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# Effect of Some Insecticides on the Parasitoids and Predators of the Cotton Whitefly, *Bemisia tabaci* Genn.

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ABSTRACT

**In an evaluation of the effects of different insecticides against the natural enemies of whitefly, *Bemisia tabaci* Genn., cotton crop treated with synthetic pyrethroids recorded 9.7 per cent parasitism due to aphelinid and it was on par with endosulfan. Pyrethroids were highly detrimental to the predators, recording the lowest number of 2 to 4.3 of early and 0.3 to 1.2 late occurring predators per 10 leaves. The insecticides of natural origin showed 15.8 to 18.1 per cent parasitoid activity and maintained 3.4 to 7.9 predators/10 leaves. Triazophos and deltaphos recorded the lowest parasitism and predation levels, whereas fenpropethrin recorded a higher level (14.8 per cent) of parasitism.**

Key Words : Aphelinid parasitoid, predators, *Bemisia tabaci*, synthetic pyrethroids, natural insecticides

The whitefly, *Bemisia tabaci* Genn., has become a threat to cotton cultivation in Andhra Pradesh and other cotton growing states of India. There is a need to generate information regarding different aspects of this pest so as to explore different control strategies for managing this pest. Bio-control agents will supplement the effects of different components of integrated pest management. Surveys in whitefly infested fields of cotton revealed the occurrence of several natural enemies of the pest (Reddy *et al.*, 1985; Venugopal, 1987). In order to identify selective and safe insecticides in cotton pest management, studies were made on the effect of some common as well as new insecticides of different origin on the parasitoid and predators of whitefly at Regional Agricultural Research Station, Lam, Guntur and the results are presented in this paper.

## MATERIALS AND METHODS

Two separate field experiments with 17 treatments each (Tables 1 and 2) were laid out in RBD, (Cultivar MCU5) replicated thrice. An individual plot size of $30m^2$ was maintained in both the field trials. The treatments were applied 8 times at 10 days interval from 50 days after sowing onwards through a knapsack sprayer (@ 500 L/ha). Nymphal parasitism due to *Eretmocerus* spp. was recorded by observing (30 leaves from each plot of 5 randomly selected plants) under binocular microscope while counting the level of nymphal and egg population of whitefly. Similarly, the early stage predators like coccinellids, *Menochilus* sp., *Verania* sp., and lace wings, *Chrysopa carnea* and late stage predators like phytoseiid mites were recorded while counting the adults of whitefly following standard sampling procedure (Venugopal, 1987). The data on mean levels of parasitism and predator numbers recorded after each round of application were subjected to statistical scrutiny to understand the selectivity of the insecticides evaluated.

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**Table 1. Effect of commonly used insecticides on the parasitoids and predators of cotton whitefly***

| Insecticide | Conc. (%) | Parasitism** (%) | Predators**(nos./10 leaves) | |
|---|---|---|---|---|
| | | | Early stage (coccinellids & *chrysopa* ) | Late stage (mites) |
| Carbaryl | 0.1 | $10.3^{bc}$ | $4.7^{ab}$ | $5.5^{d}$ |
| Chlorpyriphos | 0.1 | $3.0^{a}$ | $6.5^{ab}$ | $0.6^{ab}$ |
| Cypermethrin | 0.02 | $12.8^{cd}$ | $2.0^{a}$ | $1.2^{ab}$ |
| Deltamethrin | 0.002 | $11.9^{bc}$ | $4.3^{ab}$ | $0.3^{a}$ |
| Dichlorvos | 0.1 | $7.7^{bc}$ | $6.4^{ab}$ | $2.6^{c}$ |
| Dimethoate | 0.1 | $11.5^{bc}$ | $3.3^{ab}$ | $1.4^{ab}$ |
| Endosulfan | 0.1 | $12.5^{cd}$ | $6.7^{ab}$ | $1.9^{ab}$ |
| Fenvalerate | 0.02 | $9.7^{bc}$ | $3.0^{ab}$ | $0.6^{ab}$ |
| Methyl Parathion | 0.1 | $10.4^{bc}$ | $3.9^{ab}$ | $1.0^{ab}$ |
| Methyl Parathion (D) | 25kg/ha | $6.0^{ab}$ | 4.0ab | $0.6^{ab}$ |
| Monocrotophos | 0.1 | $9.8^{bc}$ | $3.0^{ab}$ | $1.0^{ab}$ |
| Phorate (G) | 2.5kg a.i/ha | $6.2^{ab}$ | $6.7^{ab}$ | $1.2^{ab}$ |
| Phosalone | 0.1 | $7.4^{bc}$ | $5.5^{ab}$ | $1.2^{ab}$ |
| Phosphamidon | 0.1 | $6.9^{ab}$ | $5.7^{ab}$ | $1.2^{ab}$ |
| Quinalphos | 0.1 | $6.2^{ab}$ | $4.0^{ab}$ | $1.3^{ab}$ |
| Water spray | | $17.8^{d}$ | 16.0c | $9.6^{e}$ |
| Untreated check | | $17.2^{d}$ | $13.8^{c}$ | $11.3^{e}$ |

