J. Cotton Res. Dev. **31** (2) 305-308 (July, 2017) **ISSN No. 0972-8619**

Impact of insecticides and biorationals on parasitoids of mealybug, *Phenacoccus solenopsis* on cotton

S.G.HANCHINAL*, B.V.PATIL, A. NAGANGOUDA AND A.G.SREENIVAS

Department of Entomology, University of Agricultural Sciences,Raichur - 584 102

**Email:shanchinal@gmail.com*

ABSTRACT: Influence of insecticides on parasitoids was evaluated during 2011-2012 and 2012-2013. Results indicated that parasitoids emergence was nil in the treatments with thiodicarb 75 WP, profenophos 50 EC, quinalphos 25 EC, acephate 75 SP and chlorpyriphos 20 EC indicating their detrimental effects on parasitoids. However parasitoids emergence was observed in the treatments which received buprofezin 25 SC, *neem* oil, Neemark 1500 ppm, fish oil rosin soap and *Verticillium lecanii.* The emergence of parasitoids were in the following order, control (43.67%)>*neem* oil 2000 ml/ha (13.67%)> neemark 1500 ppm @ 5000 ml/ ha(8.33%)>buprofezin 25 SC @ 1000 ml and 1500 l/ha (7.67%)> acephate 75 SP @ 2000 g/ ha(1.33%)>chlorpyriphos 20 EC @ 2500 ml/ha (0.67 %) during 2012-2013.

Key words : Cotton, insecticides, parasitoids, *Phenacoccus solenopsis*

In the current decade, the trend of increased build up of various mealybug species and its parasitoids in crop plants is observed mainly due to certain abiotic change in climate and environment. Mealybug species *viz., Phenacoccus solenopsis* Tinsley, *Phenacoccus solani* Ferris and *Maconellicoccus hirsutus* (Green) have been recorded on cotton in India. Among them *P. solenopsis* is the major and wide spread in the country (Nagarare *et al.,* 2009). Severe economic damage to *G. hirsutum* was reported in 2007(Dharajyoti *et al.,* 2008; Dhawan, 2008) in four major cotton growing districts of Punjab, two districts of Haryana, and low to moderate damage in parts of Maharashtra, Tamil Nadu and Andhra Pradesh. In Karnataka mealybug appeared in isolated patches in cotton growing districts during 2006. Later it was found in the cotton growing districts of Raichur, Bellary, Gulbarga, Haveri, Dharwad and Belguam during 2007-2008. Mealybug incidence was more in Tungabhadra project (TBP) and Upper Krishna project (UKP) areas which comprises major irrigated cotton (Hanchinal *et al.,* 2009). Already reported mealybug species (*Maconellicoccus hirsutus* (Green) and *Ferrisia virgata* (Cockerell)) on cotton have been associated with 16 parasitoids, belonging to 6 families of Hymenoptera. Minor feeding by coccinellids (*Coccinella septempunctata* and *Cryptolaemus montrouzieri*) and Neuroptera (*Chrysoperla* sp.) was recorded on cotton and other infested plants. The predators remain exposed to all chemical intervention and are more prone to mortality and less effective than parasitoids. The large numbers of mummified *P. solenopsis* on heavily infested cotton due to parasitization by *Aenasius bambawalei* Hayat, a potential bioagent. The parasitoid completed its life cycle on the mealybug leaving the mummified body along with the exit hole behind. (Rishikumar *et al.,* 2009) Management of this mealybug is difficult due to its wide host range, presence of waxy coating on the body and high reproductive potential. But the crawler stage is the most fragile and easily controllable stage in its life history. Recently some organophosphates, IGRs and Bio-pesticides have been recommended for the control of mealybug (Suresh *et al.,* 2010). Many insecticides are hazardous to parasitoids and predators of mealybugs.

MATERIALS AND METHODS

Field experiment was conducted during 2011-2012 and 2012-2013 seasons to evaluate the efficacy of insecticides and biorationals against *P. solenopsis* on *Bt* cotton NCS145 (Bunny) at Main Agricultural Research Station, UAS, Raichur. The experiment was laid out in a randomized block design with three replications and ten treatments during both the years. A plot size of 7.20 x 6.00 m and a spacing of 90 x 60 cm row to row and plant to plant were maintained. In each plot 80 plants were maintained and five plants were randomly selected and tagged for observation. In both the year, agronomic practices were followed as per the recommended package of practices.

