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INCIDENCE OF MIRID BUG SPECIES COMPLEX IN BT AND NON-BT COTTON GENOTYPES

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ABSTRACT

The present study on the incidence of mirid bugs in relation to weather factors in Bt and non Bt cotton hybrids was carried out at the KVK, Haradanahalli, Chamarajanagar. During the study three species of mirid bugs viz., *Creontiades biseratense* (Distant), *Helopeltis theivora* (Waterhouse) and *Taylorilygus apicalis* (Fiber) were observed, of which *C. biseratense* was the dominant. Maximum incidence of *C. biseratense* (6.56/ 10 squares/ plant), *Helopeltis theivora* (3.60/ 10 squares/ plant) and *Taylorilygus apicalis* (2.40/ 10 squares/ plant) was observed at 42nd, 45th, 43rd standard meteorological weeks. Correlation coefficients revealed that maximum temperature has a significant negative association with incidence. However, non-significant negative association was exhibited by evening relative humidity (RH) and rainfall. In contrast to this, significant positive association was observed with morning RH, a non-significant positive one with minimum temperature.

Key words: *Creontiades biseratense, Helopeltis theivora, Taylorilygus apicalis*, Bt and non Bt cotton, population dynamics, correlation coefficients, relative humidity, temperature, rainfall

Cotton (*Gossypium* spp.) is an important fibre crop and India ranks first in cotton area and production with a productivity of 451 kg/ ha (CCI, 2021). After the wide scale adoption of Bt cotton in India from 2002 the area under Bt cotton increased to 95% and the sucking pests have attained a major pest status (Hanchinal et al., 2009; Anon., 2020). The mirid bug *Creontiades biseratense* (Distant) was first recorded in 2005 in Karnataka (Patil et al., 2006), later it was noticed in other states of south India viz*.,* Tamil Nadu, Andhra Pradesh and Maharashtra. (Surulivelu and Dhara Jothi, 2007). In South India, mirid bug, *C. biseratense* is creating a major menace in Bt cotton, that leading to significant yield loss. Three species of mirid bugs (Miridae: Hemiptera) viz., *Creontiades biseratense* (Distant), *Compylomma livida* (Reuter) and *Hyalopeplus linefer* (Walker) are infesting cotton since 2005; of these *C.biseratense* is the most widespread as key pest particularly in Karnataka (Udikeri et al, 2011). *Helopeltis theivora* Waterhouse has been reported first time infesting cotton (Dharajothi et al, 2018). Both adults and nymphs damages developing flower buds/ squares and tender bolls. One to two days old bolls with dried petals intact provide a good habitat to the insects for feeding and sheltering. The characteristic symptoms of feeding on the flower bud shows oozing out of yellow fluid from the buds and staining of this yellow fluid on the inner surface of the bracts. Infested tender bolls have number of black patches on all sides of the outer surface of boll rind. It was observed shedding of most of the damaged squares and tender bolls happens and damage causes loss of seed cotton yield to the tune of 11.69% (Rohini et al., 2009; Vinaykumar, 2013). Majority of cotton growers are unaware of the mirid bugs and their damage, and population dynamics of these in Bt cotton is not known. As this causes economic damage this study explores the species of mirid bugs and their population dynamics in Bt and non Bt cotton.

