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## Annotation and seasonal incidence of insect pests on *Ajwain* (*Trachyspermum ammi* L.)

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### Abstract

*Ajwain* (*Trachyspermum ammi* L.) is an important seed spice crop, but information on its insect pest complex and seasonal pest activity under the agro-climatic conditions of Vidarbha is limited. A field survey was conducted at six locations during the crop season to document the insect fauna associated with *Ajwain* under local conditions. Seasonal incidence of insect pests and natural enemies was studied on *Ajwain* during the *rabi* season of 2025-26 at the Research Farm of the Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Weekly observations were recorded from crop establishment to maturity on randomly selected plants. The survey recorded a diverse arthropod fauna comprising 10 insect pest groups, six predator groups, three pollinator groups and two decomposer groups. Aphid, identified as *Myzus persicae*, was the most frequently occurring pest and was observed across the surveyed locations. Other pests included leaf hopper, tree hopper, plant bug, mealy bug, grasshopper, black field cricket, cotton seed bug, hairy caterpillar and semilooper. Pest incidence in the seasonal study commenced during the 48th meteorological week. Aphid population increased progressively from 0.2 aphids per 5 cm twig during the 48th meteorological week and attained a maximum of 18.3 aphids per 5 cm twig during the 9th meteorological week. Leaf hopper, plant hopper and plant bug attained their maximum populations during the 8th meteorological week, whereas mealy bug and defoliators remained at comparatively low levels. Natural enemies appeared soon after pest establishment and increased with pest abundance. Ladybird beetles, predatory spiders and syrphid flies attained maximum populations of 3.4, 2.5 and 1.9 individuals per plant, respectively. The study demonstrated that aphid was the predominant insect pest of *Ajwain* and that pest activity increased during the later crop period, accompanied by an increase in natural enemy abundance. These observations provide baseline information for monitoring and timely management of insect pests in *Ajwain* under *Vidarbha* conditions.

**Keywords:** Annotation, seasonal incidence of pests, *Ajwain*, *Trachyspermum ammi*

### Introduction

*Ajwain* is cultivated on a limited scale, while its cultivation has expanded in parts of the *Vidarbha* region. Like other seed spice crops, *Ajwain* is attacked by several insect pests. Aphids, leaf hoppers and seed bugs have been reported among the important sucking pests, while defoliators and other insects may also occur under field conditions. Previous studies have demonstrated variation in the insect pest complex of *Ajwain* according to genotype and agro-climatic conditions. Ranjeetha *et al.* (2020) <sup>[9]</sup>, for example, recorded aphid and other insect pests associated with *Ajwain* genotypes under the eastern dry zone of Karnataka. Information on the local insect pest complex is essential for determining the pest species requiring regular monitoring. Equally important is knowledge of seasonal population development because the timing of pest appearance and peak abundance determines the period during which management interventions are most likely to be effective. Studies conducted on related seed spice crops have shown that aphid populations generally increase during the later *rabi* period and that predator abundance may increase concurrently with pest abundance (Purti and Anuradha, 2017; Kanjiya *et al.*, 2018; Swami *et al.*, 2018; Dadhich and Pandey, 2022) <sup>[8, 2, 10, 1]</sup>. Despite the increasing importance of *Ajwain* in *Vidarbha* region, information on its insect pest assemblage and seasonal incidence under local conditions remains limited. Therefore, the present investigation was undertaken to annotate the insect pests associated with *Ajwain* and to study their seasonal incidence under local conditions.

## Materials and Methods

The investigations were conducted during the *rabi* season of 2025-26 at the Research Farm of the Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, (MS). *Ajwain* variety AA-01-19 was sown by line sowing method at 60 cm × 30 cm spacing. All the requisite agronomical practices were followed to ensure good crop growth.

For annotation of insect pests on *Ajwain* a field survey was conducted at six locations within the jurisdiction of Dr. PDKV, Akola. The survey locations included the Department of Entomology field, Integrated Farming Research System field, Agricultural Technology Information Centre field and farmer fields at *Seloo* (Distt. *Wardha*), *Vivara* and *Akot* (Distt. *Akola*). The observations were recorded at regular interval at these places from vegetative stage through crop maturity to know the infestation of insect pests on *Ajwain*. The insect specimens from each places were collected and identified using insect catalogues, identification keys and pictorial resources. The recorded arthropods were grouped according to their ecological status as pests, predators, pollinators or decomposers.

