

Mirid Menace-A Potential Emerging Sucking Pest Problem in Cotton

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Abstract: Three species of mirid bugs were found attacking Bt cotton in Karnataka of which, *Hyalopeplus lineifer* (Walker) and *Campylomma livida* (Reuter) (Miridae Hemiptera) are new reports. Of the three, a related species of the brown mirid, *Creontiades biseratense* (Distant) was found in large numbers. The incidence was severe in Haveri district with mean value of 43.85 bugs/ 25 squares. Acephate 70SP and Acetamiprid 20SP found to have higher bio-efficacy against mirid bugs. The avoidable yield loss was about 290 kg/ha or 11.69 per cent over unprotected check.

Key words: emerging pests; mirid bugs; Bt cotton; acephate

1 Introduction

Broad scale adoption of insect resistant GM cotton that offer protection against boll worms and shift towards integrated pest management practices has led to a marked reduction in insecticide application (up to 80 percent) and change towards use of more selective insecticides on cotton¹. Ironically these changes have allowed other pests to survive and emerge as important ones. Thus the new cotton pest complex includes mirids, aphids, whiteflies, thrips and mealybugs². Unfortunately the use of insecticide chemistry disrupts the beneficial insect complex resulting in proliferation of pest invaders.

The mirids or true bugs comprise a large and diverse insect family Miridae belonging to the order Hemeptera. These are small, terrestrial insects, usually oval shaped or elongate measuring less than 12 mm in length³. Most of the more well known mirids have attention because they are agricultural pests with a wide host range of sunflower, safflower, pigeon pea, Lucerne, legumes, maize, sorghum, bajra⁴. In South India (Karnataka) also mirids are gaining importance as they are attaining major pest status on Bt cotton. Hence detailed studies on species complex, bio ecology, crop loss estimation, and good management aspects are under progress at Agricultural Research Station, Dharwad under Technology Mission on Cotton, Mini Mission I, adhoc project entitled “**Emerging and key pests; their the characterization, taxonomy, genetic diversity and control**” through CICR, Nagpur as Nodal agency.

2 Material and Methods

2.1 Species complex of mired bugs on Bt cotton

Collection of mirid bugs has been done from four districts (*viz.*, Dharwad, Haveri, Raichur and Gulbarga) of Karnataka state having larger area under Bt cotton and mirid incidence regularly since couple of seasons. In Raichur and Gulbarga cotton is an irrigated crop Dharwad and Belgaum represent rainfed ecosystem. Samples from minimum three villages separated by 20 km represent one district. The collected specimens were got identified by mirid taxonomist.

2.2 Population dynamics

Rowing survey was carried out to assess the population dynamics of mirid bugs in three Belgaum, Haveri and Gulbarga districts. Observations have been recorded at fort nightly interval on the occurrence of emerging pests and predators from July to December.

2.3 Cultivar association

A total of 59 Bt hybrids and 4 non Bt hybrids (checks) have been evaluated for cultivar association with mirid bugs. Observations have been recorded at fortnightly intervals on the occurrence of emerging pests and predators.

2.4 Assessment of avoidable loss and damage potential by Mirid bugs (*Creontiodes biseratense* (Distant))

The experiment was laid out in randomized block design with 4 treatments and five replications with Bunny Bt genotype. Prior to imposition of the treatment, there was uniform population of mirid bugs throughout the experimental block. Decline in population of mirid bugs was noticed after imposition of the treatment. The differential dosage of acephate exerted differential efficacy leading to population variation. Two sprays were undertaken once at the end of 1st fortnight of September 2007 and another during the beginning of 2nd fortnight of October.

2.5 Management of mirid bugs

Field experiment was laid out in RBD with 12 treatments and three replications. Four sprays were taken at fortnightly intervals starting from 40 days after sowing. Observations were recorded on pest density of all regular pests and emerging pests at fortnightly intervals starting from 38 days after sowing. Before imposition of treatments, there was no variation with respect to number of mirids among various treatments indicating the uniform distribution of insect population.

3 Results and Discussion

The results of one season investigation are highlighted below.

3.1 Record of new species

Green mirid (*Creontiodes dilutus*) has always been considered a significant pest of Australian cotton. The related species, the brown mirid (*Creontiodes pacificus*) is also sometimes found in this region⁴. The mirid complex on Bt cotton in three major cotton growing regions of China, basically consisted of five different mirid species⁵.

But in Karnataka (India), *Creontiodes biseratense* (Distant) is the only reported species of mirid so far⁶. Thus the present report comprising the occurrence of reported species along with two new species of mirids viz., *Hyalopeplus lineifer* (Walker) and *Compylomma livida* (Reuter) is the first formal record of occurrence of these three different mirid species on Bt cotton from Karnataka.

Symptoms and nature of damage caused by these mirids on cotton were similar to those described by Khan et al.⁴. Nymphs and adults of both the species were observed to feed on squares and small developing bolls. During feeding the mirids pierce the plant tissues with their stylet. The affected area rapidly dulls in colour, then blackens and ultimately results in death of the cells in the region. Feeding by these insects results in heavy shedding of medium sized squares and tiny bolls². Larger squares suffer damage that may cause development of deformed bolls which is often referred to as "parrot beaking". If the infestation is severe in older bolls, the damaged locks may not develop properly accompanied with the presence of stained lint. As the squares and bolls drop off, significant reduction in yield is noticed².

