. rapae* was recorded in 4th SMW with 4.4 parasitized aphid/ 10 cm apical shoot, respectively.

3.1.2 Seasonal incidence of mustard aphid (*Lipaphis erysimi*), and associated natural enemies (lady bird beetle and parasitoid of mustard aphid, *Diaeretiella rapae*) for crop sown under late sown condition recommended by the university. (30th November 2025)

- **Incidence of mustard Aphid (*Lipaphis erysimi*):** The seasonal incidence of mustard aphid was recorded on mustard crop sown on 30th November 2025. The observation commenced from 1th Standard Meteorological Week (SMW) corresponding to date 7th January 2026 and continued till the 13th Standard Meteorological Week (SMW) corresponding to date 1st April 2026. The aphid population showed a progressive

increase, reaching its peak during the 6th SMW on 11th February 2026 and then gradual decline was evident.

An initial population of 0.8 aphids per 10 cm apical twig was noted during the 1st Standard Meteorological Week (SMW) on 7th January 2026. After that, during the 2nd, 3rd, and 4th SMWs, the aphid population progressively increased to 4.2, 16.8, and 41.2 aphids per 10 cm twig, respectively. From the 5th SMW onward, the population of aphids increased rapidly, reaching 69.8 aphids per 10 cm twig. During the 6th SMW (11th February 2026), the population peaked at 88.4 aphids per 10 cm apical twig.

Following the peak, the aphid population declined steadily to 51.8, 27.8, 14.6, 2.4, 1.2, 0.7 and 0.2 aphids per 10 cm twig during the 7th to 13th SMWs, respectively. The decline in aphid abundance coincided with increasing maximum temperature, decreasing relative humidity and advancement of crop maturity.

The results of Panda *et al*. (2000) [14] and Gauraha *et al*. (2002) [7], who observed peak aphid incidence during favourable winter conditions, were similar to the mustard aphid occurrence during the late-sown crop. The current finding of a negative correlation between the population of *L. erysimi* (Kalt.) and temperature confirms the findings of Dogra *et al*. (2001) [6], which suggest that aphid multiplication is favoured by lower temperatures.

- **Incidence of Lady Bird Beetle:** With a mean population of 0.2 beetles per plant, the predator ladybird beetle activity (adults + grubs) initially emerged during the 3rd SMW after being missing throughout the 1st and 2nd SMWs. The predator population peaked at 3.0 beetles per plant during the 6th SMW, which coincided with the highest aphid infestation.
- **Incidence of parasitiod of mustard aphid, *Diaeretiella rapae*:** The population of mummified aphids was observed from 2nd SMW to 11th SMW *rabi* 2025-26. The population of mummified aphids ranged from 1.2 to 3.6 parasitized aphid/ 10 cm apical shoot. Peak infestation of *D. rapae* was recorded in 6th SMW with 3.6 parasitized aphid/ 10 cm apical shoot, respectively.

Table 1: Seasonal incidence of mustard aphid and associated natural enemies on mustard during *Rabi* season 2025-26 (Last week of optimum sowing period recommended by the university – 30th October 2025).

Sr. No.	Date of Observation	SMW	Mean aphid population /10 cm twig	Lady Bird Beetle / plant (Adult+grub)	*D. rapae*/ 10 cm twig plant	Rainfall (mm)	No of Rainy Days	Temperature ^{0}C		Relative Humidity (%)		BSH (hrs)	Wind Speed (km/hr)	Evaporation (mm)
								Max.	Min.	Mor.	Eve.			
1	15-12-2025	50	1.8	0.0	0.0	0	0	29.5	10.9	47	36	5.8	1.4	1.9
2	22-12-2025	51	8.6	0.0	0.0	0	0	31.3	13.3	51	39	1.5	1.9	2.7
3	29-12-2025	52	23.4	0.0	0.0	0	0	30.7	10.1	54	36	5.2	2.5	2.6
4	05-01-2026	1	42.6	0.4	1.2	0	0	32.1	10.2	44	27	7.1	3.2	3.1
5	12-01-2026	2	66.2	1.2	2.3	0	0	30.4	11.1	46	30	7.6	3.5	2.7
6	19-01-2026	3	89.0	2.8	3.7	0	0	29.7	9.5	54	37	3.9	1.4	2.9
7	26-01-2026	4	130.0	3.2	4.4	0	0	31.7	4.1	54	23	5.5	2.1	3.1
8	02-02-2026	5	87.4	2.6	3.6	0	0	33.3	12.3	58	25	7.5	1.8	3.6
9	09-02-2026	6	55.4	2.0	2.4	0	0	32.1	10.5	90	61	8.1	2.4	3.2
10	16-02-2026	7	19.2	1.4	2.0	0	0	31.5	13.7	76	35	8.2	2.9	2.8
11	23-02-2026	8	7.4	0.8	1.2	0	0	34.9	14.3	68	34	8.6	3.1	3.0
12	02-03-2026	9	1.2	0.0	0.6	0	0	36.9	15.3	58	29	6.4	4.2	3.3
13	09-03-2026	10	0.6	0.0	0.2	0	0	37.3	15.7	50	28	7.1	2.4	3.5

