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# Insect pest spectrum on ajwain, *Trachyspermum ammi* L. genotypes under eastern dry zone of Karnataka

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**Abstract**
An experiment was conducted with fourteen ajwain genotypes at the Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, GKVK, Bengaluru, from October 2019 to April 2020 to document insect pest spectrum infesting ajwain. Out of the four insect pests recorded to invade ajwain, three are new pest records on ajwain except aphids. Only the aphid could differentiate the ajwain genotypes and rest three failed to do so due low pest pressure. Irrespective of genotypes, the mean pest population was 2.23 defoliators per plant (*Thysanoplusia orichalcea* and *Archips* sp. together), 4.98 per cent stem fly infestation which caused 1.73 per cent plant mortality per 3.8 $m^2$ plot and 61.85 aphids per 5 cm apical shoot. Aphid population was significantly least on genotype, Lam Sel-1 (43.37) and AA-2 (51.43) and was maximum on DAC-8 (71.90) which indicates scope for exploring the variability for aphid in crop improvement programme.

**Keywords:** Ajwain, *Thysanoplusia orichalcea*, *Archips* sp., stem fly, aphid, Bengaluru

## Introduction
Ajwain (*Trachyspermum ammi* L., 2n=18) is one of the important seed spices also known as Carom seed or Carom Ajowan or Bishop's weed, belonging to the family Apiaceae. It is indigenous to Egypt and distributed in many parts of the world namely, India, Iran, Afghanistan, *etc*. In India, it occupies an area of 34,500 ha with the production of 27,940 tonnes and it is mainly cultivated in Rajasthan (15,430 ha area and 10,540 tonnes production), Gujarat (5,320 ha and 5,050 tonnes), Telangana, Madhya Pradesh, Andhra Pradesh, Uttar Pradesh, Uttaranchal, Haryana, Punjab, Maharashtra and to a small extent in Karnataka [1]. Apart from flavoring, ajwain seeds are used for the treatment of diarrhea, dysentery, atonic dyspepsia, cholera, colic skin diseases, hysteria, flatulence, indigestion, abdominal pains, piles, bronchial problems, asthma, lack of appetite, abdominal tumors, galactagogue, amenorrhea and it possesses various pharmacological activities like anti-fungal, anti-oxidant, antimicrobial, cytotoxic, hypolipidemic, anti-hypertensive, anti-spasmodic, broncho-dilating actions, anti-lithiasis, diuretic, abortifacient, anti-tussive, nematicidal, anthelmintic, anti-filarial, antiplatelet-aggregatory and hepatoprotective activity [2]. The steam distillation of ajwain seeds yields essential oil of about 2.5 to 4.0 per cent and the most important active constituents in ajwain are thymol (30-60 %) and carvacrol. Ajwain has found to be infested with insect pests such as aphids (*Myzus persicae* Sulzer), jassids (*Empoasla* sp.) and seed bug (*Nysus* sp.), diseases such as root rot (*Rhizoctonia solani* Kallur) and powdery mildew (*Erysiphe polylgoni* DC) [3]. As the crop is gaining importance in the southern states, an effort was made to evaluate the available ajwain genotypes during the post rainy/winter season under eastern dry zone of Karnataka. In this study, focus was to identify the insect pest spectrum associated with ajwain to enable evolving suitable mitigating measures when the crop takes a larger area in due course of time.