3.2 Population dynamics

In general the population of mirids was more in Haveri (43.85 bugs/ 25 squares) followed by Belgaum (18.15 bugs) and Gulbarga (14.95 bugs). At all the places the incidence began during September and continued till December, however the peak incidence was observed during October/November months. The maximum incidence (65.6 bugs/ 25 squares) was noticed in Haveri during the second fortnight of November which is correlated to be an endemic area for the pest in Karnataka.

3.3 Cultivar association

A total of 59 Bt hybrids and 4 Non Bt checks have been evaluated for cultivar association with mirid bugs. But for slightly more population in interspecific Bt cotton hybrids, no specific association between cultivars and mirids was established (**Table 1**).

3.4 Assessment of avoidable loss and damage potential by Mirid bugs (*Creontiodes biseratense* (Distant))

The highest yield of seed cotton (2770 kg/ha) was harvested from the treatment which received acephate @ 1400 gai/ ha which could suppress the incidence of mirid to the maximum extent (**Table 2**). The other treatments with lower dosages of acephate also lead to increase in yield compared to untreated check (2480 kg/ha). Thus considering optimum protection rendered the avoidable yield loss was 290 kg/ha or 11.69 per cent compared to no protection.

3.5 Management of mirid bugs

Among the various treatments, Acephate was superior in reducing the mirid bug infestation (9.53 mirid/ 25 squares) (**Table 3**). Next in the order of superiority were acetamiprid (13.60), imidacloprid (13.60 mirids/ 25 squares). Rest of the treatments registered higher number of mirids/ plant and were found to be statistically on par to untreated control.

In Australia recent trials have shown that reduced rates of indoxocarb or fipronil combined with salt have given effective control of mirids with reduced negative affects on beneficials ⁷. The field trials on bioecology and management of mirid bugs are in progress for detailed and confirmative assessment.

All these experiments are in progress for confirmative trials in the present season also. Cultivar association with mired bugs is being elucidated for 36 first and second generation Bt hybrid.

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Table 1 Bt cotton cultivars having incidence below average population of mirid bugs

Cultivar groups	Mean no.of miridbugs/25 squares	Mirid bugs
Interspecific (H × B) Bt hybrids Population < 32.4/ plant:	32.4	MRC-6918, RCH-708
Intraspecific (H × H) Bt hybrids : BG-I Population < 24.0/ plant:	24.6	Chiranjeevi, JKCH-33, JK Durga, PRCH-102, PRCH-103, Dyna, OLE, VCH-111, Tulasi-117, RCH-368, RCH-111, NSPL-405, Ratna, NSLP-999, Jai, PCH-930, PCH-205, PCH-115, Bunny, NCH-990, SP-504, Kavach, Pat-2270, Rudra
Intraspecific (H × H) Bt hybrids: BG-II Population < 24.9/ plant:	24.9	MRCH-7347, MRCH-7351, RCH-2, RCH-530, RCH-533

Table 2 Incidence of mirid bugs under varied selection pressure and avoidable loss

Treatments	Dosage (gai.ha)	Miridbugs / 25 squares	Yield (kg/ha)	Avoidable yield loss	
				(kg/ha)	(%)
T1-Acephate 70SP	175	26.70b (5.26)	2515	35	1.41
T2-Acephate 70SP	350	18.70b (4.44)	2586	106	4.27
T3-Acephate 70SP	700	11.50c (3.35)	2645	165	6.65
T4-Acephate 70SP	1400	7.80c (2.96)	2770	290	11.69
T5-Untreated control		53.70a (7.38)	2480	--	--
CV (%)		13.59	14.19		
CD (5%)		0.96	NS		
SEm±		0.32	184.39		

Figures in the parenthesis are $\sqrt{x+1}$ transformed values.

Table 3 Evaluation of control measures for the management of cotton pests

Treatments	Dose (per lit)	*Mirid bugs /25 squares	Yield (kg/ha)
T1- Dimethoate 30 EC	1.7ml	19.40abc (4.52)	3016bcd
T2-Imidacloprid 200SL	0.2 ml	15.80bcd (4.10)	3360ab
T3-Acetamiprid 20 SP	0.2 g	13.60cd (3.82)	3727a
T4-Thiamethoxam 25 WG	0.25 g	18.80abc (4.45)	3368ab
T5-Acephate 70 SP	1.0 g	9.53d (3.25)	3441ab
T6-Chlorpyryphos 20 EC	2.0 ml	19.20abc (4.49)	3209abc
T7-Neem oil + Nirma powder	2.5ml +1.0g	17.40abc (4.29)	3009bcd
T8-Nirma powder	10.0g	25.12a (5.11)	2627cd
T9- <i>Verticillium leccani</i>	2.0g	22.10ab (4.81)	3027bcd
T10- <i>Beauveria bassiana</i>	2.0g	21.40abc (4.73)	2966bcd
T11- <i>Metarhizium anisoplae</i>	2.0g	20.10abc (4.59)	3018bcd
T12-Untreated control		26.40a (5.23)	2570d
CV (%)		11.13	10.02
CD (5%)		0.83	527.90
SEm±		0.28	180.00

Figures in the parenthesis are transformed values $\sqrt{x+1}$.