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INSECT PESTS AND ITS NATURAL ENEMIES OF MARIGOLD

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ABSTRACT

Sucking pests, including aphids and thrips, were observed from the last week of November to the second week of February. The peak populations of aphids and thrips were observed during the second week of January. Mite populations were noticed on the crop from the fourth week of November to the third week of February, with the peak population observed during the second week of January. The pod borer, *Helicoverpa armigera*, population was observed from the third week of December to the third week of February, with larval populations reaching their peak during the second week of February. The population of natural enemies in the marigold field was observed based on numbers from the last week of November to the third week of February 2023-24.

Key words : Aphid, *Helicoverpa armigera*, Insect pests, Marigold, mites, Natural enemies, Thrips.

Introduction

Marigold (*Tagetes erecta* L.) holds significant importance as a loose flower in Madhya Pradesh and across India. Originally from Central and South America, particularly Mexico, it was introduced to various parts of the world during the early 16th century. However, it has adapted so well to Indian conditions that it is now considered almost native to the region. In India, marigold cultivation covers a total area of 255 thousand hectares, with a production of 1754 thousand MT of loose flowers (Dixit *et al*., 2013). Marigold production ranks first among flower cultivations in Madhya Pradesh, with an area of 4007 hectares, a production of 29270 million tons and a productivity of 7.30 million tons per hectare in Chhattisgarh (Anonymous, 2020-21). Marigold is a key commercial flower crop grown in various regions of India. In the year 2003-04, the estimated area under marigold cultivation in India was 17600 hectares, with a production of 2 lakh metric tons. Marigold faces challenges from several insect pests such as aphids, mites, leaf miners, mealybugs, thrips and *Helicoverpa armigera* (Chivde *et al*., 2011). The genus *Neohydatothrips* John is the largest thrips genus in the order Thysanoptera, with 103 described species, all of which are phytophagous, feeding and breeding on leaves. The capitulum borer, *H. armigera*, is highly polyphagous, known to feed on about 181 host plants, including important crops like pulses, cotton, and vegetables (Manjunath *et al*., 1985). Nowadays, marigold is successfully used to control nematodes in vegetable crops such as brinjal, tomato, and chili.

Materials and Methods

The experiment was undertaken in Marigold cultivar African marigold (*Tagetes erecta* L.) was planted on November 2, 2023 to February 14, 2024 as winter crops, respectively at horticulture field, FAST, AKS University, Satna (M.P.) during winter-spring season of 2023-24. The crop was cultivated on ridges with a row-to-row distance of 50 cm and a plant-to-plant distance of 40 cm. Fertilizers and other agronomic practices were implemented in accordance with the recommended guidelines.

Method of recording observations

Thrips and aphid populations were assessed by

randomly selecting 10 plants and collecting them on white paper by tapping the flowers, stems or twigs with fingers, then counting the dislodged thrips. Mites were examined in flowers and tender parts of the plant, such as leaves, developing shoots, and fruits. Ten plants were randomly chosen and marked. Leaf samples measuring 1 cm in size were collected from the top, middle, and bottom of each plant and examined for mite presence using a microscope at weekly intervals. *H. armigera* larvae were randomly selected from 5 plants, and the total number of larvae on each leaf from the top, middle and bottom canopy, as well as the capitulum was recorded. The pest populations were counted, and the average number of insect pests was determined.

Results and Discussion

Aphid (*Myzus persicae*) infestation poses a significant threat to marigold plants, leading to substantial damage across various crops (Table 1 and Figs. 1-4). The presence of aphids was first observed on the crop in the fourth week of November 2023, persisting until the third week of February 2024. The aphid population exhibited a gradual increase, peaking at 24.12 aphids per 10 plants during the third week of January 2024, followed by a decline until the third week of February 2024. Shah *et al*. (2015) reported a similar trend, with aphid infestation beginning in the first week of November at 1.018 aphids per leaf and steadily rising to 1.930 aphids per leaf by the first week of December. This pattern aligns closely with findings of Varmora *et al*. (2009) on cabbage and Bhagat *et al*. (2018) on marigold.