## Materials and Methods
A field experiment was conducted at the Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture (CoH), UHS campus, GKVK, Bengaluru, Karnataka, India during October 2019 to April 2020. Experimental site is located at an elevation of 930 meters above MSL with 12°58' North latitude and 77°35' East longitude which comes under

Eastern Dry Zone of Karnataka. Fourteen ajwain genotypes obtained from different institutes were evaluated in randomised complete block design with three replications. The seed were sown in plots of size 2.7 m x 1.4 m (3.8 $m^2$) with a spacing of 45 cm x 20 cm accommodating 42 plants. Incidence of different insect pests on ajwain genotypes with time was recorded as and when they appeared as detailed below. Insect pests invading ajwain at College of Horticulture, UHS Campus, GKVK, Bengaluru were collected and reared to adult and were submitted to the Insect Biosystematics Laboratory, Department of Entomology, University of Agricultural Sciences, GKVK, Bengaluru for identification. Randomly ten plants were selected in each plot and the number of leaf rollers and semi loopers per plant were collectively counted between 71-88 Days after sowing (DAS) under the defoliator category. Around 100 days, the infestation of stem flies was evident and ten random plants were selected in a zigzag manner and tagged from which the stem fly infestation was recorded by observing drying and exit hole on the stem on 104 DAS and expressed as per cent infestation per 3.8 $m^2$ plot. Fifteen days later, the same tagged plants were observed again for mortality. A week later, the aphid infestation was measured from ten random plants by counting them on 5 cm apical shoot from five shoots in a plant. The data recorded were transformed either to square root or arc-sin as needed and analysed following RCBD design using statistical tool, WASP 2.0® (Jangam and Wadekar, 2019) [4]. Means were segregated using critical difference (CD) values at p=0.05 level of significance (Panse and Sukhatme, 1957) [5].

## Results

Out of the four insect species recorded invading ajwain at College of Horticulture, Bengaluru the identity of one of the defoliators was established as *Thysanoplusia orichalcea* (Fabricius) (semi looper) (Lepidoptera: Noctuidae). The other defoliator which was webbing the leaves and inflorescence was identified to generic level only as leaf roller, *Archips* sp. (Lepidoptera: Tortricidae). Identities of stem fly (Diptera) and aphid (Hemiptera: Aphididae) could not be established for time being and efforts are on for the same.

Semi looper, completely devoured the leaves it traversed while, the webber larvae webbed leaves and inflorescence causing yellowing followed by drying of the damaged shoots or branches. The stem fly maggots bore into the stem and fed inside resulting in yellowing, drying, withering and drooping of leaves ultimately leading to death of the entire plant in a week or two. Aphids colonised the apical shoots and due the heavy feeding there was withering and slight yellowing besides copious honey dew and sooty mould development on the lower foliage and stem. Irrespective of the ajwain genotypes evaluated at CoH, Bengaluru during 2019-20, the mean pest population was 2.23 defoliators per plant (*Thysanoplusia orichalcea* and *Archips* sp. together), 4.98 per cent stem fly infestation resulting in 1.73 per cent plant mortality per 3.8 $m^2$ plot (Table 1) and the aphid population was 61.85 aphids per 5 cm apical shoot. There was no significant differences observed in infestation of defoliators, stem fly and plant mortality due to stem fly (Table 1) among the ajwain genotypes. Both the defoliators put together ranged from a minimum of 1.87 to 2.67 per plant failed to differentiate the genotypic differences in ajwain at CoH, Bengaluru during 2019-20. The stem fly infestation ranged from 3.00 to 6.66 per cent per 3.8 $m^2$ plot resulting in plant mortality of 1.33 to 2.33 per cent per 3.8 $m^2$ plot also failed to differentiate the genotypic differences among the ajwain genotypes. Aphid population was minimum on the genotype, Lam Sel-1 (43.37 Aphid/ 5 cm apical shoot) followed by AA-2 (51.43 Aphid/ 5 cm apical shoot) and was maximum on seven genotypes *viz.*, DAC-8 (71.90), DAC-7 (71.47), DAC-6 (67.00), GA-1 (66.17), DAC-2 (65.57), DAC-3 (64.63) and DAC-4 (63.83) which were on par with each other.

