

Survey of Sorghum Earhead Bug and its Natural Enemies in Karnataka

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ABSTRACT

Survey of sorghum earhead bug *Calocoris angustatus* Lethierry and its natural enemies conducted for three years (1977-80) in sorghum tract consisting of eight districts in Karnataka revealed the presence of the bug and involvement of only one species with colour variation in all the districts. The bug population was more in *Kharif* season in Mysore, Bijapur, Chitradurga, Bellary, Dharwad and Belgaum districts compared to other districts. During summer, maximum incidence was seen at Mysore (16.55 bugs) whereas during *Rabi* season it was highest in Bijapur (24.00 bugs). The natural enemies found in the survey were *Camponotus compressus* (L.), *Camponotus paria*, Emery, *Rhinocoris fuscipes* (F.), *Geocoris tricolor* (F.), Erythraeid mite; *Hierodula* sp., 16 species of spiders and the entomogenous fungus *Cephalosporium*. The predatory potential of *R. fuscipes*, *G. tricolor*, *Hierodula* sp., and spiders was assessed under laboratory conditions.

KEY WORDS: *Calocoris angustatus*, natural enemies, sorghum

The sorghum earhead bug *Calocoris angustatus* was first reported by Lethierry in the year 1893 from South Arcot District of Tamil Nadu (earstwhile Madras State). Puttarudriah (1947), Usman (1967) and Thimmaiah *et al.* (1972) reported its occurrence in Mysore and Mandya; Chitradurga and Tumkur and in Dharwad districts respectively. Other than the brief report of Hiremath and Thontadarya (1983), only two predators namely *Reduviolus* Sp. and *Geocoris tricolor* (Nayar *et al.*, 1976) an unidentified parasite (Anonymous, 1978) and a bacterial disease in the laboratory (Ballard, 1916) have been reported as natural enemies of *C. angustatus*. Since the previous reports did not bring out a true picture of the distribution of *C. angustatus* in the sorghum growing tracts of Karnataka, a systematic survey was undertaken during 1977-80 on the population level of the bug and its natural enemies.

MATERIALS AND METHODS

Major sorghum growing districts of Karnataka (Table 1) were surveyed for the distribution and incidence of earhead bug and its natural enemies. In the selected taluks, 2 to 4 places were visited for three years during the milky grain stage of sorghum in all or few seasons depending upon the sorghum cultivation.

Population of the bug was assessed by sudden trapping method. Each earhead was enclosed by a polythene bag (20 x 35 cm) which contained a small wad of cotton soaked in chloroform and stapled to one corner of the bag. Holding the open

end of the bag tightly at peduncle, the earhead was bent at 30° angle and then tapped gently so that all the anaesthetized adults and nymphs present in the earhead be dislodged and counted. The number of bugs and its natural enemies based on the field and laboratory observation were recorded separately. The data of different years were pooled and means were worked out.

RESULTS AND DISCUSSION

Among the 20 districts of the state, sorghum was grown considerably in eight districts, out of which Mysore and Chitradurga were from southern part and the remaining from the northern part. Sorghum in Mysore district was grown in *Kharif* and summer seasons, whereas it was grown in all the three seasons in transitional tract comprising of Dharwad, Belgaum and parts of Raichur districts. In Bijapur, Gulbarga and parts of Raichur and Dharwad districts it was predominantly grown during the *Rabi* season.

The earhead bug population was maximum in Gundlupet with 48.7 bugs per 10 earheads followed by 44.5 and 42.5 bugs in Nanjangud and Mysore taluk respectively. The bug population was more in *Kharif* season in Mysore, Bijapur, Chitradurga, Bellary, Dharwad and Belgaum districts compared to other districts, which agrees with reports of Puttarudriah (1947) and Thimmaiah *et al.* (1972). Mysore, Chitradurga, Belgaum, Bellary and Dharwad districts were visited during the summer season and the maximum incidence was observed in Mysore (16.55 bugs in Nanjangud). During the *Rabi*

TABLE 1. Occurrence of *C. angustatus* and its natural enemies in Karnataka in different seasons* during 1977-80