For seasonal incidence studies separate *Ajwain* plot was maintained under natural infestation at the Entomology field of Dr. PDKV, Akola. Observations were initiated at crop establishment and continued until harvest. Ten randomly selected and tagged plants were used for weekly observations. Pest and natural enemy populations were recorded at weekly intervals following the methodology adopted by Ranjeetha *et al.* (2020) [9]. Aphid population was recorded on the apical 5-cm twig and expressed as number per 5 cm twig. Leaf hopper, plant hopper, mealy bug and plant bug populations were recorded per plant, while hairy caterpillar and semilooper populations were recorded as larvae per plant. Ladybird beetles, predatory spiders and syrphid flies were recorded as number per plant.

Meteorological observations corresponding to the observation weeks were obtained for maximum and minimum temperature, bright sunshine hours, wind speed, morning and evening relative humidity, evaporation and rainfall. The seasonal trend was interpreted in relation to the observed pest and natural enemy populations.

The relationship between the seasonal population of insect pests and natural enemies and prevailing weather parameters was determined using Pearson's correlation coefficient (*r*). Weekly population observations corresponding to the meteorological weeks were paired with the respective weekly weather observations. The weather variables considered were maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, sunshine hours and evaporation. Correlation coefficients were calculated separately for each insect pest and natural enemy to determine the direction and strength of association with the individual weather parameters.

## Results and Discussion

The survey conducted at six locations revealed a diverse arthropod assemblage associated with the *Ajwain* ecosystem (Table 1). The recorded fauna comprised 20 groups/species, including 10 pest groups, six predator groups, three pollinator groups and two decomposer groups.

Among the pest complex, aphid (*Myzus persicae*) was the most consistently occurring insect and was recorded at

almost all surveyed locations. Other pest groups included mealy bug, leaf hopper, tree hopper, plant bug, grasshopper, black field cricket (*Teleogryllus commodus*), cotton seed bug, hairy caterpillar and semilooper. The occurrence of pest groups varied among locations, indicating variation in the arthropod assemblage within the local *Ajwain* ecosystem.

The predominance of aphid in the present investigation agrees with previous observations on *Ajwain* and other seed spices. Ranjeetha *et al.* (2020) [9] identified aphid as an important pest of *Ajwain* and recorded substantial variation in aphid infestation among *Ajwain* genotypes. Seed spice literature also identifies sucking pests, particularly aphids, as important pests of the crop group.

The beneficial arthropod community comprised ladybird beetles, big-eyed bugs (*Geocoris* spp.), syrphid flies, spiders, green lacewings (*Chrysoperla* spp.) and great black wasps. Honey bees and butterflies were recorded as flower visitors, while green bottle flies and chironomid midges were associated with decomposing material.

The observations on seasonal incidence (Table 2) revealed that no insect pest incidence was recorded until the 47<sup>th</sup> meteorological week (MW). Pest activity commenced during the 48<sup>th</sup> MW and increased progressively with crop development. Sucking pests were predominant during the observation period. However, aphid was the earliest and most prominent pest observed on *Ajwain*. It appeared during the 48<sup>th</sup> MW at 0.2 aphids per 5-cm twig and increased to 6.8 aphids per 5-cm twig by the 52<sup>nd</sup> MW. Thereafter, the population increased rapidly and reached a maximum of 18.3 aphids per 5-cm twig during the 9<sup>th</sup> MW.

Leaf hopper and plant hopper populations also increased progressively from the 48<sup>th</sup> meteorological week. Their maximum populations were 5.7 and 5.8 individuals per plant, respectively, during the 8<sup>th</sup> meteorological week. Plant bug attained a maximum population of 6.1 individuals per plant during the same week.

Mealy bug remained at a comparatively low level, appearing during the 50<sup>th</sup> meteorological week and fluctuating between 0.1 and 0.4 individuals per plant. Hairy caterpillar and semilooper also occurred at low densities, with maximum populations of 0.3 and 0.4 larvae per plant, respectively.

