



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2018; 6(5): 2102-2105

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Received: 10-07-2018

Accepted: 12-08-2018

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## Incidence of Gall Forming Flower Feeders in Major Chilli Growing Areas of Telangana

**Divya S, Anitha V, Anitha Kumari D and Vidyasagar B**

### Abstract

A field survey was conducted to record the occurrence and extent of damage of gall forming flower feeders in major chilli growing areas, viz. Khammam, Warangal and Rangareddy of Telangana during 2015-16. *Asphondylia capsici*, *Goethella asulcata* and *Ceratoneura indi* were identified as the gall forming species of which *A. capsici* was the predominant species in all the three districts. *A. capsici* constituted 91 per cent of the total composition, followed by *G. asulcata* (8 per cent) and *C. indi* (1 per cent) in Khammam while in Warangal, *A. capsici* (62 per cent) was followed by *C. indi* (22 per cent) and *G. asulcata* (16 per cent) in their occurrence. The gall forming insect complex caused the maximum damage (26.67 per cent) in Khammam district followed by Warangal (24.82 per cent) and least damage (6.66 per cent) was recorded in Ranga Reddy district. *A. capsici* was observed to cause maximum damage during February in Khammam district, December and March in Warangal and in December in Rangareddy district.

**Keywords:** Chilli, gall forming flower feeders, *Asphondylia capsici*, *Goethals sulcata*, *Ceratoneura indi*, *Telangana*

### 1. Introduction

Chilli (*Capsicum annum* L.) is an important spice as well as vegetable crop grown all over India. India is the largest producer of chillies with an annual production of 1492.1 lakh tonnes from an area of 774.9 lakh ha<sup>[1]</sup>. Important chilli growing states in India are Andhra Pradesh, Telangana, Karnataka, Maharashtra and Tamil Nadu which constitute nearly 75 per cent of the total area under chilli. Area under chilli crop in Andhra Pradesh and Telangana is around 1.72 lakh ha which is about 25.12 per cent of the total area in India<sup>[2]</sup>. In the Telangana State it is grown in 73,000 hectares with 253,000 tonnes production from major chilli growing areas such as Khammam, Warangal, Mahabubnagar and Ranga Reddy districts<sup>[3]</sup>.

The pest spectrum in chilli is complex with more than 293 insects and mites species debilitating the crop in the field as well as in storage<sup>4</sup>. Amongst them thrips, yellow mite, aphids are the most vital production constraints. A recent addition to these destructive group of insects are gall forming insects particularly the midge, *Asphondylia capsici* Barnes which has become a regular pest especially in irrigated chilli. Chilli blossom midge was first identified on chilli in Cyprus<sup>5</sup> causing malformed pods in chilli. Though the pest was identified 65 years ago on chilli, its first occurrence from South India was reported in Tamil Nadu<sup>[6]</sup> and subsequently from Warangal, Andhra Pradesh<sup>[7]</sup>. Gall midge is a serious pest causing 10-40 per cent yield loss<sup>8</sup> in chilli. Infestation by chilli gall midge is characterized by severe flower drop, malformed fruits, reduction in yield, fruit size, seed number. In recent years a complex of gall formers belonging to Diptera and Hymenoptera has been reported from various parts of India. The studies on the gall forming insect complex in Telangana are meagre with the first extensive study being that of Reddy (1997)<sup>[9]</sup>, twenty years ago, who studied the biology, extent of damage, relative abundance and management of chilli blossom midge in the irrigated chilli tract of Malyal, Warangal in Andhra Pradesh. A need was felt to document the species composition of these galls forming flower feeders in the present day and their spread in the major chilli growing regions of Telangana to assess their damage potential and develop a strategy for their management.

## 2. Materials and Methods

### 2.1 Damage Assessment

A survey was carried out to record the incidence of gall forming insects affecting chilli grown in open field conditions in Warangal, Khammam and Ranga Reddy districts of Telangana during October 2015 to March 2016. Sampling sites were selected in the three districts as given in (Table 1). In each district three mandals were selected from which 2 villages were selected. In each village 2 farmers' fields were selected for collection of data on pest incidence and species composition during the peak flowering period. Random sampling for buds / flowers and fruits were done as per procedure of Basavaraj <sup>[10]</sup> to record the per cent damage, species diversity at monthly intervals during the peak flowering and fruiting period. Per cent damage / incidence were calculated by using the given formula for the gall forming complex as a whole and individual identified species.

$$\text{Percent} = \frac{\text{Total number of damaged flower buds/Fruits}}{\text{Total number of flower buds/Fruits damage}} \times 100$$

