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SEASONAL INCIDENCE OF *MACROSIPHONIELLA SANBORNI* INFESTING CHRYSANTHEMUM

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ABSTRACT

The seasonal incidence of aphids on chrysanthemum was studied at PGI, M.P.K.V., Rahuri, during 2023–24 and 2024–25 to understand population dynamics in relation to abiotic factors. Aphid infestation appeared in the 38th SMW during 2023 and in the 34th SMW during 2024, persisting until crop maturity. Peak populations of 34.6 and 38.6 aphids per 3 cm twig were recorded during the 49th and 42nd SMW, respectively. Correlation analysis revealed a positive association with minimum temperature (r = 0.245) and a strong negative influence of wind speed (r =-0.713). Seasonal variation in aphid incidence highlights the role of climatic factors in population buildup, emphasizing their importance in aphid forecasting and management strategies in chrysanthemum.

***Key words*:** correlation, SMW, Population dynamic, chrysanthemum.

Introduction

Chrysanthemum morifolium, commonly known as chrysanthemum, mums, or shevanti, is one of the most commercially important ornamental and flowering plants belonging to the family Asteraceae. In India, chrysanthemum is cultivated over an area of about 35.35 thousand hectares, producing nearly 521.42 thousand metric tonnes annually, while Maharashtra contributes approximately 0.85 thousand hectares with a production of 4.54 thousand metric tonnes (Government of India, Ministry of Agriculture and Farmers Welfare, 2024). Chrysanthemum is a herbaceous plant characterized by shallow, fibrous root systems, lobed leaves and large, attractive flower heads that may occur singly or in clusters. Beyond its ornamental value, chrysanthemum has been used for centuries in traditional medicine to treat ailments such as hypertension, hyperthyroidism, respiratory disorders, inflammation, headaches, colds, bronchitis, and swellings (Khan and Ullah 2025). It also serves as a source of pyrethrum, a natural insecticide of considerable commercial importance.

Despite its significance in floriculture and cut flower production, chrysanthemum productivity and market value are adversely affected by insect pest infestations, particularly aphids, resulting in substantial economic losses to growers. Several insect pests, including leaf miners, aphids, caterpillars, whiteflies and thrips pose serious constraints to profitable chrysanthemum cultivation (Saicharan *et al.*, 2019). Among these, the chrysanthemum aphid, *Macrosiphoniella sanborni*, causes both direct damage through sap feeding and indirect damage by promoting sooty mould development (Agrios, 1988). Aphids primarily infest young shoots and leaves by extracting phloem sap, leading to weakened plant growth. The population dynamics of aphids are strongly influenced by abiotic factors such as temperature, humidity and rainfall, which affect their survival, development and reproductive potential (Ajij *et al.*, 2009). Temperature plays a critical role by regulating aphid reproduction and population buildup (Cammell and Knight, 1992).

Material and Methods

In order to study the experiment on seasonal incidence of aphids on selected healthy seedlings of "Poornima white" variety of chrysanthemum, the seedlings were transplanted at the mid-height of ridges in laid out field at the spacing of 45 cm × 60 cm. The crop was left for natural infestation of major insect pests. The observations were recorded as soon as the infestation was noticed. The population of aphids was recorded at weekly interval during morning hours on five randomly selected and tagged plants in each plot. The populations of aphids were counted on 3 cm twig of each plant and expressed as number of aphids per 3 cm twig. (Thakar *et al.*, 2023). The correlation was computed between the mean aphid population and weather parameters, *viz.*, maximum and minimum temperature, Morning and evening relative humidity, wind speed, rainfall, bright sunshine hours and wind velocity. The following formula was used for calculating correlation coefficient (Pearson, 1895).

$$r = \frac{N \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{N \Sigma x2 - (\Sigma x)2 . N \Sigma y2 - (\Sigma y)2}}$$

Where,

r = simple correlation coefficient

x = Independent variable *i.e.* abiotic components

y = Number of observations

N = Dependent variables *i.e.* pest

Results and Discussion

Aphid, *Macrosiphoniella sanborni* (*Kharif* 2023)