The presence of thrips (*Neohydatothrips* sp.) was noted in the marigold crop from the last week of November 2023 to the third week of February 2024. Throughout the growth stages, the thrips population remained relatively low during the early and late stages but peaked during active vegetative growth. Initially, in the fourth week of November 2023, the observed populations were recorded at 4.33 thrips per 10 plants. Subsequently, the thrips population steadily increased, reaching its peak at 11.08 thrips per 10 plants during the third week of January 2024. From the fourth week of January onwards, the average population of thrips decreased, with the lowest population observed (6.25 thrips per 10 plants) at the end of the flowering stage in the third week of February 2024. Wahab *et al*. (2015) reported similar trends, documenting the highest average numbers during two survey periods from mid-April to late July and from early September to late December 2013, with the lowest numbers recorded for Thrips tabaci (4.6 and 5.9 individuals per plant, respectively).

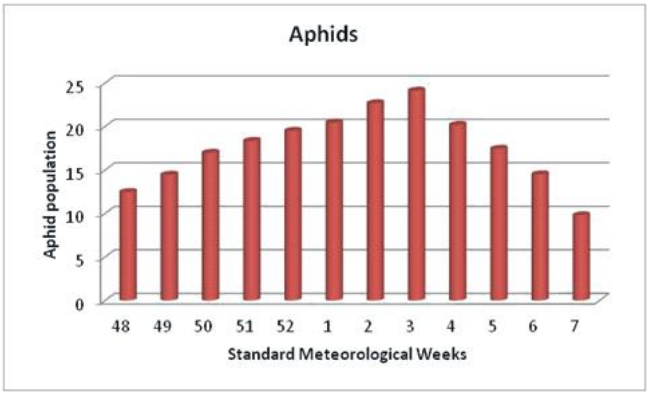

Fig. 1 : Mean population of aphid on marigold crop during 2023-24.

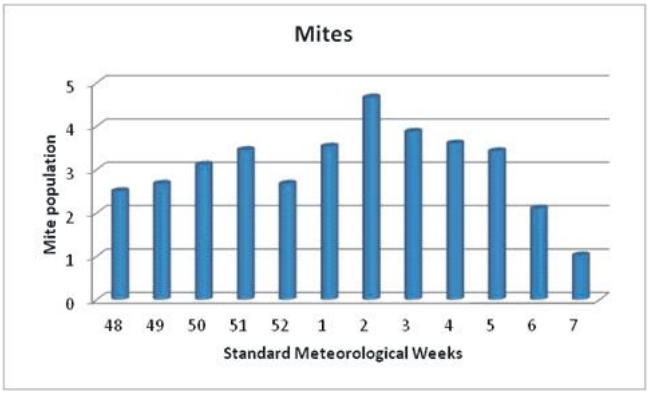

Fig. 2 : Mean population of mites on marigold crop during 2023-24.

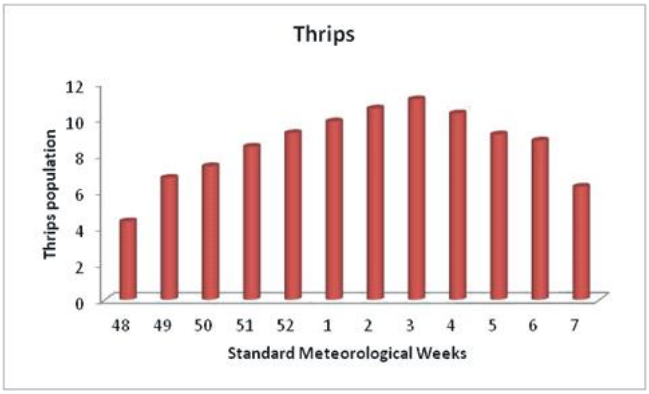

Fig. 3 : Mean population of thrips on marigold crop during 2023-24.