	POPULATION / 10 earheads during		
	<i>Kharif</i> (17)	<i>Rabi</i> (17)	<i>Summer</i> (14)
<i>C. angustatus</i>	24.70	10.50	8.70
<i>Camponotus sp.</i>	0.63	0.44	0.93
<i>R. fuscipes</i>	0.10	0.06	0.17
<i>G. tricolor</i>	0.09	0.08	0.01
Erythraeid mites	0.20	0.77	0.33
Spiders	1.72	1.30	1.30

* Figures in parentheses represent number of surveys

season, maximum bug population of 24.00 bugs per 10 earheads was recorded in Bijapur taluk followed by Haveri taluk in Dharwad District (19.80 bugs).

In general, the population of the bug was high during *Kharif* as compared to *Rabi* and summer seasons (Table 1). The notable feature was that the pest was in alarming status in all eight districts where sorghum was grown either in all three seasons or two seasons.

The bugs collected from all the districts for three years revealed the presence of the bug and involvement of only one species with colour variation. Further, the detailed genitalia studies made in order to find out whether the different coloured bugs belonged to the same species, confirmed the existence of a single species. However, unconfirmed species of *Calocoris* has been reported on sorghum earhead at Kota, Jhalawar, Bundi and Chittorgarh in Rajasthan (Anonymous, 1979).

Two species of ants *Componotus compressus* L. and *C. paria* Emery were observed to catch and carry fourth and fifth instar nymphs of *C. angustatus* with the help of mandibles. Close observations also indicated that the female nymphs were the common preys. During summer 1978-79, maximum of 3 ants of both the species per 10 earheads was recorded at Harapanahalli, followed by 2.2 ants at Mysore during *Kharif* 1978-79 and at Ramadurga during summer season of 1979-80. These ants were observed in all eight districts.

One species of reduviid bug *Rhinocoris fuscipes* (F.) was recorded preying on the nymphs and adults of the bug. The reduviid followed the

prey and attacked from behind or from the side. Whenever the prey was near by, the predator pierced its proboscis and served the prey dry in 15 minutes. Since the population of the reduviid bug was very low in the field, its potential as predator could not be determined. However, in the laboratory, the reduviid nymph was found to prey on a minimum of three later instar nymphs or adults per day when unlimited number of bugs were given. It preyed on a maximum of six earhead bugs under captivity on the earhead. Similarly, the adult reduviid preyed on an average 5.5 nymphs or 4.9 adults of *C. angustatus* in three days. The predatory bug was found distributed all over the sorghum growing tract of Karnataka. A maximum of 1.2 reduviid bugs per 10 earheads was recorded at Harapanahalli during 1977-78 followed by 0.8 bugs at Siruguppa, during summer.

One species of lygaeid bug namely *Geocoris tricolor* (F.) was observed to prey upon the later instar nymphs of *C. angustatus*. The study revealed the presence of this bug in negligible proportion in all the areas surveyed. A maximum of 1.2 bugs was recorded per 10 earheads at Holalu village in Huvinhadagali taluk during *Kharif* 1978-79 followed by 0.5 bugs at Gokak. The predator was not found in Raichur and Gulbarga districts which are *Rabi* and dry area. Earlier, Nayar *et al.* (1976) had reported its occurrence. Under laboratory conditions, this predator could prey upon a maximum of three bugs per day with an average of 1.77.

An Erythraeid mite bright orange red in colour, both larvae and adults of which were found attached to the body of third, fourth and fifth instar nymphs and adults of both sexes of the bug.

The mites were found attached to the vertex, base of the antennae, prothorax on sternal plates, in between coxae, on tibiae and costa of the forewing. A single earhead bug was found having a maximum of six mites attached all over the body. The mites were found clinging firmly with the help of mouth parts at an angle of 80° to 90°. In addition to *C. angustatus*, the mite was also seen attached to *Orius maxidentex* Ghouri, *O. tentillus* (Motsch) and *Compylomma livida* Reut, found on the sorghum earheads.

The predatory mite was found throughout the sorghum growing tract. A maximum of 4.15 mites was found per 10 earheads at Murunal (Bagewadi taluk) during *Rabi* followed by 3.2 mites during *Kharif* and 2.6 at Ramadurga during *rabi* season. This appears to be the first record on the occurrence of this mite as a predator of *C. angustatus* and other bugs of sorghum earhead.