The seasonal incidence of aphids on chrysanthemum during *Kharif* 2023 is presented in Table 2 and illustrated in Fig. 1. Aphid infestation was first noticed during the 38th Standard Meteorological Week (SMW), coinciding with maximum and minimum temperatures of 27.2°C and 23.7°C, and morning and evening relative humidity of 81 and 65 per cent, respectively. The aphid population increased progressively with crop growth and remained active until the 3rd SMW. During the observation period, aphid density varied from 0.8 to 34.6 aphids per 3 cm twig per plant. The highest population (34.6 aphids per 3 cm twig per plant) was recorded during the 49th SMW under conditions of 29.0°C maximum and 19.4°C minimum temperature, along with 89 per cent morning and 50 per cent evening relative humidity. A gradual decline in aphid population was observed during the later stages of the crop, suggesting reduced favourability of prevailing weather conditions and crop maturity for aphid multiplication.

Table 1: Correlation of weather parameters and chrysanthemum aphids during *Kharif* 2023.

Sr. No.	Weather parameter	Correlation coefficient (r)
1	Maximum temperature	-0.156 NS
2	Minimum temperature	0.532*
3	Morning relative humidity	0.075 NS
4	Evening relative humidity	-0.456*
5	Wind speed (km/hr)	-0.573**
6	Rainfall (mm)	-0.025 NS
7	Sunshine (Hrs)	0.416*
8	Evaporation (mm)	0.189 NS

* 5% level of significance(r=575*); N.S.- Non-significant.
1% level of significance (r=0.537)

Correlation analysis (Table 1) indicated that wind speed exerted a highly significant negative influence on aphid incidence (r = -0.573**), reflecting its adverse effect on aphid establishment and population buildup. Maximum temperature showed a negative but non-significant association (r = -0.156), whereas minimum temperature exhibited a significant positive correlation (r = 0.532). Relative humidity had a marginal effect, with morning relative humidity showing a slight positive correlation (r = 0.075) and evening relative humidity a negative correlation (r = -0.456). Rainfall displayed a non-

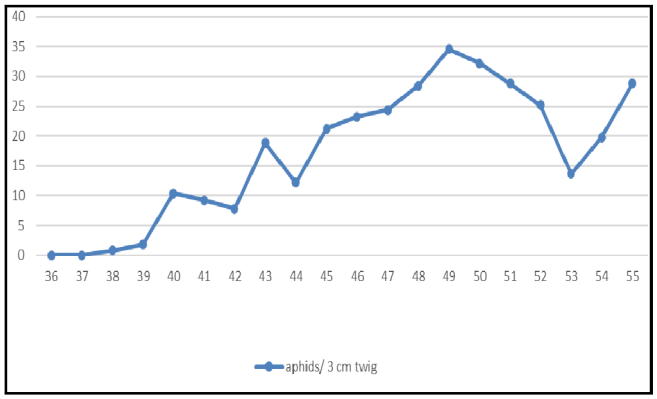

Fig. 1: Seasonal incidence of aphids (*M. sanborni*) on chrysanthemum during *Kharif* 2023.

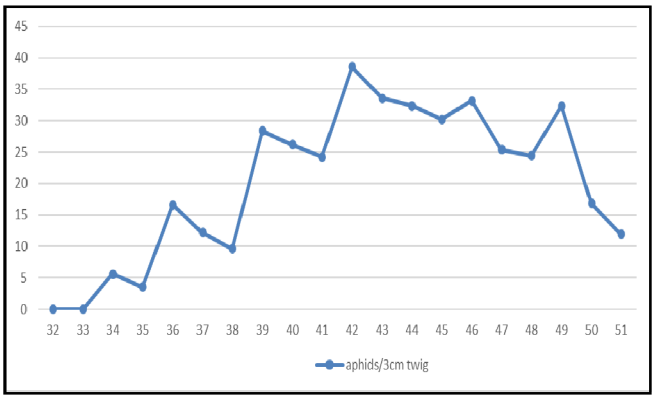

Fig. 2: Seasonal incidence of aphids (*M. sanborni*) on chrysanthemum during *Kharif* 20243.