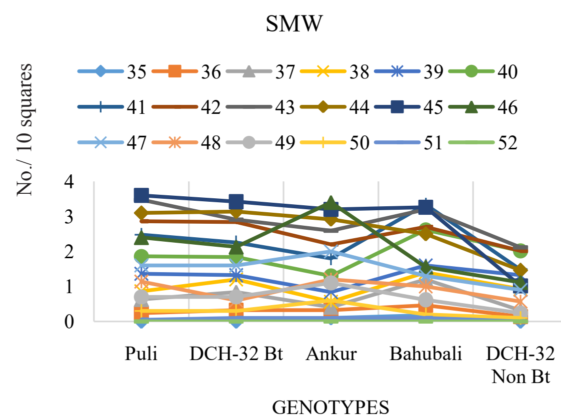
MATERIALS AND METHODS

A field experiment was conducted at Haradanahalli, Chamarajanagara during 2020-21. The popular cotton cultivars Ankur (BG II) obtained from Ankur Seeds Pvt. Ltd, Puli (BG II), Shri Ram Bioseed Cotton Seeds, Bahubali (BG II) from Mahyco Company, and DCH-32 (Bt and non Bt) from University of Agricultural Sciences, Dharwad were sown in kharif 2020. The experiment was replicated thrice with randomized block design with a spacing of 90x 60 cm between rows and plants, respectively. All recommended agronomic practices were followed except insecticidal sprays (Anon., 2018). Such three blocks of a plot size 12x 9 m were maintained to evaluate the population dynamics. The observation on the incidence from flowering (40 DAS) and boll setting (60 DAS) stage was recorded on weekly intervals till harvest. In each observation, ten plants were randomly selected and in each plant ten squares and bolls were examined during the evening hours. The data on incidence in each block was recorded plant-wise and mean counts/ plant was worked out. The species of mirids collected were got identified by the project of "Niche area of excellence on taxonomy of insects and mites", UAS, Bangalore. The incidence data were correlated with weather factors (of previous week) viz., maximum and minimum temperature, morning and afternoon relative humidity (RH) and total rainfall. The weather data were obtained from the agrometeorological observatory unit, Krishi Vignan Kendra, Haradanahalli, Chamarajanagara. The mean incidence at weekly intervals were subjected to Pearson's rank correlation analysis (Pearson, 1948).

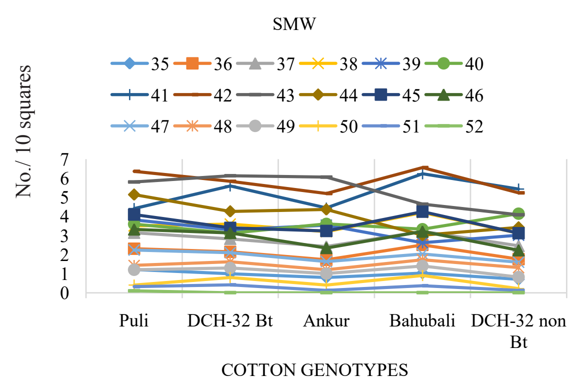
RESULTS AND DISCUSSION

The present study revealed the occurrence of three species of mirid bugs viz., Indian cotton mirid bug *Creontiades* (=*Poppiocapsidea*) *biseratense* (Distant), tea mosquito bug *Helopeltis theivora* Waterhouse and broken-backed bug *Taylorilygus apicalis* Fieber. Among these *C. biseratense* was the most common and dominant. The population dynamics of *C. biseratense* was analysed on different Bt cotton hybrids viz., Puli, DCH 32, Ankur, Bahubali and DCH-32 (non *Bt*) from 40 days after sowing and continued till harvest. The incidence was observed from 33rd standard meteorological week (SMW) of August, with gradual increase from first fortnight of September reaching a peak during second and third week of October. In Puli and Bahubali peak incidence was of 6.36 and 6.56 mirid bugs on 10 squares/ plant, respectively in 42nd SMW of October; it was at peak of 6.13 and 6.06/ 10 squares/ plant in DCH-32 (*Bt*) and Ankur, respectively in 43rd SMW of October; in DCH-32 non Bt cotton hybrid, incidence was 5.44/ 10 squares/ plant at 41st SMW (Fig. 1a). These findings agree with those of Manohar et al. (2012); Prakash et al. (2013) also reported similar incidence. In contrast, Vinaykumar et al. (2014) observed the maximum incidence during second fortnight of October (12.2 bugs/10 sqaures). Likewise, Jeer and Nandihalli (2019) also noticed the peak incidence of *C. biseratense* in 46th SMW.

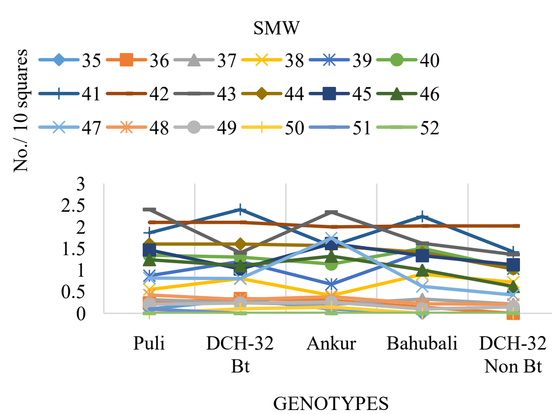
The population dynamics of *C. biseratense* revealed a significant positive association with morning RH (r = 0.51, 0.53, 0.56, 0.53 and 0.55) among all the hybrids *viz.,* Puli, DCH-32, Ankur, Bahubali and DCH-32 (non *Bt*), respectively. Likewise, minimum temperature also influenced revealed a positive significant association (Table 1). These results corroborate with those of Saravanan et al. (2017) who reported the significant negative correlation with maximum temperature and positive correlation with RH. Similarly, Naveen (2017) reported a significant negative one with maximum temperature (r = -0.76) and evening RH (r = -0.34) and significant positive one with minimum temperature (r = 0.88). Maximum incidence of *H. theivora* i.e.,3.60, 3.42, 3.40 and 3.34/10 squares/ on *Bt* hybrids Puli, DCH-32, Ankur and Bahubali, respectively was observed (Fig. 1b). These results conform with those