**Table 1:** Insect pest infestation on ajwain genotypes at CoH, Bengaluru during 2019-20

| Genotypes | No. of defoliators/ plant (71 DAS) | Stem fly (%)/3.8 $m^2$plot | | No. of Aphids/ 5 cm apical shoot (123 DAS) |
|---|---|---|---|---|
| | | Incidence (104 DAS) | Plant Mortality (118 DAS) | |
| DAC-1 | 2.27 (1.49) | 5.33 (13.17) | 1.67 (7.33) | 56.00 (7.48) |
| DAC-2 | 2.00 (1.40) | 6.00 (14.14) | 2.00 (7.95) | 65.57 (8.10) |
| DAC-3 | 1.87 (1.36) | 5.00 (12.50) | 2.00 (7.95) | 64.63 (8.03) |
| DAC-4 | 2.20 (1.47) | 4.33 (11.90) | 1.33 (6.53) | 63.83 (7.98) |
| DAC-5 | 2.40 (1.53) | 4.67 (12.42) | 1.33 (6.53) | 57.43 (7.55) |
| DAC-6 | 2.20 (1.47) | 6.00 (13.91) | 2.33 (8.75) | 67.00 (8.17) |
| DAC-7 | 2.67 (1.60) | 3.00 (9.55) | 1.33 (6.53) | 71.47 (8.44) |
| DAC-8 | 2.07 (1.43) | 5.67 (13.76) | 1.67 (7.33) | 71.90 8.47) |
| AA-1 | 2.60 (1.60) | 6.67 (14.72) | 2.33 (8.75) | 58.53 (7.63) |
| AA-2 | 2.20 (1.48) | 5.67 (13.69) | 1.67 (7.33) | 51.43 (7.16) |
| AA-93 | 2.27[a] (1.50) | 3.67 (11.01) | 1.33 (6.53) | 62.50 (7.88) |
| GA-1 | 2.20 (1.48) | 6.00 (14.10) | 2.00 (7.95) | 66.17 (8.09) |
| Lam Sel-1 | 2.27 (1.50) | 4.67 (12.35) | 2.00 (8.13) | 43.37 (6.58) |
| Lam ajwain-2 | 2.13 (1.46) | 3.00 (9.60) | 1.33 (6.53) | 62.33 (7.89) |
| Mean | 2.23 (1.48) | 4.98 (12.62) | 1.73 (7.43) | 61.58 (7.81) |
| S.Em ± | (0.10) | (1.36) | (0.81) | (0.32) |
| CD p=0.05 | NS | NS | NS | (0.95) |
| CV% | 11.35 | 18.71 | 18.93 | 7.27 |

*Figures in the parentheses are $\sqrt{x} + 0.5$.
**arc sin (angular) transformed values.

## Discussion

In general, ajwain is generally not or less affected by insect pests and diseases. However, sporadic incidences of crop damage by aphids, jassids, seed bug and midge are available which lack details [3, 6]. Similarly, aphids, mites, tobacco caterpillar and gram caterpillar have been listed as pests of ajwain in Andhra Pradesh for which general recommendations have been prescribed [7]. Aphids have been

considered as one of the major production constraints for ajwain production in most part of major ajwain producing states of India. In Dungla tehsil of Chittorgarh district, Rajasthan, 67- 70 per cent farmers expressed difficulty in aphid management as one of the major constraints in ajwain production technology adoption, where around 20 to 37 per cent farmers were aware of aphid management, which involves two systemic chemical or botanical insecticidal sprays [8, 9, 10]. Aphid, *Hydaphis coriandri* (Das, 1918) has been recorded on ajwain besides few more members of apiaceae throughout India since over a century [11, 12]. Except these, the record of other insect and mite pests is obscure.