The weekly data show a clear shift from negligible pest abundance during early crop establishment to increasing pest pressure during January and February. Aphid abundance was particularly pronounced during the later crop period, whereas defoliators remained at low densities. This pattern indicates that the local *Ajwain* crop during the study season was more favourable for sucking pests than for foliage-feeding larvae.

Natural enemies appeared shortly after the establishment of pest populations and increased concurrently with pest abundance. Ladybird beetles were first recorded during the 49<sup>th</sup> meteorological week and reached a maximum of 3.4 individuals per plant during the 9<sup>th</sup> meteorological week. Predatory spiders appeared during the 50<sup>th</sup> meteorological week and reached a maximum of 2.5 individuals per plant during the 8<sup>th</sup> meteorological week. Syrphid flies were first observed during the 51<sup>st</sup> meteorological week and reached a maximum of 1.9 individuals per plant during the 9<sup>th</sup> meteorological week.

Similar increases in coccinellid and other predator populations during periods of higher aphid abundance have

been reported in coriander and fennel (Purti and Anuradha, 2017; Kanjiya *et al.*, 2018; Dadhich and Pandey, 2022) <sup>[8, 2, 1]</sup>

The correlation coefficient between the insect pests, natural enemies and different weather parameters were worked out (Table 3). The correlation analysis revealed that maximum temperature, minimum temperature and evaporation were positively and significantly associated with the populations of all the insect pests and natural enemies, whereas bright sunshine hours and evening relative humidity did not show significant associations with any of the organisms. Wind speed showed significant positive relationships with most of the populations, except leaf hopper and plant bug. Morning relative humidity also showed significant negative correlations with most of the populations, except semilooper. The present findings are in agreement with the earlier results of Kumar *et al.* (2016) <sup>[3]</sup>, Dadhich and Pandey (2022) <sup>[1]</sup>, Parveen and Samyuktha (2026) <sup>[7]</sup>, Kumar *et al.* (2023) <sup>[4]</sup>, Nayak *et al.* (2019) <sup>[6]</sup>, and Nabil and Hegab (2019) <sup>[5]</sup>, who demonstrated varying associations between weather parameters and insect pest populations under different agro-ecological conditions.

The present investigation demonstrated that *Ajwain* cultivated under local conditions supported a diverse arthropod community consisting of insect pests, predators, pollinators and decomposers. Ten pest groups were

recorded, with aphid (*Myzus persicae*) being the most widespread and predominant pest. Pest incidence commenced during the 48th meteorological week and increased progressively during crop development, with aphid attaining its maximum population during the 9<sup>th</sup> meteorological week. Leaf hopper, plant hopper and plant bug reached maximum abundance during the 8<sup>th</sup> meteorological week, whereas mealy bug, hairy caterpillar and semilooper remained at comparatively low densities. The abundance of ladybird beetles, predatory spiders and syrphid flies increased concurrently with pest populations. These findings provide useful baseline information for pest surveillance and indicate that the later crop period, particularly January-February, represents an important period for monitoring insect pest populations and associated natural enemies in *Ajwain* under *Vidarbha* conditions. Maximum and minimum temperature and evaporation showed significant positive associations with pest and natural-enemy populations, while morning relative humidity showed predominantly significant negative relationships. The study identified the later crop period, particularly January-February, as the period of greater pest activity, providing useful baseline information for seasonal monitoring and timely management of insect pests on *Ajwain* under *Vidarbha* conditions.