**Table 1:** Selected Sampling Sites in three districts of Telangana State

S. No	District	Mandal	Villages
1	Rangareddy	Chevella	Pulgutta
			Kandada
		Moinabad	Amdapur
			Nakkalapalli
		Shankarpally	Bulkapur
			Prodtur
2	Warangal	Mahabubabad	Malyal
			Betholu
		Parkal	Puligolla
			Rangapur
		Ghanpur	Gorlaveedu
			Chelpur
3	Khammam	Cherla	Kothuru
			Thegada
		Bayyaram	Bayyaram
			Singaram
		Kusumanchi	Agraharam
			Jeelacheruvu

#### 2.1.1 Species identification/composition studies

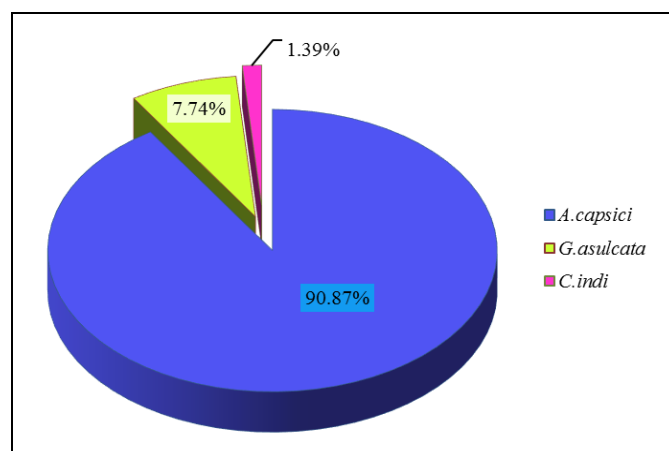
In each field five (5) plants were randomly selected covering the centre and four corners of the field from which 25 fresh flower buds or pods /plant were collected and brought to the laboratory at Vegetable Research station, Rajendranagar. The collected samples were then carefully dissected and examined under Magnus Stereo microscope for larvae / pupa. The pupae were transferred with the help of a camel hair brush into small (2.5x7.5cm) transparent plastic vials to observe the emergence of adults. The emerged adults were sent to the concerned taxonomic authorities for validation of identification. The dipteran adults were identified by Dr. A. Kalaisekar, Principal Scientist, IIMR (Indian Institute of Millet Research), Hyderabad, specializing in midges and the hymenopteran adults were identified at the National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru and also

based on the description given by Narendran and Kumar <sup>[11]</sup>. The relative abundance of different gall forming insects was calculated based on the recovery of species from the dissected flower buds.

## 3. Results and Discussion

### 3.1 Gall forming insect complex affecting Chilli in Telangana

Data on percent damage caused by various gall forming flower feeders in the selected chilli growing districts of Khammam, Warangal and Ranga Reddy revealed that three species constituted a complex viz., *Asphondylia capsici* Barnes (Diptera: cecidomyiidae), *Goethella asulcata* Girault (Hymenoptera: Eulophidae) and *Ceratoneura indi* Girault (Hymenoptera: Eulophidae) and were found infesting the chilli flowers from October to March during the period of study. *A. capsici* was observed to be the predominant species among the gall forming insect complex in all the three districts followed by *G. asulcata* and *C. indi*. The midge affecting chilli in all the three districts was identified as *A. capsici*, which is in agreement with the report of Reddy (1997) however Kalavathi<sup>12</sup> reported the occurrence of *A. capparisi*, *G. asulcata*, *C. indi* which caused galls in Chilli in Guntur, Khammam and Krishna districts of Andhra Pradesh. Dissection of the affected flowers and fruits carried out to establish the predominant species in the three districts showed that *A. capsici* constituted 91 per cent of the total composition, followed by *G. asulcata* (8 per cent) and *C. indi* (1 per cent) in Khammam (Fig 1). However *G. asulcata* was reported as the dominant species with a mean incidence of 28.24 percent followed by *C. indi* (14.48) and *A. capparisi* (6.64 per cent) respectively in Khammam <sup>[13]</sup>. In Warangal, of all the three species, *A. capsici* was again the predominant species constituting 62 per cent whereas *G. asulcata* was recorded to an extent of 16 per cent and *C. indi* occurred to an extent of 22 per cent of the dissected specimens (Fig 2). In Ranga Reddy district, *A. capsici* was the major constituent (59 per cent) while *G. asulcata* constituted 28 per cent followed by *C. indi* to an extent of 13 percent in terms of the total damage caused by the insect complex (Fig 3). However in Raichur, *G. asulcata* was the dominant species followed by *A. capparisi* and *C. indi* in contrast to the present study <sup>[13]</sup>.