The presence of mites (*Tetranychus urticae*) was observed in the marigold crop from the last week of November 2023 to the third week of February 2024. Initially, in the fourth week of November 2023, the population was recorded at 2.50 mites per 10 plants. Subsequently, the mite population gradually increased, peaking at 4.66 mites per 10 plants during the second week of January 2024. From the third week of January onwards, the average mite population decreased, reaching its lowest point at 1.02 mites per 10 plants by the end of the flowering stage in the third week of February 2024.

Table 1 : Mean population of different insect pests on marigold during 2023-24.

Date of Observation	Standard Week No.	Aphid population	Mites population	Thrips population	*Helicoverpa armigera*
02/12/2023	48	12.47	2.50	4.33	0.00
09/12/2023	49	14.45	2.67	6.74	0.00
16/12/2023	50	16.98	3.11	7.38	0.33
23/12/2023	51	18.34	3.45	8.46	0.33
30/12/2023	52	19.50	2.67	9.21	1.66
06/01/2024	01	20.43	3.53	9.86	2.00
13/01/2024	02	22.67	4.66	10.57	2.66
20/01/2024	03	24.12	3.87	11.08	3.00
27/01/2024	04	20.19	3.60	10.30	4.66
03/02/2024	05	17.44	3.42	9.14	5.00
10/02/2024	06	14.50	2.10	8.80	6.87
17/02/2024	07	09.80	1.02	6.25	3.33

Table 2 : Mean population of different natural enemies recorded on marigold during 2023-24.

Date of Observation	Standard Week No.	*Canthoconidia* sp.	Syrphid fly	Lady bird beetle
02/12/2023	48	0.00	0.00	0.00
09/12/2023	49	0.00	0.00	0.00
16/12/2023	50	0.00	0.00	0.00
23/12/2023	51	0.00	0.00	0.02
30/12/2023	52	0.01	0.05	0.04
06/01/2024	01	0.03	0.00	0.07
13/01/2024	02	0.00	0.05	0.48
20/01/2024	03	1.04	0.28	0.05
27/01/2024	04	0.04	0.33	1.26
03/02/2024	05	0.57	0.02	0.80
10/02/2024	06	0.00	0.21	0.06
17/02/2024	07	0.08	0.00	0.04

Ahmed *et al*. (2015) reported similar findings, noting the maximum mite population (4.15 mites per leaf) during the third week of May and the minimum population (0.30 mites per leaf) during the first week of March. The minimum mite population was observed in the first week of March, which subsequently increased significantly in the following weeks, decreased during the fourth week of April, increased again up to the third week of May, and gradually decreased thereafter, reaching its lowest level by the last week of June.

The presence of *H. armigera* larvae was observed in the marigold crop from the second week of December 2023 to the third week of February 2024. The larvae remained active on the flowering stage of the crop throughout the season. Initially, in the second week of December 2023, the population of *H. armigera* larvae was recorded at 0.33 larvae per 5 plants. Subsequently, the larvae population gradually increased, reaching its peak during the second week of February 2024 at 6.87 larvae per 5 plants. Patel *et al*. (2015) reported similar findings, noting that during the first year (2013-14), the activity of *H. armigera* on chickpea crops began in the 46th standard week (second week of November) and increased gradually up to the 50th standard week (third week of December). The maximum larval population (2.24 larvae per 5 plants) was observed in the 49th and 50th standard week (first and second week of December), while it was at a minimum (0.08 larvae per 5 plants) in the 9th standard week (fourth week of February). Thus, the larval population ranged from 0.08 to 2.24 larvae per 5 plants throughout the entire period. Bhagat *et al*. (2018) also reported similar findings.

