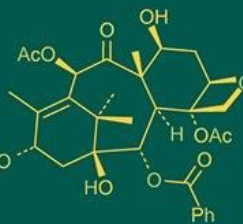
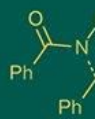
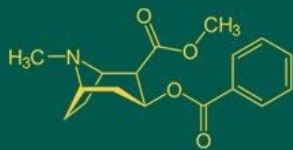


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Seasonal incidence of major insect pests of chrysanthemum

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Abstract

A field study conducted during the *Kharif* 2022-23 at experimental farm of Department of Entomology VNMKV, Parbhani, evaluated the influence of weather parameters on major insect pests of *Chrysanthemum indicum*. Aphid (*Macrosiphoniella sanbornii*) infestation began 15 days after transplanting, with a first recorded population of 14.5 aphids/3 leaves/plant in the 29th SMW. Thrips infestation appeared in July with population ranging from 3.8 to 12.4 thrips/3 leaves /plant. The highest population (12.4 thrips/3 leaves) was recorded during the 40th SMW, followed by a gradual decline. Whiteflies (*Bemisia tabaci*) were first noticed during 31st SMW and peaked in the 44th SMW. *Spodoptera* infestation was first observed in the second week of August (0.20 larvae/plant). The population increased steadily to reach a peak of 4.0 larvae/plant in the 44th SMW. Bud borer (*Helicoverpa armigera*) infestation started in the 4th week of August (34th SMW) with 0.2 larvae/plant, reaching its peak (0.80 larvae/plant) in the 45th SMW. Natural predators like lady bird beetles, green lace wings and predatory spiders were observed throughout the cropping season.

Keywords: Seasonal incidence, *Chrysanthemum*, sucking pests, aphids, jassid, whitefly, thrips, *Spodoptera litura*, *Helicoverpa armigera* correlation, natural enemies

Introduction

Chrysanthemum indicum (Shevanti), a member of the Asteraceae family, is a popular ornamental plant with over 2,500 years of cultivation history (Sreedhar *et al.*, 2020) [12]. Native to East Asia, it is valued for its aesthetic, medicinal, and commercial uses. Known as the "Autumn flower," it is used in decorations, traditional medicine, and as a natural insecticide due to pyrethrins in its flowers. In India, around 1,000 varieties are grown, with chrysanthemum ranking second to rose in global cut flower trade (Datta & Bhattacharjee, 2001; Govekar *et al.*, 2020) [4, 7]. Its long-lasting blooms are ideal for pot culture, garlands, and festive decorations (Thakur & Grewal, 2019) [14]. All parts of the plant have medicinal uses, and its roots help repel insects (Al-Snafi., 2018) [1].

Despite its benefits, chrysanthemum is highly susceptible to insect pests such as aphids (*Macrosiphoniella sanbornii*), thrips (*Frankliniella occidentalis*), whiteflies, spider mites, *Spodoptera litura* and bud borers (*Helicoverpa armigera*). These pests damage the plant at different growth stages, reducing both yield and quality. Aphids, in particular, reproduce rapidly and cause deformation and discoloration of leaves and flowers (Valizadeh *et al.*, 2013) [15]. Understanding the seasonal pest incidence and the role of weather factors is crucial for timely and effective pest management, helping ensure healthy crops and higher productivity.

Materials and Methods

A field experiment was conducted during the *Kharif* season of 2022-23 at the experimental farm of Department of Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the seasonal incidence of major insect pests of chrysanthemum. The soil was black cotton with good fertility and drainage. The local variety of *Chrysanthemum indicum* was transplanted on 29 June 2022 at a spacing of 40 × 60 cm. Seedlings were transplanted 25-30 days after sowing (DAS). The recommended fertilizer dose (125:120:25 kg/ha) was applied. Gap filling was completed within 8-10 days and weeding/intercultural operations were done every 15-20 days to maintain crop health.

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Parbhani's climate during Kharif is characterized by 800-900 mm annual rainfall, mainly from June to September, with hot, dry summers and cool winters. Meteorological data on weekly basis for Kharif seasons during the 2022-23 were obtained from meteorological observatory, VNMKV, Parbhani. The data pertaining to seasonal incidence of major pests were compared with various environmental factors.

Results and Discussion

Seasonal Occurrence of Sucking Insect Pests on *Chrysanthemum indicum*

The data pertaining to Seasonal incidence of sucking pests during Kharif 2022-23 are presented in Table 1.