SMW = Standard Meteorological Week, BSH = Bright Sunshine Hours, Min. = Minimum, Max.= Maximum

Table 2: Seasonal incidence of mustard aphid and associated natural enemies on mustard during *Rabi* season 2025-26 (late sown condition recommended by the university – 30th November 2025).

Sr. No.	Date of Observation	SMW	Mean aphid population / 10cm twig	Lady Bird Beetle/ plant (Adult+grub)	*D. rapae* / 10 cm twig	RF (mm)	No of Rainy Days	Temperature ^{0}C		Relative Humidity (%)		BSH (hrs)	Wind Speed (km/hr)	Evaporation (mm)
								Max.	Min.	Mor.	Eve.			
1	07-01-2026	1	0.8	0	0	0	0	33.2	10.6	45	29	7.1	1.7	3.1
2	14-01-2026	2	4.2	0	0.2	0	0	31.3	12.2	49	33	7.6	2.1	2.7
3	21-01-2026	3	16.8	0.2	1.2	0	0	30.4	10.2	55	36	3.9	2.3	2.9
4	28-02-2026	4	41.2	1.2	1.8	0	0	32.1	9.5	54	27	5.5	2.6	3.1
5	04-02-2026	5	69.8	2.2	2.4	0	0	33.9	12.7	61	36	7.5	2.9	3.6
6	11-02-2026	6	88.4	3.0	3.6	0	0	32.5	11.2	81	45	8.1	3.5	3.2
7	18-02-2026	7	51.8	2.1	2.2	0	0	31.5	13.8	78	37	8.2	4.6	2.8
8	25-02-2026	8	27.8	1.2	1.8	0	0.	35.4	14.6	65	34	8.6	2.4	3.0
9	04-03-2026	9	14.6	0.6	1.2	0	0	37.1	15.1	60	32	6.4	2.8	3.4
10	11-03-2026	10	2.4	0.2	0.8	0	0	37.9	16.2	52	30	7.1	2.6	3.9
11	18-03-2026	11	1.2	0.0	0.2	0	0	33.5	12.1	61	34	8.4	2.5	4.8
12	25-03-2026	12	0.7	0.0	0	0	0	32.4	11.6	66	36	9.8	3.0	5.5
13	01-04-2026	13	0.2	0.0	0	0	0	33.7	12.6	64	37	10.3	3.9	5.8

SMW = Standard Meteorological Week, BSH = Bright Sunshine Hours, Min. = Minimum, Max.= Maximum

Simple Linear Correlation of Weather Parameters with Mustard Aphid and Associated Natural Enemies on Mustard Crop Sown at Different Dates of Sowing Recommended by the University

3.2.1 Simple linear correlation of weather parameters with mustard aphid, predator, lady bird beetle and parasitoid, *Diaeretiella rapae* along with correlation of mustard aphid with predator, lady bird beetle and parasitoid, *Diaeretiella rapae* on mustard crop sown on last week of optimum sowing period recommended by the university (30th October 2025)

- **Correlation of weather Parameters with Mustard Aphid:** During the *Rabi* season 2025-2026, the correlation analysis between weather parameters revealed that (Table 3) mustard aphid population was negatively correlated with maximum temperature (r = −0.369) and strongly negatively correlated with minimum temperature (r = −0.793). The association with minimum temperature was statistically significant at the 5 per cent level, whereas that with maximum temperature was non-significant. Morning and evening relative humidity showed negligible to weak negative correlations (r = −0.013 and −0.173, respectively), while bright sunshine hours (r = −0.031) and wind speed (r = −0.301) also exhibited negative associations. In contrast, evaporation showed a positive correlation (r = 0.269). However, these relationships were non-significant at the 5 per cent level.