**Table 1:** Insect pest complex recorded on *Ajwain* under local conditions

| Sr. No. | Common name         | Scientific name              | Order       | Status              |
|---------|---------------------|------------------------------|-------------|---------------------|
| 1       | Aphid               | <i>Myzus persicae</i>        | Hemiptera   | Pest                |
| 2       | Mealy bug           | -                            | Hemiptera   | Pest                |
| 3       | Grasshopper         | -                            | Orthoptera  | Pest                |
| 4       | Tree hopper         | <i>Oxyrhachis tarandus</i>   | Hemiptera   | Pest                |
| 5       | Leaf hopper         | -                            | Hemiptera   | Pest                |
| 6       | Plant bug           | -                            | Hemiptera   | Pest                |
| 7       | Black field cricket | <i>Teleogryllus commodus</i> | Orthoptera  | Pest                |
| 8       | Cotton seed bug     | -                            | Hemiptera   | Pest                |
| 9       | Hairy caterpillar   | -                            | Lepidoptera | Pest                |
| 10      | Semilooper          | -                            | Lepidoptera | Pest                |
| 11      | Great black wasp    | -                            | Hymenoptera | Predator            |
| 12      | Big-eyed bug        | <i>Geocoris</i> spp.         | Hemiptera   | Predator            |
| 13      | ladybird beetle     | -                            | Coleoptera  | Predator            |
| 14      | Syrphid fly         | -                            | Diptera     | Predator/Pollinator |
| 15      | Spider              | -                            | Araneae     | Predator            |
| 16      | Green lacewing      | <i>Chrysoperla</i> spp.      | Neuroptera  | Predator            |
| 17      | Honey bee           | <i>Apis</i> spp.             | Hymenoptera | Pollinator          |
| 18      | Butterflies         | -                            | Lepidoptera | Pollinator          |
| 19      | Green bottle fly    | <i>Lucilia sericata</i>      | Diptera     | Decomposer          |
| 20      | Chironomid midge    | -                            | Diptera     | Decomposer          |

**Table 2:** Seasonal incidence of insect pests and natural enemies on *Ajwain* during rabi 2025-26

| Metrological Week No.            | Seasonal incidence of pests and natural enemies on <i>Ajwain</i> during 2025-26 |                        |                          |                           |                               |                        |                       |                              |                               |                         |
|----------------------------------|---------------------------------------------------------------------------------|------------------------|--------------------------|---------------------------|-------------------------------|------------------------|-----------------------|------------------------------|-------------------------------|-------------------------|
|                                  | Aphids (No./5 cm of twig)                                                       | Mealy bugs (No./plant) | Leaf hoppers (No./plant) | Plant hoppers (No./plant) | Hairy caterpillar (No./plant) | Semilooper (No./plant) | Plant bug (No./plant) | Ladybird beetles (No./plant) | Predatory spiders (No./plant) | Syrphid fly (No./plant) |
| 46 <sup>th</sup> (12Nov-18 Nov)  | 0                                                                               | 0                      | 0                        | 0                         | 0                             | 0                      | 0                     | 0                            | 0                             | 0                       |
| 47 <sup>th</sup> (19 Nov-25 Nov) | 0                                                                               | 0                      | 0                        | 0                         | 0                             | 0                      | 0                     | 0                            | 0                             | 0                       |
| 48 <sup>th</sup> (26 Nov-02 Dec) | 0.2                                                                             | 0                      | 0.1                      | 0.1                       | 0                             | 0                      | 0.1                   | 0                            | 0                             | 0                       |
| 49 <sup>th</sup> (03 Dec-09 Dec) | 0.8                                                                             | 0                      | 0.5                      | 0.3                       | 0.1                           | 0                      | 0.3                   | 0.1                          | 0                             | 0                       |
| 50 <sup>th</sup> (10 Dec-16 Dec) | 2.1                                                                             | 0.1                    | 1.0                      | 0.6                       | 0                             | 0.1                    | 0.7                   | 0.2                          | 0.1                           | 0                       |
| 51 <sup>th</sup> (17 Dec-23 Dec) | 4.0                                                                             | 0.2                    | 1.8                      | 1.1                       | 0.1                           | 0.1                    | 1.4                   | 0.3                          | 0.4                           | 0.1                     |
| 52 <sup>th</sup> (24 Dec-31 Dec) | 6.8                                                                             | 0.1                    | 2.5                      | 1.8                       | 0.2                           | 0.2                    | 2.5                   | 0.5                          | 0.7                           | 0.3                     |
| 1 <sup>st</sup> (01 Jan-07 Jan)  | 9.6                                                                             | 0.1                    | 3.0                      | 2.1                       | 0                             | 0.1                    | 3.6                   | 0.8                          | 1.3                           | 0.4                     |
| 2 <sup>nd</sup> (08 Jan-14 Jan)  | 11.6                                                                            | 0                      | 3.4                      | 2.4                       | 0.1                           | 0.2                    | 4.5                   | 1.5                          | 1.6                           | 0.6                     |
| 3 <sup>rd</sup> (15 Jan-21 Jan)  | 12.4                                                                            | 0                      | 4.0                      | 2.9                       | 0.1                           | 0.3                    | 4.8                   | 1.8                          | 1.7                           | 1.0                     |
| 4 <sup>th</sup> (22 Jan-28 Jan)  | 13.5                                                                            | 0.2                    | 4.6                      | 3.6                       | 0.2                           | 0.4                    | 5.0                   | 2.1                          | 1.9                           | 1.2                     |