During the survey, *Hierodula* sp. (Mantodea: Mantidae) was found preying on *C. angustatus* at Udabur (Mysore) and Dharwad during *Kharif* season of both 1978-79 and 1979-80. The population of the mantid was very low (0.02 and 0.1 per 10 earheads at Udabur and Dharwad respectively). The mantid which was preying upon fifth instar nymphs and adults was brought to the laboratory and was provided with 10 later instar

nymphs and adults daily for three days. It was observed that the mantid preyed upon 6-8 bugs daily.

During the survey, 16 species of spiders (both juvenile and adults) were found preying both on the nymphs and adults of *C. angustatus* (Table 2). The behaviour of these spiders was studied in the laboratory. When the earhead bugs (only later instar nymphs and adults) were provided to the one day-starved juvenile and adult spiders, the spider was found jumping and catching the bug at the cervix (neck) region by chelicerae and endites of its pedipalps. The bug was paralysed and was found dead within five minutes. The sucking by the spider continued for 25 to 40 minutes depending upon the species of the spider.

A maximum of 6.5 spiders per 10 earheads was observed at Mysore during *Kharif* (1979-80) although the mean for three years was 2.9 spiders. A maximum of 3.9 spiders was found at Davangere followed by 3.30 and 3.10 spiders at Ramadurga and Haveri respectively. Out of 16 species observed as predators *Neoscona rumpfi* (Threll), *N. achine*, *Clubiona* sp., *Chiracanthium* sp., *Plexippus paykulli* (Aud.), *Rhena* sp., *Marpissa* sp. and *Thomisus dhakuriensis* Tikader were relatively more in number. In general, the population of the different predators was higher in

TABLE 2 Potentiality of spiders in predation of *Calocoris angustatus* Leth. adults and later instar nymphs in the laboratory

Family	Species	Stage tested	Average No. of bugs consumed per day
Araneidae	<i>Neoscona rumpfi</i> (Thorell)	Adult	4.00
	<i>N. theis</i> (Walckenaer)	Adult	2.67
	<i>N. lugubris</i> (Walckenaer)	Adult	3.67
	<i>N. achine</i> (Simon)	Adult	4.67
	<i>N. excelsus</i> (Simon)	Adult	1.33
	<i>N. mukerjei</i> Tikader and Bal	Juvenile	3.00
Clubionidae	<i>Clubiona</i> sp.	Adult	3.67
	<i>Chiracanthium</i> sp.	Juvenile	4.00
Salticidae	<i>Plexippus paykalli</i> (Aud.)	Adult	3.67
	<i>Rhena</i> sp.	Juvenile	
	<i>Marpissa</i> sp.	Juvenile	2.00 3.67
Thomiscidae	<i>Thomisus dhakuriensis</i>	Adult	4.67
	<i>Tikadar</i>		
	<i>T. shillongensis</i> Sen.	Juvenile	4.00
	<i>Thomisus</i> sp.	Juvenile	2.33
Therididae	<i>Argyoides</i> sp.	Juvenile	2.00
Oxyopidae	<i>Oxyopes</i> sp.	Juvenile	3.00

Kharif than in the other seasons. (Table 1)

The laboratory testing of the predatory potential of the different species of spiders by providing 10 bugs comprising of later instar nymphs indicated that *N. achinae*, *T. dhakuriensis*, *N. rumpfi*, *Chiracanthium* sp. and *T. shillongensis* consumed more than four bugs per day (Table 2). This appears to be the earliest detailed account of spiders predated over *C. angustatus*.

During the course of the investigations an entomogenous fungus, *Cephalosporium* sp. was found to infect the bugs both in the field and in the laboratory. Two days after the death of the bugs, whitish spores in a gelatinous mass were observed on the body of the bug and the bug became brittle as the time advanced. Invariably, the adults were infected by the fungus. The survey indicated the presence of this fungus in almost all the districts except Raichur and Gulbarga. However the presence of fungus was not consistent in all the seasons.

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