Natural enemies

Throughout the investigation, various natural enemies of marigold insect pests were recorded, including *Canthoconodia forcelata*, syrphid fly (*Syrphuscon fractor*) and ladybird beetle (*Coccinella sexmaculata*) as shown in Table 2 and Fig. 5. The population of these natural enemies in the marigold field was monitored from the last week of November to the third week of February 2023-24. The predatory bug (*C. forcelata*) population ranged from 0.01 to 1.04 bug per 10 plants during the last week of January 2024 to the third week of February 2024, with the highest population (1.04 bug per 10 plants) observed in the third week of January 2024. Similarly, the syrphid fly population varied from 0.05 to 0.33 fly per 10 plants from the last week of December 2023 to the third week of February 2024, peaking at 0.33 syrphid fly per 10 plants in the fourth week of January 2024. The ladybird beetle population ranged from 0.02 to 1.26 beetle

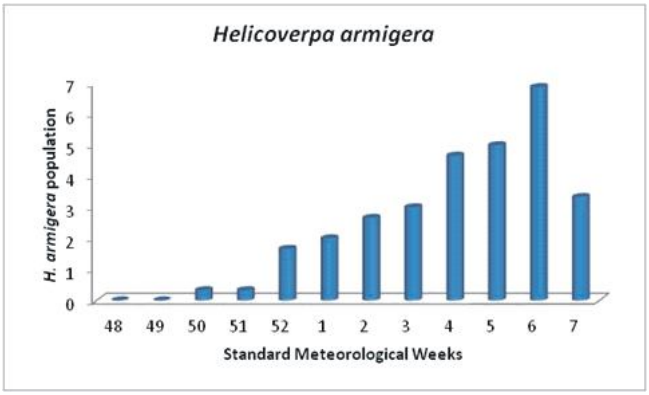

Fig. 4 : Mean population of *Helicoverpa armigera* on marigold crop during 2023-24.

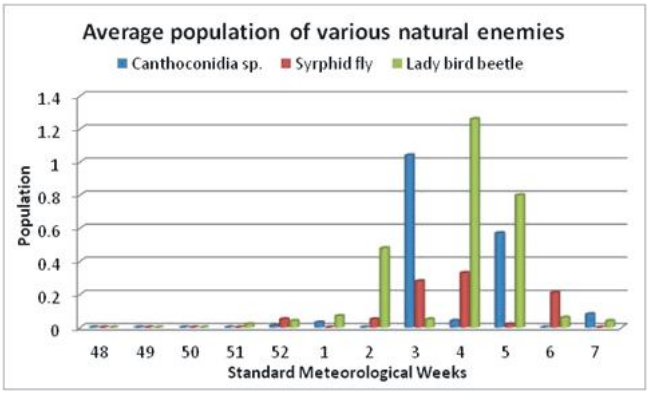

Fig. 5 : Mean population of different natural enemies recorded on marigold during 2023-24.

Fig. 6 : Marigold (*Tagetes erecta*) plants on experimental field.

per 10 plants, observed from the third week of December 2023 to the third week of February 2024, with the highest population (1.26 beetle per 10 plants) recorded in the last week of January 2024.

More or less similar result was obtained by Bhagat *et al.* (2018), who recorded the aphid population on Pusa Narangi variety of Marigold. These findings align with those of Dixit *et al.* (2013), who reported that the population of *coccinellid* beetles ranged from 1.60 to 15.30 per five plants. The *coccinellid* beetle population started from the first standard week, with an average of 1.60 beetles per five plants of cabbage, gradually increasing to a peak of 15.30 per five plants in the second

(A) (B) (C)

Fig. 7 : Insect pests on marigold plant, (A) Aphids (B) Mites (C) *H. armigera*.

week of February. These findings are consistent with those of Varshney *et al.* (2017), who observed the highest syrphid population (2.80 syrphids/plant) on PSB-1 during the ninth SW, while CCN-06-1 and Sheetal exhibited the highest syrphid population (1.60 and 1.53 syrphids/plant) in the tenth SW.

Conclusion

Several insect pests, including aphids (*Myzus persicae*), thrips (*Neohydatothrips* sp.), mites (*Tetranychus urticae*) and *Helicoverpa armigera* were observed causing damage to the marigold crop. The population of natural enemies on marigold, such as ladybird beetles, *Canthaconidia* sp. and Syrphid flies, was monitored from the last week of November to the second week of February 2023-24.

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