**Fig 1:** Species composition of gall forming insect complex in Khammam district.

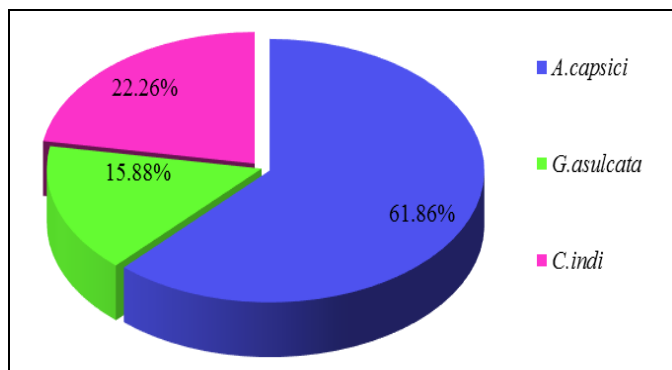


Fig 2: Species composition of gall forming insect complex in Warangal district.

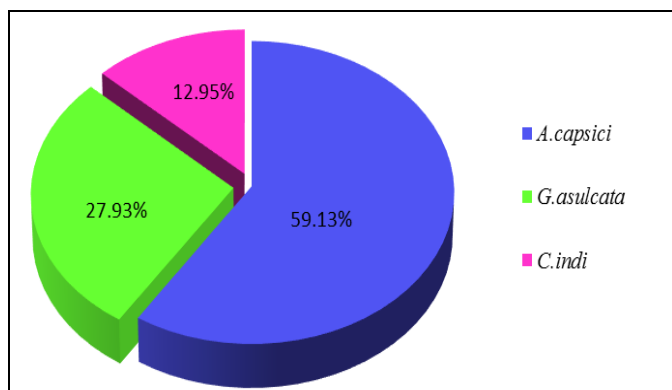


Fig 3: Species composition of gall forming insect complex in Ranga Reddy district.

### 3.1.1 Extent of damage of Gall forming insect complex in Khammam, Warangal and Ranga Reddy districts

The gall formers were found to cause the most damage in Khammam district (26.67%) followed by Warangal (24.82%) and the least damage was seen in Rangareddy district (6.66%) (Fig.4) during the survey period. Perusal of the data on damage caused by gall forming insect complex in three selected mandals of Khammam district revealed that the damage ranged between 20.05 per cent to 30.75 per cent with Kusimanchi recording the least damage (20.05) followed by Cherla (29.21) and Bayyaram (30.75) (Table 2). During the sampling period, the least damage of 18.01 per cent was observed in October 2015 and maximum damage of 47.93 per cent in February 2016 (Fig. 5).

In Warangal district, the damage ranged between 23.86 per cent and 25.92 per cent between the three selected mandals with Mahabubabad recording 23.86 percent damage followed by Parkal (24.70 per cent) and Ghanpur (25.92 per cent) (Table 2). During the sampling period least damage was observed in October 2015 (14.98) and maximum damage of 32.83 and 32.16 percent was observed in the months of January and March 2016 (Fig.4).

The gall forming insect complex was found to cause the least damage in the three mandals of Shankerpalli, Chevella and Moinabad (6.75, 6.98 and 6.26 per cent respectively) in Rangareddy district which was also the least damage among the three selected districts (Table 2). In October, the extent of damage recorded was 3.53 which peaked in the month of December (11.36 per cent) and thereafter gradually declined to 3.59 per cent in March 2016.

Table 2: Damage by gall forming insect complex in selected mandals in three chilli growing districts of Telangana (2015-2016).

Month/ Mandal	Khammam			Mean	Warangal			Mean	Ranga Reddy			Mean
	Cherla	Bayyaram	Kusimanchi		Mahabubabad	Ghanpur	Parkal		Shankerpalli	Chevella	Moinabad	
October	16.79	17.8	19.46	18.02	10.5	21.71	14.95	14.98	2.15	4.60	4.63	3.53
November	25.43	27.98	15.55	22.99	15.5	13.26	15.27	16.79	8.23	6.40	5.87	6.25
December	23.86	26.08	15.86	21.93	26.17	36.0	28.15	30.09	9.62	13.06	11.24	11.36
January	16.12	36.23	21.76	24.70	29.80	33.13	34.46	32.40	6.32	8.76	9.04	8.03
February	62.33	53.45	28.0	47.83	26.57	19.88	23.17	22.53	6.67	7.28	4.38	6.09
March	30.74	23.16	19.81	24.57	34.71	31.57	32.20	32.16	6.79	1.75	2.25	3.59
Mean	29.21	30.75	20.05	26.67	23.86	25.92	24.70	24.83	6.75	6.98	6.26	6.66