a. *Creontiades biseratense*



b. *Helopeltis theivora*



b. *Taylorilygus apicalis*

Fig. 1. Seasonal ncidence of mirid bugs on cotton genotypes

Table 1. Correlation coefficients- incidence of mirid bugs vs weather factors in cotton hybrids (kharif*,* 2020)

Hybrids	Mirid bug	T. Max (^{O}C)	T. Min (^{O}C)	Morning RH (%)	Evening RH (%)	Rainfall (mm)
Puli	C. b	-0.40*	0.38	0.51*	-0.27	-0.26
	H. t	-0.46*	0.08	0.60**	-0.35	0.28
	T. a	-0.43*	0.26	0.58**	-0.38	-0.33
DCH-32 (*Bt*)	C. b	-0.45*	0.41*	0.53**	-0.22	-0.27
	H. t	0.44*	0.10	0.64**	-0.35	-0.33
	T. a	-0.44*	0.35	0.52**	-0.36	-0.31
Ankur	C. b	-0.37	0.36	0.56**	-0.27	-0.32
	H. t	-0.46*	0.17	0.60**	-0.36	-0.24
	T. a	-0.46*	0.17	0.60**	-0.36	-0.24
Bahubali	C. b	-0.48*	0.42*	0.53**	-0.14	-0.24
	H. t	-0.42*	0.20	0.64**	-0.32	-0.34
	T. a	-0.39	0.30	0.57**	-0.38	-0.40*
DCH-32	*C. b*	-0.41*	0.40*	0.55**	-0.23	-0.31
(N*Bt*)	*H. t*	-0.35	0.22	0.59**	-0.34	-0.34
	T. a	-0.43*	0.33	0.58**	-0.35	-0.41*

C. b – Creontiades biseratense, H. t – Helopeltis theivora, T.a – Taylorilygus apicalis

of Roy et al. (2008); Roy et al. (2015) reported that *H. theivora* incidence was high during July to December and low during January-June. Incidence of *H. theivora* exhibited a significant positive association with morning RH (r = 0.60, 0.64, 0.54, 0.64, 0.55 and 0.59) among all the hybrids viz., Puli, DCH-32, Ankur, Bahubali and DCH-32 (non Bt), respectively; positive correlation with minimum temperature, except Ankur, which showed a slight negative association was also observed. Maximum temperature, evening RH and rainfall exerted a negative effect. While, Bt Cotton hybrids viz., Puli, DCH-32, Ankur and Bahubali exhibited a significant negative association with maximum temperature (Table 1). The present results are in close conformity with those of Roy et al. (2008) as regards minimum temperature and RH; Shaheen et al. (2015) also reported a positive correlation with mean temperature and humidity, but in contrast a significant positive association was there with rainfall.

The incidence of *T. apicalis* increased in September and reached maximum in October, it was 2.40, 2.40, 2.34 2.24 and 2.02/ plant on hybrids Puli, DCH-32, Ankur, Bahubali and DCH-32 (non Bt), respectively. (Fig. 1c). Similar observations were made by Malgvi et al. (2000), and Prajna (2018) reported it in last week of September and earlier week of October. Incidence was comparatively less compared to *C. biseratense* and *H. theivora*; and a significant positive association with morning RH (r = 0.58, 0.52, 0.60, 0.57 and 0.58) was observed in Puli, DCH-32, Ankur, Bahubali and DCH-32 (non Bt), respectively. Likewise, minimum temperature showed a non-significant influence on the population of *T. apicalis*. Maximum temperature exerted a significant negative association in Puli (r = -0.43), DCH-32 (-0.44), and Ankur (r = -0.46) Bt hybrids and DCH-32 (r = -0.43) non Bt hybrid. And, rainfall exhibited a significant negative association (r = -0.40) on Bahubali (Table 1). The present findings were in partial accordance with those of Ahirwal et al. (2009). Mishra et al. (2015) reported a significant positive association with temperature. Prajna (2018) reported that *Nesidiocoris tenuis* incidence had a positive association with maximum temperature and morning RH, while minimum temperature and evening RH influences the incidence negatively.

AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

CONFLICT OF INTEREST

No conflict of interest.

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