Aphid (*Macrosiphoniella sanbornii*)

The data revealed that *Macrosiphoniella sanbornii* infestation began around 15 days after transplanting with 14.5 aphids/3 leaves recorded in the 29th SMW. Aphid population was ranged between 14.5 and 42.5 aphids/3 leaves. The population increase sharply from the 43rd SMW and reached its peak (42.5 aphids/3 leaves) during the 48th SMW (November) under dry weather with temperatures of 30.1 °C (max), 11.4 °C (min) and afternoon humidity at 32%. Infestation then declined gradually. Aphid population was ranged between 14.5 and 42.5 aphids/3 leaves. These results are aligned with Saicharan *et al.*, (2017) [10] who reported peak aphid incidence 150 days after the vegetative stage (45.17 aphids/plant). similarly, Bhujade *et al.*, (2019) [3] observed a similar peak during the 46th SMW.

Thrips (*Frankliniella occidentalis*)

The data pertaining to thrips population indicated that first incidence of thrips was observed during the month of July with population ranging from 3.8 to 12.4 thrips/3 leaves. The peak infestation (12.4 thrips/3 leaves) occurred during the 40th SMW, under favourable conditions of 11.0 mm rainfall, 31.8°C max temperature, 21.4 °C min temperature. After reaching its peak, the population steadily declined toward the end of the season. Similar results were obtained by Sarode *et al.*, (2020) [11] who recorded highest incidence of thrips in 41th SMW.

Whitefly (*Bemisia tabaci*)

Whitefly infestation was ranged from 0.8 to 3.5 whiteflies /3 leaves, first noticed during the 31st SMW (early August) with 1.4 whiteflies/3 leaves. The peak population of 3.5 whiteflies/3 leaves was recorded in the 44th SMW. The lowest count (0.6 whiteflies/3 leaves) occurred in the 36th SMW. These findings align with earlier studies by Geetha & Hegade (2018) [6] noted a peak whitefly incidence in the 43rd SMW, while Harde *et al.*, (2018) [8] reported similar peaks during October and the 45th SMW, respectively.

Seasonal Occurrence of foliage feeders on *Chrysanthemum indicum*

The data pertaining to seasonal incidence of foliage feeders during Kharif 2022-23 are presented in Table 1.

Leaf eating caterpillar (*Spodoptera litura*)

Results reveal that *Spodoptera* infestation began in the second week of August at 0.20 larvae/plant, gradually rising

and reached its peak during 44th SMW (4.0 larvae/plant). More or less similar findings are reported by Bangale *et al.*, (2019) [2] who reported *S. litura* population ranging from 0.81 to 5.0 larvae/plant on soybean, while Kalyan & Ameta (2017) [9] observed peak incidence in the 42nd SMW.

Bud borer (*Helicoverpa armigera*)

The data revealed that the incidence of *Spodoptera* larvae noticed during the second week of August with population range of 0.20 larvae/plant which gradually increased and reached its peak (4.0 larvae/plant) during 44th SMW. The results of present investigations are found similar with Bangale *et al.*, (2019) [2] who reported *S. litura* population ranging from 0.81 to 5.0 larvae/plant on soybean, while Kalyan & Ameta (2017) [9] observed peak incidence during 42nd SMW.

Seasonal incidence of natural enemies ladybird beetle (*Coccinella septempunctata*) spider (*Oxyopes satticus*) on *Chrysanthemum indicum* in Kharif 2022-23

The data revealed that first incidence (0.4 beetles/plant) of lady bird beetles noticed in the 31st SMW (early August) at reached its peak (2.4 beetles/plant) in the 40th SMW (early October). Similarly, predatory spiders emerged in the 30th SMW (late July) with the population of (0.2 spiders/plant) and reached its peak (1.8 spiders/plant) during 41st SMW (mid-October). These results of present investigations are more or less accordance with the findings of Suyal *et al.*, (2018) [13] and Gaikwad *et al.*, (2020) [5], who reported peak lady bird beetles and spider population found during the 40th SMW.

Relationship between weather parameters and population of sucking pests and foliage feeders of *Chrysanthemum indicum*

The data with respect of correlation analysis between pest populations on chrysanthemum and weather parameters (Table 2) revealed that bright sunshine hours showed a significant positive correlation with aphid population ($r = 0.442^*$) and whitefly ($r = 0.693^*$) population, while maximum temperature was significantly and positively correlated with thrips ($r = 0.579^*$) population. These findings indicate that increased sunshine and higher temperatures favor the buildup of these pests. The coefficient of determination (R^2) represents the proportion of common variation in the two variables. Overall, weather parameters contributed to 69.0%, 47.2% and 72.2% of the variation in aphid, thrips and whitefly populations, respectively.