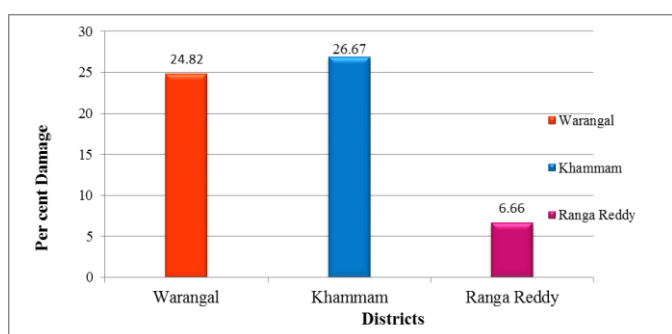
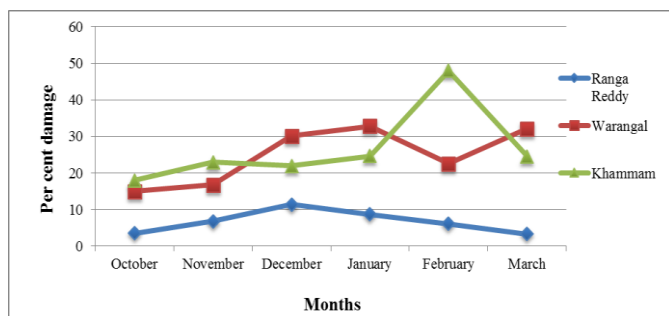


Fig 4: Damage by gall forming insect complex in selected districts of Telangana State from 2015-2016 on chilli.

### 3.1.2 Progression of incidence/damage during the crop growth in the three districts.

The percent damage due to gall forming insect complex

recorded in the three selected districts over a period of six months from October 2015 to March 2016 revealed that in Khammam lowest damage percent (18.01) was observed in the month of October and reached a peak in February (47.83 %) and thereafter reduced to 24.61 percent in March. In case of Warangal, highest percent damage was observed in January with a drop in February (22.53%) followed by a peak in March (32.16%). The initial damage recorded was 14.98 per cent in Warangal. However in Ranga Reddy district it was observed that the initial damage caused in October was 3.53percent which reached a peak in December (11.36 %) and gradually reduced to 3.59 percent in March. (Table 2) (Fig.5). In Raichur district a similar study revealed incidence of *A. capparis* from October to January<sup>[10]</sup> while in Ranga reddy the incidence started in August<sup>1</sup>. However *G.asulcata* reached peak incidence in September while *C.indi* reached a peak in November<sup>[14]</sup>.



**Fig 5:** Progression of damage by gall forming insect complex in selected districts of Telangana from October 2015-March 2016.

#### 4. Conclusion

Roving surveys conducted in selected mandals of Khammam, Warangal and Ranga Reddy districts of Telangana at monthly intervals, coinciding with flowering and fruiting stage during October 2015 to March 2016 revealed that a dipteran and 2 hymenopterans constituted a complex *Viz.*, *A. capsici*, *G. asulcata* and *C. indi* forming galls in chilli flowers. *A. capsici* was observed to be the predominant species in all the three districts followed by *G. sulcata* and *C. indi*. The gall forming insect complex caused the maximum damage (26.67 per cent) in Khammam district followed by Warangal (24.82 per cent). The predominant species *A. capsici* was observed to cause maximum damage during February in Khammam district, December and March in Warangal and in December in Rangareddy district which may be attributed to the difference in times of sowing and prevalent weather conditions of the different districts, so also the difference in species dominance could vary based on the varieties grown and favourable weather conditions.

#### 5. Acknowledgement

The study is a part of M.Sc (Ag). Dissertation of the first author and the facilities provided by Department of Entomology, College of Agriculture, Rajendranagar, Hyderabad, Professor Jayashankar Telangana State University and Vegetable Research Station, SKLTSHU (Sri Konda Laxman Telangana State Horticultural University), Rajendranagar is greatly acknowledged. The authors are also grateful to the farmers of the three districts and extension personnel of DAATTCs (Warangal, Khammam and Ranga Reddy) of PJTSAU for facilitating the survey.

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