In both the years two rounds of common sprays were taken to combat early sucking pests of cotton. Treatments were imposed when sufficient number of mealybug population was observed in the experimental block (90 days after sowing). Effect of pesticides on parasitoids emergence was also recorded after three, seven and 14 days of treatment imposition. After spray survived adult mealybugs were brought to the laboratory along with twigs and kept in cages for emergence of parasitoids and expressed as per cent emergence.

RESULTS AND DISCUSSION

Data on the population of parasitoids emergence in laboratory were recorded after three, seven and 14 days of spray application.

On three days after spray, maximum parasitoid emergence (20.22%) was recorded in control. Parasitoids emergence was nil in the treatments thiodicarb 75wp, profenophos 50EC, quinalphos 25EC, acephate 75 SP, chlorpyriphos 20 EC. However buprofezin 25 SC@ 1000 ml/ha recorded significantly maximum per cent emergence of 6.56 among different chemical treatments. This was followed by *neem* oil 2000 ml and Neemark 1500 ppm @ 5000 ml/ha recorded 5.84 and 5.48 per cent emergence, respectively and were *on par* with each other. Similar trend was observed on seven and 14 days after treatment imposition. The emergence of parasitoids were in the order of different treatments, control (23.64%)> neemark 1500 ppm @ 5000 ml/ha(12.48%)>*neem* oil 2000 ml/ha (4.84%)> acephate 75 SP @ 2000 g/ha(0.52%)> chlorpyriphos 20 EC @ 2500 ml/ha (0.48 %) during 2011-2012 season (Table 1).

During 2012-2013 season emergence of parasitoids was maximum in control and recorded 38.33, 39.33 and 43.67 per cent, respectively on three, seven and 14 days after treatment application. On three days after spray, maximum parasitoid emergence (38.33%) was recorded in control which was significantly superior over rest of the treatments. This was followed by neemark 1500 ppm @ 5000 ml/ha, buprofezin 25 SC @ 1000 ml/ha and *neem* oil 2000 ml/ha which recorded 8.67,7.33 and 6.67 per cent parasitoid emergence, respectively and significantly differed with each other. Similar trend was observed on seven and 14 days after spray. On 14 days after spray, parasitoid emergence was maximum (43.67%) in control which was significantly superior over rest of the treatments. The emergence of parasitoids were in the following order, control (43.67%)>*neem* oil

Table 1. Effect of different insecticides on parasitoid emergence during 2011-2012 and 2012-2013

Sl. No	Treatments	Dosage/ ml/g/ha	Per cent parasitoid emergence					
			2011-2012			2012-13		
			3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS
1	Thiodicarb 75WP	625 g	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]
2	Profenophos 50EC	1500 ml	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71)	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]
3	Profenophos 50EC + Soap water 1500 ml + (1%)		0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]
4	Quinalphos 25EC	2000 ml	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]	0.00(0.71) [d]	0.00(0.71) [e]	0.00(0.71) [e]
5	Acephate 75SP	2000 g	0.00(0.71) [d]	0.00(0.71) [e]	0.52(0.81) [e]	0.00(0.71) [d]	0.00(0.71) [e]	1.33(0.71) [e]
6	Chlorpyriphos 20EC	2500ml	0.00(0.71) [d]	0.00(0.71) [e]	0.48(0.80) [e]	0.00(0.71) [d]	0.00(0.71) [e]	0.67(0.71) [e]
7	Buprofezin 25 SC	1000 ml	6.56(2.63) [c]	0.00(2.49) [d]	0.00(0.71) [e]	7.33	7.00	7.67
8	*Neem* oil	2000ml	5.84(2.49) [c]	5.85(3.01) [c]	4.84(2.27) [d]	6.67	9.33	13.67
9	Neemark 1500 ppm	5000 ml	5.48(2.41)	8.66(2.78)	12.48(3.59)	8.67	8.33	8.33
10	Untreated Control	—	20.22	18.63	23.64(4.91) [a]	38.33	39.33	43.67
	SEm +	0.12	0.11	0.12	0.09	0.07	0.09	
	CD (p= 0.05)	0.36	0.33	0.37	0.25	0.213	0.27	

2000 ml/ha (13.67%)> neemark 1500 ppm @ 5000 ml/ha(8.33%)>buprofezin 25 SC @ 1000 ml and 1500 l/ha (7.67%)> acephate 75 SP @ 2000 g/ha(1.33%)>chlorpyriphos 20 EC @ 2500 ml/ha (0.67 %) (Table 1).

