

Short Communication

Biology and seasonal incidence of Dipteran and Hymenopteran flower feeders in chilli

D Anitha Kumari¹, G Anitha² and V Anitha^{3*}

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Chilli is an important commercial crop grown in Telangana and Andhra Pradesh. The crop is attacked by a number of insect pests at different stages of its growth (Halder *et al.*, 2015). Among different pests attacking the flowers, blossom midge *Asphondylia capsici* Barnes (Diptera: Cecidomyiidae) is a serious pest in Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Madhya Pradesh. Damage due to midge is estimated to be 10-40% in Karnataka, Tamil Nadu, Andhra Pradesh, Odisha and Chhattisgarh. According to Nagaraju *et al.*, (2002) and Tewari *et al.*, (1987) the infestation due to gall insects on capsicum flowers ranged from 10-56 per cent depending on the variety or hybrid, stage of the crop, location and management practices, whereas on egg plant it ranged between 2-44 per cent.

In recent years, there is an increased infestation of gall midge in many parts of South and Central India especially on hot peppers. Gall infested flowers either drop off or develop into malformed fruits and sometimes pollen germination is affected (Kumar *et al.*, 2000; Nagaraju *et al.*, 2002). Infested flowers lose their shape, become discolored, have an abnormal look and become hard. Further, infested fruits will have less number of seeds with reduced seed germination, 34-53% reduction in fruit size, 52-88% reduction in seed number and 60-88% reduction seed weight/fruit (Nagaraju *et al.*, 2002). Maryanna *et al.*, (2006) observed flower buds or very young pods of chilli to be transformed into galls and opined that when young pods were attacked, they did

not grow normally and remained smaller than normal pods. According to Kumar *et al.*, (2010) the gall formers infesting egg plant and bell pepper belong to Diptera and Hymenoptera. Galls induced by these insects were morphologically similar and can be distinguished only after dissection of infested flowers.

A field experiment was laid out at Vegetable Research Station, Rajendranagar in an area of 500 sqm. The crop (variety LCA 334) was grown using the recommended package of practices without any insecticidal sprays. Fifty chilli flowers were collected daily from the field and were placed individually in glass vials containing water soaked cotton swab to prevent desiccation of samples. The open end of the vial was covered using muslin cloth held in place by a rubber band. They were observed daily for emergence of the adult stages. Some flowers were carefully dissected to observe various life stages of the feeders. The number of gall midges and hymenopterans emerging from each flower were recorded daily. A culture of each of the pests was maintained to study their biology. Some emerged insects were collected and preserved in 70% ethyl alcohol and labeled for identification. They were sent for identification to NBAIR, Bangalore. Per cent incidence of each of the pest was calculated using the formula mentioned below.

Per cent incidence = $\frac{\text{Malformed flowers}}{\text{Total flowers}} \times 100$

¹Vegetable Research Station, Sri Konda Laxman Telangana State Horticulture University, Rajendranagar, Hyderabad, Telangana

²All India Coordinated Research Project on Biological Control of Crop Pests, Professor Jayashankar Telangana State Horticultural University, Rajendranagar, Hyderabad, Telangana

³Professor Jai Shankar Telangana State Horticultural University, Rajendranagar, Hyderabad, Telangana

*E-mail: anithavenkat@yahoo.com



Fig 1. A malformed flower damaged by *Asphondylia capparidis* and adult (right)



Fig 2. Grubs of *G. asulcata* in an infested flower (left) and adult (right)



Fig 3. Mustard ball like structures formed by *C. indi* in an infested flower and adults (right)

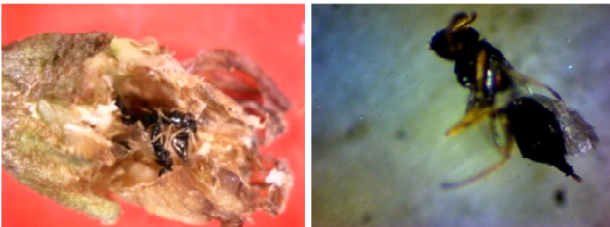


Fig 4. A damaged flower with adults of *Eurytoma sp.* and a single adult (right)

Results revealed that chilli flowers were infested by a complex of Hymenopteran and Dipteran feeders as mentioned below:

1. *Asphondylia capparidis* Rubsaamen (Diptera: Cecidomyiidae): Gall midge first appeared in August, started causing damage to flowers to an extent of 1-12.5 per cent. Its life cycle was completed in 14.5 days (egg period 2.0 days; maggot period 5.6 days, pupal period 3.6 days and adult period 3.3 days). The maggots fed on the ovaries of the flowers and pupation was within the ovary. The ovary was converted into a gall (Fig.1). Only one insect per flower was recorded. Its damage was less after October. However Basavarajet *al.*, (2011) reported its incidence from

October to January in Raichur district of Karnataka.

2. *Goethella asulcata* Girault (Hymenoptera: Eulophidae): This pest was first noticed in August and it damaged flowers to an extent of 4 - 17.40 per cent. Its damage persisted from August to October and peak incidence was recorded in September. Life cycle was completed in 8.1 days of which 1.8 days was the egg period. Eggs hatched into pale yellow coloured grubs with red eyes which fed on the stamens and ovary and formed galls inside the flowers. Pupation also occurred inside the unopened flower. Pupae are black in colour with red eyes. After 1-2 days of pupation, black coloured adults emerged (Fig.2) and lived for 2-4 days. As many as twenty two adults were emerged from a single flower.
3. *Ceratoneura indi* Girault (Hymenoptera: Eulophidae) : This was the most devastating pest causing damage of 4 - 47.2 per cent and persisted throughout the flowering season, though peak population was recorded in the first week of November. Thereafter a decline was observed after the first week of December. Ovaries and stamens were transformed into black mustard seed-like balls. Grubs were light white in colour and lodged in the mustard balls (Fig.3). They lived for 4-6 days. Pupation also occurred in the mustard balls and after 3-4 days adult emerged which lived for 4-6 days. Adults were black in colour. Total life cycle was 14.9 days. Usually 2-6 adults emerged from a single flower.
4. *Eurytoma sp.* (Hymenoptera: Eurytomidae): Extent of damage recorded by this pest was 4 - 16 per cent. It was first noticed in August and declined after November, but its damage was less throughout the crop period. Total life cycle was completed in 10.8 days. Egg period was 2.2 days. After hatching, whitish yellow grubs fed on stamens and ovaries for 2.5 days. Pupation occurred inside the affected flowers and pupae were brown coloured. Adults were black in colour (Fig.4.) and lived for 2-3 days.

About 5 percent of the flowers were found to be infested by more than one type of flower feeder. *G. asulcata* and *Eurytoma sp.* were usually found to coexist in a single chilli flower. Kumar *et al.*, (2010) observed gall midge to damage more than 90 percent of the flowers in the early stage of the crop and *C. indi* only a few. However as the season progressed *C. indi* recorded more damage

in chilli flowers in Karnataka. Nagaraju *et al.*, (2004) recorded *C. indi* and *G. asulcata* as gall forming insects of Capsicum in Karnataka. The incidence of these pests started in August and continued till harvest. *C. indi*, *G. asulcata* and *Eurytoma* could be some of the very few phytophagous hymenopterans reported till date. Information on biology and seasonal incidence of these pests could help in planning of crop sowing so that the crop escapes from the pests.

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