  The present findings are largely consistent with Gour and Pareek (2003) [8] observed negative associations of mustard aphid population with maximum and minimum temperature, while Hasan and Singh (2010) [10] reported negative relationships of *L. erysimi* with temperature, rainfall, wind speed and evaporation.
- **Correlation of weather Parameters with Predator, Lady Bird Beetle:** Correlation analysis showed that ladybird beetle population was negatively correlated with maximum temperature (r = −0.278) and minimum temperature (r = −0.605). Morning and evening relative humidity exhibited positive associations with beetle population, while bright sunshine hours showed a weak positive correlation (r = 0.111). Wind speed was negatively correlated (r = −0.351), whereas evaporation showed a positive correlation (r = 0.327) with ladybird beetle population.
- **Correlation of weather Parameters with Parasitoid, *Diaeretiella rapae* (Mummified aphid):** Correlation analysis revealed that *D. rapae* population was negatively associated with maximum temperature (r = −0.234) and minimum temperature (r = −0.593), with a stronger negative relationship with minimum temperature. Morning and evening relative humidity showed positive associations with parasitoid population, while bright sunshine hours also exhibited a weak positive correlation (r = 0.163). Wind speed was negatively correlated (r = −0.222), whereas evaporation showed a positive correlation (r = 0.370) with *D. rapae* population.
- **Correlation of Mustard Aphid with Predator, Lady Bird Beetle:** The mustard aphid population reached its maximum abundance of 130.0 aphids/10 cm twig during 4th SMW, coinciding with the highest ladybird beetle population of 3.2 beetles/plant. A strong positive and significant correlation was observed between mustard aphid and ladybird beetle populations (r = 0.906) at the 5 per cent level of significance, indicating that increased aphid availability favoured the incidence of predator ladybird beetles.
- **Correlation of Mustard Aphid with Parasitoid, *Diaeretiella rapae* (Mummified aphid):** Simple linear correlation of parasitoid *D. rapae* population increased with the rise in mustard aphid incidence, reaching a maximum of 4.4 Mummified aphids /10 cm twig during 4th SMW, when aphid population also peaked at 130.0 aphid's/10 cm twig. A strong positive and significant correlation was observed between *D. rapae* and mustard aphid populations (r = 0.926) at the 5 per cent level of significance, indicating that higher aphid availability favoured parasitoid incidence.

3.2.2 Simple linear correlation of weather parameters with mustard aphid, predator, lady bird beetle and parasitoid, *Diaeretiella rapae* along with correlation of mustard aphid with predator, lady bird beetle and parasitoid, *Diaeretiella rapae* on mustard crop sown on last week of optimum sowing period recommended by the university (30th November 2025)

- **Correlation of weather Parameters with Mustard Aphid:** The simple linear correlation among the population of mustard aphids and several climatic parameters under late sowing conditions was examined during the *Rabi* season 2025–2026 (Table 3). According to the correlation study, the population of mustard aphids and morning relative humidity were positively and statistically significantly correlated (r = 0.599) at the 5 percent significance level. The aphid population, on the other hand, did not significantly correlate with maximum temperature (r = -0.209), minimum temperature (r = -0.215), evening relative humidity (r = 0.503), rainfall (r = -0.126), number of rainy days (r = -0.126), or bright sunshine hours (r = -0.126). Evaporation (r = -0.478) indicated a negative and non-significant relation with the number of mustard aphids, while wind speed (r = 0.367) showed a positive and non-significant correlation.

  In agreement with the findings of Ansari *et al*. (2007) [4], Hasan *et al*. (2009) [9], Hasan and Singh (2010) [10], Nayak (2010) [13], and Pawar *et al*. (2010) [17], the current study found a negative correlation between the population of mustard aphids and both maximum and minimum temperatures. While Hasan *et al*. (2009) [9] indicated a positive effect, Pawar *et al*. (2010) [17] reported a negative connection with bright sunshine hours.
- **Correlation of weather Parameters with Predator, Lady Bird Beetle:** According to correlation analysis, the population of ladybird beetles was inversely correlated with both the maximum temperature (r = −0.114) and the minimum temperature (r = −0.068), suggesting that the incidence of beetles decreased as the temperature increased. On the other hand, there were positive associations between morning and evening relative humidity (r = 0.681 and 0.505, respectively). Beetle population was negatively connected with bright sunshine hours (r = -0.025) and evaporation (r = -0.467), whereas wind speed was positively correlated (r = 0.454).
- **Correlation of weather Parameters with Parasitoid, *Diaeretiella rapae* (Mummified aphid):** The population of *D. rapae* was shown to be adversely