|                                 |      |     |     |     |     |     |     |     |     |     |
|---------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 <sup>th</sup> (29 Jan-04 Feb) | 15.2 | 0.1 | 5.2 | 4.1 | 0.3 | 0.3 | 5.4 | 2.4 | 2.1 | 1.3 |
| 6 <sup>th</sup> (05 Feb-11 Feb) | 16.4 | 0.2 | 5.4 | 5.0 | 0.3 | 0.2 | 5.7 | 2.7 | 2.3 | 1.6 |
| 7 <sup>th</sup> (12 Feb-18 Feb) | 17.5 | 0.3 | 5.5 | 5.4 | 0.2 | 0.2 | 6.0 | 3.0 | 2.4 | 1.7 |
| 8 <sup>th</sup> (19 Feb-25 Feb) | 18.1 | 0.4 | 5.7 | 5.8 | 0.3 | 0.3 | 6.1 | 3.2 | 2.5 | 1.7 |
| 9 <sup>th</sup> (26 Feb-4 Mar)  | 18.3 | 0.2 | 5.4 | 5.3 | 0.2 | 0.1 | 5.8 | 3.4 | 2.2 | 1.9 |

**Table 3:** Correlation coefficients between insect pests & natural enemies on *Ajwain* and weather parameters

| Weather Parameter | Aphid population | Mealy bug | Leaf hopper | Plant hopper | Hairy caterpillar | Semilooper | Plant bug | Lady bird beetle | Predatory spider | Syrphid   |
|-------------------|------------------|-----------|-------------|--------------|-------------------|------------|-----------|------------------|------------------|-----------|
| Tmax              | 0.8040**         | 0.8384**  | 0.8011**    | 0.8818**     | 0.7235**          | 0.5278*    | 0.7702**  | 0.8629**         | 0.8131**         | 0.8640**  |
| Tmin              | 0.8736**         | 0.6438**  | 0.8498**    | 0.8925**     | 0.6987**          | 0.6163*    | 0.8556**  | 0.9097**         | 0.8863**         | 0.9171**  |
| BSH               | -0.3304          | -0.1435   | -0.3471     | -0.2817      | -0.2328           | -0.4819    | -0.3496   | -0.3032          | -0.3552          | -0.3154   |
| WS                | 0.5044*          | 0.5145*   | 0.4940      | 0.5381*      | 0.5631*           | 0.5048*    | 0.4827    | 0.5763*          | 0.5054*          | 0.5461*   |
| RH-I              | -0.7862**        | -0.6168*  | -0.7424**   | -0.8088**    | -0.5513*          | -0.3544    | -0.7417** | -0.8652**        | -0.7617**        | -0.8427** |
| RH-II             | -0.3256          | -0.4867   | -0.3183     | -0.4012      | -0.3860           | -0.0025    | -0.2668   | -0.4192          | -0.2750          | -0.4003   |
| Evaporation       | 0.8772**         | 0.7725**  | 0.8515**    | 0.9075**     | 0.7257**          | 0.5491*    | 0.8443**  | 0.9176**         | 0.8591**         | 0.8897**  |
| Rainfall          | NA               | NA        | NA          | NA           | NA                | NA         | NA        | NA               | Na               | NA        |

**Note:** \*\* = significant at 1% ( $|r| \geq 0.623$ ); \* = significant at 5% ( $0.497 \leq |r| < 0.623$ ); NS = non-significant; RH = relative humidity

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