Correlation analysis of borers with weather parameters showed that bright sunshine hours had a significant positive correlation with both leaf-eating caterpillar ($r = 0.708^*$) and bud borer ($r = 0.597^*$) populations on chrysanthemum. The coefficient of determination (R^2) represents the proportion of common variation in the two variables. Weather parameters explained 61.2% and 53.7% of the variation in leaf-eating caterpillar and bud borer population, respectively.

Table 1: Seasonal incidence of major insect pests population on *Chrysanthemum indicum* during Kharif 2022-2023.

Sr. No.	SMW	Duration	Aphids/3 leaves	Thrips/3 leaves	Whiteflies/3 leaves	<i>S. litura</i> larvae/plant	<i>H. armigera</i> larvae/plant
1	29	16 Jul-22 Jul	14.5	4.1	0	0	0
2	30	23 Jul-29 Jul	19.8	4.5	0	0	0
3	31	30 Jul-5 Aug	24.3	7.5	1.4	0	0
4	32	6-12 Aug	18.8	5.4	0.8	0.2	0
5	33	13-19 Aug	22.2	9.2	1.5	0.4	0
6	34	20-26 Aug	23.5	10.4	1.7	1.2	0.2
7	35	27 Aug-2 Sep	24.8	11.5	2.1	1.5	0.3
8	36	3-9 Sep	16.5	5.0	0.6	1.0	0
9	37	10-16 Sep	18.2	6.5	0.8	2	0.2
10	38	17-23 Sep	20.5	9.2	1.1	2.4	0.4
11	39	24-30 Sep	19.2	10.8	0.9	2.8	0.2
12	40	1-7 Oct	21.5	12.4	1.8	3.4	0.3
13	41	8-14 Oct	18.2	9.5	1.0	3.0	0.1
14	42	15-21 Oct	16.5	6.4	0.7	2.6	0
15	43	22-28 Oct	19.3	8.6	2.7	3.2	0.3
16	44	29 Oct-4 Nov	24.5	7.6	3.5	4.0	0.6
17	45	5-11 Nov	27.3	9.5	2.6	3.6	0.8
18	46	12-18 Nov	29.6	9.8	3.0	3.3	0.5
19	47	19-25 Nov	36.4	7.6	2.4	3.0	0.3
20	48	26-2 Dec	42.5	7.2	2.0	2.8	0.4
21	49	3-9 Dec	31.5	6.5	2.2	2.4	0.3
22	50	10-16 Dec	28.2	6.2	1.8	2.0	0.2
23	51	17-23 Dec	24.5	4.1	1.4	1.6	0.1
24	52	24-31 Dec	21.6	3.8	1.0	1.4	0.1

Table 2: Correlation of weather parameters with aphid, thrips, whitefly, leaf eating caterpillar, bud borer and natural enemies

Weather parameter	Correlation coefficient ('r' values)						Spider
	Aphid	Thrips	Whitefly	Leaf eating caterpillar	Bud borer	Lady bird beetle	
Rainfall (mm)	-0.584*	-0.316	-0.697*	-0.33	-0.557*	-0.124	-0.18
Maximum Temperature °C	-0.145	0.579*	0.184	0.206	0.224	0.45*	0.4
Minimum Temperature °C	-0.707*	0.125	-0.694*	-0.581*	-0.62*	0.021	-0.256
Morning Relative Humidity (%)	-0.465*	-0.207	-0.539*	-0.086	-0.247	0.066	0.092
Evening Relative Humidity (%)	-0.654*	-0.072	-0.802*	-0.591*	-0.614*	-0.135	-0.337
Bright sunshine (Hr)	0.442*	0.317	0.693*	0.708*	0.597*	0.362	0.57

*Significant at 5% level ** Significant at 1% level

Conclusion

The study highlights the persistent occurrence of aphids, thrips and whiteflies on *Chrysanthemum indicum* throughout the growing season with aphids consistently identified as the predominant sucking pest. Although the intensity of infestation varied with the seasons, each pest species responded distinctly to environmental changes. Thrips and whiteflies were more prevalent during the early to mid-season under warmer conditions, whereas aphid population surged during cooler, late-season periods. Weather conditions played a significant role in shaping these pest dynamics. The research also reveals a complex interplay between pest populations and their natural predators, influenced by host-specific interactions. These insights enhance our understanding of pest ecology in *Chrysanthemum indicum* cultivation to effectively minimize crop losses.

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