Table 2: Seasonal incidence of major insect pests of chrysanthemum during *Kharif* 2023.

SMW	Aphids/3 cm twig	Temperature (°C)		RelativeHumidity (%)		Wind speed (km/hr)	Rainfall (mm)	Sunshine (Hrs)	Evaportation (mm)
		Max	Min	RH1	RH2				
36	0	34.2	24.9	80	49	3.1	0	8.9	7.4
37	0	27.2	24.9	75	57	3.1	0.6	0	3.8
38	0.8	27.2	23.7	81	65	4	0	0	4.2
39	1.8	28.4	22.4	98	80	2.1	40.8	1.8	1.4
40	10.4	30	23.7	93	52	0.4	0	4.5	5
41	9.2	33.6	23.9	85	38	0.7	0	9.1	6.4
42	7.8	35	23.4	76	35	1.1	0	8.6	7.8
43	18.8	32	22.9	74	34	0.8	0	4	5.2
44	12.2	32	19.4	60	28	0.6	0	9.7	5.8
45	21.2	32	17.9	78	36	1.9	0	7.5	5.6
46	23.2	33	18.1	79	33	1.6	0	8.3	6.2
47	24.4	30.6	18.9	80	37	0.3	0	7.4	5.8
48	28.4	30.2	20.9	84	46	1	49.2	6	5.6
49	34.6	29	19.4	89	50	1.6	0	4.9	5
50	32.2	28.8	17.1	88	45	0.8	0	8.9	5.6
51	28.8	27.4	16.3	78	45	1	0	8.3	5.6
52	25.2	30	14.4	75	39	0.6	0	9.5	6.2
01	13.6	29	8.3	40	43	0.9	0	8.4	5
02	19.8	26.2	7.7	61	47	0.9	0	3.5	4.6
03	28.8	29.2	10.9	87	34	1	0	8.6	5

significant negative correlation (r = -0.025), possibly due to mechanical removal of aphids. Sunshine hours were positively and significantly correlated with aphid population (r = 0.416), while evaporation showed a weak and non-significant relationship (r = 0.189), indicating a limited role in aphid population dynamics.

Aphids, Macrosiphoniella sanborni (Kharif 2024)

The seasonal incidence of aphids on chrysanthemum during *Kharif* 2024 is presented in Table 4 and illustrated in fig. 2. Aphid infestation was initially detected during the 34th Standard Meteorological Week (SMW) and persisted until the 51st SMW, indicating continuous presence throughout the vegetative and flowering phases of the crop. Weekly observations revealed that aphid density varied from 3.5 to 38.6 aphids per 3 cm twig per plant. Population levels were low during the early growth stages but increased gradually with crop development. The highest aphid population (38.6 aphids per 3 cm twig per plant) was recorded during the 42nd SMW, followed by a decline as the crop approached maturity. The initial occurrence of aphids coincided with maximum and minimum temperatures of 31.8°C and 21.5°C, along with morning and evening relative humidity of 95 and 67 per cent, respectively. Peak aphid activity was observed under moderate temperatures and relatively high humidity, suggesting favourable climatic conditions for aphid multiplication.

Weekly aphid population data collected from the first week of August (32nd MW) to the third week of December (51st MW) were correlated with abiotic factors (Table 4). Minimum temperature showed a significant positive relationship with aphid incidence (r =0.245), whereas maximum temperature exhibited a non-significant negative correlation (r=-0.180). Aphid populations were negatively associated with evening relative humidity (r = -0.148) and positively with morning relative humidity (r =0.006), though both relationships were statistically non-significant. Rainfall and evaporation also showed non-significant negative correlations (-0.150 and r = -0.014 respectively). In contrast, wind speed demonstrated a highly significant negative correlation (r

Table 3: Correlation of weather parameters and aphids of chrysanthemum during *Kharif* 2024.