correlated with maximum temperature (r = −0.072), minimum temperature (r = −0.085), rainfall, and rainy days (r = −0.023 for both), according to correlation analysis. On the other hand, there were positive associations between morning and evening relative humidity (r = 0.568 and 0.430, respectively). Wind speed indicated a positive correlation (r = 0.291), whereas bright sunshine hours revealed a negative association (r = −0.251). Morning relative humidity had the largest positive correlation with the *D. rapae* population, whereas evaporation had the strongest negative correlation (r = −0.597).

- **Correlation of Mustard Aphid with Predator, Lady Bird Beetle:** The population of mustard aphids increased rapidly from 0.8 aphid's/10 cm twig in the 1st SMW to 88.4 aphid's/10 cm twig in the 6th SMW, which also happened to be the largest number of lady bird beetles (3.0 beetles/plant). Increased aphid availability favoured the abundance of predatory lady bird beetles, as seen by the strong positive and significant connection (r = 0.981) between mustard aphid and lady bird beetle populations at the 5% level of significance.
- **Correlation of Mustard Aphid with Parasitoid, *Diaeretiella rapae* (Mummified aphid):** The parasitoid *D. rapae* population's abundance increased in along with the mustard aphid population, according to a simple linear association. It reached a maximum of 3.6 Mummified aphids /10 cm twig during the 6th SMW, when the aphid population similarly peaked at 88.4 aphid's/10 cm twig. mustard aphid populations showed a strong positive and significant connection (r = 0.959) at the 5% level of significance, suggesting that higher aphid availability favoured parasitoid incidence.

Table 3: Correlation of mustard aphid and natural enemies populations with biotic and abiotic factor during *Rabi* season 2025-2026 under different date of sowing.

Correlation Parameters	Weather parameters	Last week of optimum sowing period (30th October 2025)	Late sown condition (30th November 2025)
Aphid	Rainfall	0.093	-0.126
	Temperature (Max.)	-0.369	-0.209
	Temperature (Min.)	-0.793	-0.215
	Relative Humidity (Mor.)	-0.013*	0.599
	Relative Humidity (Eve.)	-0.173	0.503
	Bright sunshine Hours	-0.031	-0.126
	Evaporation	0.269	-0.478
	Lady bird beetle	0.906	0.981*
	Diaereteilla rapae	0.926	0.959
Lady bird beetle	Rainfall	0.083	-0.087
	Temperature (Max.)	-0.278	-0.114
	Temperature (Min.)	-0.605	-0.068
	Relative Humidity (Mor.)	0.306	0.681
	Relative Humidity (Eve.)	-0.001	0.505
	Bright sunshine Hours	0.110	-0.025
	Evaporation	0.327	-0.467
Diaereteilla rapae	Rainfall	0.131	-0.023
	Temperature (Max.)	-0.234	-0.072
	Temperature (Min.)	-0.593	-0.085
	Relative Humidity (Mor.)	0.218	0.568
	Relative Humidity (Eve.)	-0.120	0.430
	Bright sunshine Hours	0.162	-0.251
	Evaporation	0.370	-0.597

Note: *significant at 5% level;

4. Conclusion

In contrast to the crop seeded on November 30th, 2025, which reported a relatively lower peak of 88.4 aphid's/10 cm twig during the 6th SMW, the crop sown on October 30th, 2025, recorded the greatest aphid population, reaching 130.0 aphids/10 cm twig during the 4th SMW. Delaying sowing hence caused a shift in the peak incidence period and relatively decreased aphid abundance. A close density-dependent interaction between the pest and its natural enemies is shown by the fact that the populations of ladybird beetles and *Diaeretiella rapae* grew and peaked at the same time as the aphid population.

While other climatic indicators indicated non-significant correlations, the minimum temperature under October 30th cultivation revealed a large negative and significant correlation with aphid population. Aphid population was positively and significantly correlated with morning relative humidity under (November 30th) late-sown conditions, whereas the other weather parameters exhibited non-significant associations. Under both sowing dates, the aphid population showed a substantial and positive correlation with *D. rapae* and ladybird beetles, suggesting that the abundance of natural enemies rose as the aphid population increased. Overall, the study showed that the timing and intensity of mustard aphid incidence as well as the natural enemies that are linked to it, were influenced by the sowing date.

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