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Natural Enemies of *Bemisia tabaci* Gennadius and Effect of Insecticides on their Activity

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ABSTRACT

In a survey on the natural enemies of *Bemisia tabaci* Gennadius, two parasitoids *Eretmocerus mundus* Merc and *Encarsia shafeei* (Hayat) and seven predators were recorded in cotton ecosystem. The predators *viz., Serangium parcesetosum* (Coccinellidae), *Deraecoris indianus* (Miridae) and *Paederus fuscipes* Curtis (Staphylinidae) were recorded for the first time on this pest. Field experiment revealed that the activity and abundance of the natural enemies were significantly reduced when triazophos, monocrotophos and methamidophos were sprayed as compared to endosulfan and phosalone. Neem oil and fish oil rosin soap were less harmful to the natural enemies.

Key Words : *Bemisia tabaci,* natural enemies, toxicity insecticides

Bemisia tabaci Gennadius, a polyphagous aleurodid with wide host range is a serious pest of cotton in tropical and subtropical countries (Cock, 1986). Ever since its severe outbreak in 1984, its population continued to remain high in southern and central cotton zones in India affecting cotton production and productivity (Basu, 1986).

Widespread and indiscriminate use of insecticides is reported to reduce the population of natural enemies (Greathead and Bennett, 1981; Reddy *et al.,* 1985; Natarajan *et al.,* 1986; Venugopal Rao, 1987). Studies made on the natural enemies of this pest and effects of synthetic and botanical insecticides are reported in this paper.

MATERIALS AND METHODS

A survey was made in cotton growing regions of Tamil Nadu and Andhra Pradesh during 1985-88 and the parasitoids and predators recorded / recovered were identified. A field experiment was conducted during 1987 summer in a farmer's field (Idigarai village, Coimbatore district) where the population of pest, parasitoids and predators were high. The cotton Cv.LRA 5166 (*Gossypium hirsutum* L.) at 120 days harboured 40 to 50 adults, 600 to 700 nymphs of the pest and 12-15 parasitoids per leaf. The predator population per leaf was 2-3. Six insecticides, neem oil and fish oil rosin soap (FORS) were sprayed once (Table 1) to evaluate their toxicity to the natural enemies of whitefly. The population of parasitoids and predators were assessed from 50 leaves at the rate of two per plant from 25 plants selected at random. The parasitoids were observed from the top two leaves, whereas the predators were assessed from the leaves of the middle canopy of the plant.

RESULTS AND DISCUSSION

Two aphelinid parasitoids *viz., Eretmocerus mundus* Merc. and *Encarsia shafeei* Hayat were recovered in the field surveys. The population density of the former constituted 86 per cent and these were differentiated based on the antennal differences (Plate 1). The golden yellow coloured parasitoids were more abundant on the top canopy of the plant, whereas the predators were concentrated around the middle canopy of the plant where the grownup prey (nymphs) density remained high (Venugopal Rao, 1987). The predators collected were, the

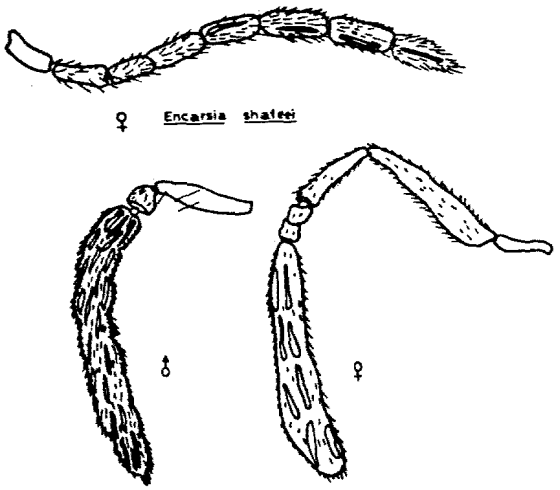

Fig. 1. Antennal differences in the aphelinid parasitoids. Natural enemies of *Bemisia tabaci* Gennadins and effect of insecticides on their activity.