Sr. No.	Weather parameter	Correlation coefficient (r)
1	Maximum temperature	-0.180^{NS}
2	Minimum temperature	0.245^{NS}
3	Morning relative humidity	0.006^{NS}
4	Evening relative humidity	-0.148^{NS}
5	Wind speed (km/hr)	-0.713**
6	Rainfall (mm)	-0.150^{NS}
7	Sunshine (Hrs)	0.203^{NS}
8	Evaporation (mm)	-0.014^{NS}

***** 5% level of significance(r=575*); N.S.- Non-significant.
******1% level of significance (r=0.537**)

Table 4: Seasonal incidence of major insect pests of chrysanthemum during *Kharif* 2024.

SMW	Aphids/3 cm twig	Temperature (°C)		RelativeHumidity (%)		Wind speed (km/hr)	Rainfall (mm)	Sunshine (Hrs)	Evaportation (mm)
		Max	Min	RH1	RH2				
32	0	30.8	23.9	80	57	3.0	0.0	3.8	5.8
33	0	31.4	21.3	85	49	2.8	1.0	6.8	6.2
34	5.6	31.8	21.5	95	67	1.8	83.0	2.5	3.4
35	3.5	27.2	23.3	83	63	2.6	0.0	0.0	4.2
36	16.6	27.0	22.7	90	65	1.7	4.0	0.0	4.2
37	12.2	31.2	22.5	78	59	2.6	0.0	7.9	6.0
38	9.6	29.8	20.1	71	52	2.8	0.0	9.5	5.8
39	28.4	32.6	22.7	90	64	2.2	52.4	2.5	3.6
40	26.2	32.2	21.1	84	48	1.8	0.0	8.4	6.4
41	24.2	32.6	22.3	78	60	1.5	0.0	8.8	6.6
42	38.6	30.8	22.3	87	58	1.0	0.0	8.1	6.0
43	33.60	29.4	21.1	85	61	1.1	6.4	0.4	4.8
44	32.4	32.0	17.1	78	43	1.2	0.0	9.8	5.2
45	30.2	31.0	17.1	78	41	0.7	0.0	9.1	5.2
46	33.2	29.8	13.3	81	38	1.0	0.0	6.4	4.4
47	25.4	30.8	11.9	78	33	1.2	0.0	8.9	5.0
48	24.4	28.0	9.3	78	30	0.8	0.0	8.1	3.8
49	32.4	29.4	12.7	78	62	1.6	0.0	4.9	4.4
50	16.8	27.2	9.9	67	43	1.0	0.0	9.7	4.8
51	11.9	28.0	7.5	75	26	0.9	0.0	9.2	3.8

= -0.713), indicating its strong suppressive effect on aphid population build-up.

The present findings are in agreement with earlier reports. Kunjam *et al*., (2023) reported a significant negative association of aphid population with maximum temperature and rainfall, along with a positive relationship with evaporation and a negative association with night-time relative humidity and rainfall. Rambharti (2009) observed a significant negative correlation between aphid incidence and maximum temperature as well as morning relative humidity, while also recording a highly significant positive correlation with favourable weather parameters. Similarly, Dhok *et al*., (2025) reported a positive influence of minimum temperature on aphid population buildup.

The results also corroborate the observations of Pathipati *et al*., (2020), who recorded significant positive correlations of aphid population with morning (0.08**) and evening (0.53*) relative humidity, and minimum temperature (0.66**), while maximum temperature (-0.24**) and rainfall (-0.55**) exhibited significant negative relationships with aphid incidence.

Conclusion

The study revealed distinct seasonal variation in the incidence of *Macrosiphoniella sanborni* on chrysanthemum during *Kharif* 2023 and 2024. Aphid infestation commenced during mid-season and persisted until crop maturity, with peak populations occurring under moderate temperature and relatively high humidity conditions. Minimum temperature consistently favoured aphid population build-up, whereas wind speed exerted a strong and significant suppressive effect across both seasons. Other abiotic factors such as relative humidity, rainfall and evaporation showed non-significant influence on aphid incidence. These findings emphasize the critical role of specific weather parameters, particularly minimum temperature and wind speed, in regulating aphid dynamics and can be effectively utilized for developing weather-based forecasting and integrated pest management strategies in chrysanthemum cultivation.

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