Record of the ploy phagous semi looper, *Thysanoplusia orichalcea* (Fabricius); the tortrix moth, *Archips* sp. and stem fly forms the first record on ajwain, *Trachyspermum ammi* L. The non-significant differences among the fourteen ajwain genotypes evaluated at CoH, Bengaluru during 2019-20 especially for the defoliators and stem fly is mainly due to low pest pressure witnessed during the study. In a similar study conducted during same period at University of Horticultural Sciences, Bagalkot, Karnataka, India at Udyanagiri campus the stem fly invading ajwain was identified as *Melanagromyza* sp. It caused infestation ranging from 20.91 to 45.40 per cent among 16 genotypes evaluated [13]. A greater diversity of aphids has been reported to invade plants of family Apiaceae to which ajwain belongs. Significant variability reported in aphid infestation on coriander genotypes [14, 15] lends support to present findings that there is a greater variability among ajwain genotypes for aphid infestation and can be explored further for crop improvement if the ajwain acreage and pest pressure increases especially in the southern states of India. Documentation of genotypic differences for aphid infestation on ajwain forms a new study.

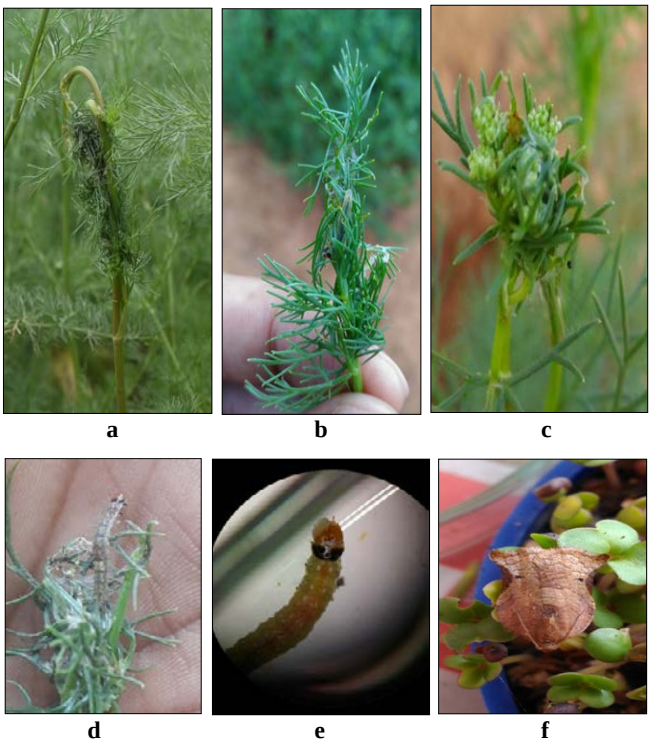


**Plate 1:** Leaf webber, *Archips* sp. and its damage observed on ajwain at College of Horticulture, UHS Campus, GKVK, Bengaluru during 2019-20 a & b: Webbed leaves; c: Webbed inflorescence; d & e. Larvae; f: adult


**Plate 2:** Semi looper, *Thysanoplusia orichalcea* (Fab.) recorded on ajwain at College of Horticulture, UHS Campus, GKVK, Bengaluru during 2019-20 a & b: Webbed leaves; c: adult


**Plate 3:** Stem fly damage and plant death in ajwain at College of Horticulture, UHS Campus, GKVK, Bengaluru during 2019-20 a: exit hole on the stem; b: stem tunnelling; c: plant death due to stem fly infestation

**Plate 4:** Aphid infestation oin ajwain at College of Horticulture, UHS Campus, GKVK, Bengaluru during 2019-20

## Conclusion

Under Eastern dry zone of Karnataka at College of Horticulture, Bengaluru semi looper, *Thysanoplusia orichalcea* (Fabricius); leaf webber, *Archips* sp.; an unidentified dipteran stem fly and an unidentified aphid were recorded on ajwain of which the former three are the first records besides the genotypic reaction to aphid. The low pest pressure of defoliators and stem fly failed to differentiate among the ajwain genotypes. Two genotypes *viz.*, Lam Sel-1 (43.37 Aphid/ 5 cm apical shoot) followed by AA-2 (51.43 Aphid/ 5 cm apical shoot) recorded significantly least aphid density among the 14 ajwain genotypes evaluated during 2019-20.

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