coccinellids (*Menochilus sexmaculatus, Coccinella septumpunctata* L., *Serangium parcesetosum* (Sicard), Chrysopid, *Chrysopa carnea* Steph., Mirid, *Deraecoris indianus* Carvalho and the ground beetle, *Paederus fuscipes* Curtes. In addition, the predatory mite *Amblyseius* sp., was also observed. Among these, *S. parcesetosum, D. indianus* and *P. fuscipes* are reported for the first time on *B. tabaci*.

Effect of insecticides and natural products on natural enemies

Population of whitefly, its parasitoids and predators assessed prior to the experimentation revealed that the adult and nymphal density were 42 and 675 respectively per leaf. The parasitoids and predators per leaf varied from 12.1 to 15.2 and 2.3 to 3.2 respectively. Triazophos was most toxic to adult parasites causing 100 and 97.4 % reduction of their activity on 3rd and 5th day respectively as compared to untreated check which harboured 11-12 parasitoids per leaf (Table 1). The reduction in the parasitoids activity was 79-97% in other insecticides and natural products. Among the insecticides, endosulfan, phosalone and amitraz respectively harboured 1.3 to 2.4, 0.9 to 1.6 and 0.6 to 1.9 parasitoids per leaf and were on par with each other. The parasitoid density in neem oil and fish oil rosin soap was 7-8 per leaf, which was significantly better than all the insecticides evaluated, but less than the water spray.

The predator population per leaf in the insecticide treatment varied from 0.1 to 0.9 and 1.3 to 1.5 in neem and FORS treatments. Triazophos recorded the lowest predator population of 0.1/leaf as compared to 2.4 in check and it remained on par with methamidophos. Phosalone, endosulfan and amitraz were comparatively less toxic recording 0.6 to 0.9 predators per leaf and remained on par with each other. Triazophos has been reported to be highly toxic to natural enemies and its toxicity to *Chelonus blackburni* Cameron persisted upto 15 days on cotton (Navarajan Paul, 1987). Endosulfan, phosalone and amitraz have been reported to be comparatively safer to the natural enemies in cotton ecosystem (Peregrine and Lemon, 1986; Venugopal Rao, 1987). Neem products and FORS have been reported to be safe to the natural enemies of whitefly (Venugopal Rao, 1987). Considering the safety to the natural enemies, neem and FORS could

Table 1. Toxicity of insecticides and natural products to parasites and predators of cotton whitefly

Treatment		Population of parasites/leaf			Predators / leaf	
		Pretreatment	3 DAT*	7DAT	Pretreatment	3DAT
Triazophos	700 g.a.i./ha	12.1	0.1[a]	0.3a	3.2	0.1[a]
Amitraz	700 g.a.i./ha	13.8	0.6b	1.9[b]	2.4	0.6[c]
Phosalone	700 g.a.i./ha	13.3	0.9bc	1.6[b]	2.6	0.7[c]
Endosulfan	700 g.a.i./ha	15.2	1.3c	2.4[b]	2.8	0.9[c]
Monocrotophos	700 g.a.i./ha	14.2	0.3a	0.5[a]	2.3	0.5[bc]
Methamidophos	700 g.a.i./ha	12.9	0.2a	0.4[a]	2.6	0.2[ab]
Neem oil	2.5 lt/ha	12.4	7.8d	7.4[c]	2.9	1.5[d]
Fish oil rosin soap (FORS)	15Kg/ha	13.1	7.7d	7.2[c]	3.0	1.3[d]
Check (Water spray)		12.4	11.9e	11.4[d]	2.3	2.4[e]

* DAT - Days after treatment

In a column, means followed by the same letters are not significantly different (P=0.05) by LSD

be successfully exploited for the management of this pest.

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