Earlier workers have also expressed that the larval and pupal stages of the parasitoids were more tolerant than adult stages. The residual toxicity of azinphosmethyl oil combination gave the highest natural enemy mortality over 35 days post treatment, while a chlorobenzilate-oil combination resulted in the lowest mortality of mealybug parasitoid, *Anagyrus pseudococci.* Similarly, other workers reported that diazinon resulted in lower residual toxicity to *A. pseudococci* at one day post treatment as compared to other insecticides. Similar study were also made and reported that mealybug parasitoids like *Aenasius advena* Comp. and *Blepyrus insularis* (Cam.) were exposed to the guava leaves treated with different insecticides. Diazion (0.05%) was found to be non toxic to *A. advena* and least toxic to *B. insularis.* The other chemicals such as endosulfan (0.07%), phosalone (0.07%) and dichlorvos (0.20%) showed lesser toxic residual effect while chlorpyriphos (0.05%), carbaryl (0.10%) and fenthion (0.10%) recorded significantly higher residual effect to both the parasitoids. Both buprofezin and flonicamid were not toxic to *L. dactylopii* with 100 per cent adult survival after 72 h. Dinotefuran was extremely detrimental to the adult parasitoid at the label rate with 100 percent mortality after 24 h. The IGR pyriproxyfen and the insecticide flonicamid were not directly or indirectly harmful to the predator, *C. montrouzieri* and parasitoid, *L. dactylopii*, indicated that insecticides were compatible with both natural enemies when used together for control of mealybug in greenhouses and conservatories.

REFERENCES

Dharajyoti, B., Surulivelu, T. and Gopalkrishnan, N. 2008. Status of mealybug on cotton in various parts of India. In: *Proceeding of National Consultation on Mealybug Management*,CICR, 28-29 Jan. 2008, Nagpur, India. p. 8-10,

Dhawan, A.K. 2008. Historical perspective of various species as cotton pests in India and rest of world and factor affecting occurrence and outbreak on cotton, In: *Proceeding of National Consultation on Mealybug Management*, CICR, Nagpur, India. p. 11-14.

Hanchinal, S.G., Patil, B.V., Bheemanna, M., Hosamani, A.C. and Sharanabasappa, 2009. Incidence of mealy bug on cotton in Tungbhadra project area. *In : Proc. Dr. Leslie C. Coleman Memorial National Symp. Plant Prot.,* Univ. of Agric. Sci., GKVK, Bangalore. December 4-6.

Nagrare, V.S., Karnthi, S., Biradar, V.K., Zade, N.N., Sangode, V., Kakde, G., Shukla, R. M., Shivare, D., Khadi, B.M. and Kranthi, K.R. 2009. Widespread infestation of the exotic mealybug species, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae), on cotton in India. *Bull. Entomol. Res.,* **8:**p. 1-5.

Rishikumar, Vijander Pal, Rahul Chauhan and Sarwan Laljat 2009. Bio ecological studies on solenopsis mealybug, *Phenacoccus solenopsis* (Tinsley) (Hemiptera: Psuedococcidae) on cotton. Proceeding National Symp. *"Bt Cotton: Opportunities and Prospects"*, CICR, Nagpur. p. 93.

Suresh, S., Jothimani, R., Sivasubrmanian, P., Karuppuchamy, R., Samiyappan and Jonathan, I., 2010. Invasive mealybugs of Tamil Nadu and their management. *Karnataka J. Agric. Sci.,* **23**:6-9.

Received for publication : August 10, 2016
Accepted for publication : December 22, 2016