* Mean of five counts recorded after each application of insecticides

** Treatment means followed by the same letters are not statistically different by D.M.R.T. (P = 0.05)

## RESULTS AND DISCUSSION

Among the 16 insecticides tested in the first experiment, cypermethrin was found to be least harmful to the aphelinid parasitoids as seen from the highest parasitism of 12.8 per cent, closely followed by endosulfan with 12.5 per cent, as against 17.8 per cent in water spray and 17.2 per cent in untreated check (Table 1). Chlorpyriphos was found to be highly detrimental to nymphal parasitoids with only 3 per cent parasitism.

Endosulfan and phorate were found least harmful to the early stage predators of whitefly, recording the highest population of 6.7/10 leaves, closely followed by chlorpyriphos with 6.5 and dichlorvos with 6.4/10 leaves. Water spray treatment and untreated check recorded maximum populations of 16 and 13.8/10 leaves respectively. Cypermethrin which was found least harmful to parasites was however observed to be highly hazardous to early stage predators (2/10 leaves). Among the other insecticides, carbaryl was found least harmful to late stage predators (Phytoseiid mites) recording the highest number of 5.5/10 leaves as compared to next highest record of 2.6/10 leaves in dichlorvos. Deltamethrin exhibited the highest adverse effect on late stage predators recording 0.3/10 leaves only, as compared to 9.6 and 11.3/10 leaves in the water spray and untreated check respectively.

Among the 17 insecticides of different origin like plant and animal products as well as synthetic chemicals, nicotine sulphate was found least harmful to nymphal parasitoids maintaining highest parasitism of 18.1 per cent and was on par with neem oil (16.7%), mineral oil (15.8%), fish oil insecticide soap (FOIS) (14%) and fenpropethrin (14.8%). Triazophos, however exhibited the highest detrimental effect on parasitoids recording only 2.8 per cent parasitism compared to 19.8 per cent in untreated check.

Against early stage predators, (coccinellids, chrysopid etc.) saradine oil (animal origin) was found least harmful recording a population of 8.8/10 leaves and differed significantly from the rest of the treatments. Deltaphos (deltamethrin + triazophos) and triazophos were found to be highly injurious with the lowest population of 0.2/10 leaves, as against 13.2/10 leaves in untreated check. Even on the late stage mite predators, triazophos, deltaphos and acephate were found deleterious, recording the lowest population of 0.1/10 leaves as against the highest population of 8.8 in saradine oil and 15.2/10 leaves in untreated check (Table 2).

**Table 2. Effect of some newer insecticides on the parasitoids and predators of cotton whitefly***

| Insecticide | Conc. (%) | Parasitism$ (%) | Predators$ (no./10 leaves) | |
|---|---|---|---|---|
| | | | Early stage | Late stage |
| Acephate | 0.1 | $3.9^{ab}$ | $1.0^{ab}$ | $0.1^{a}$ |
| Amitraz | 0.1 | $8.9^{bc}$ | $1.8^{bc}$ | $1.3^{ab}$ |
| BPMC | 0.1 | $9.8^{bc}$ | $4.2^{bc}$ | $0.6^{ab}$ |
| Fenpropethrin | 0.02 | $14.8^{cd}$ | $2.4^{bc}$ | $0.5^{ab}$ |
| Deltaphos (decamethrin + triazophos) | 0.002+ 0.05 | $3.8^{a}$ | $0.2^{a}$ | $0.1^{a}$ |
| Ethion | 0.1 | $5.4^{ab}$ | $4.2^{bc}$ | $0.2^{a}$ |
| FOIS | 2.5 | $14.0^{de}$ | $6.8^{d}$ | $6.3^{cd}$ |
| Profenophos | 0.1 | $8.0^{bc}$ | $1.0^{ab}$ | $0.6^{ab}$ |
| Isophenphos | 0.1 | $6.5^{bc}$ | $2.7^{bc}$ | $0.6^{ab}$ |
| Methamedaphos | 0.1 | $5.7^{ab}$ | 2.2bc | 0.6ab |
| Mineral Oil | 2.0 | $15.8^{de}$ | $7.4^{d}$ | $7.2^{cd}$ |
| Neem Oil | 0.5 | $16.7^{de}$ | $3.4^{bc}$ | $4.4^{c}$ |
| Nicotine sulphate | 0.2 | $18.1^{de}$ | $7.9^{d}$ | $7.6^{cd}$ |
| Phenthoate | 0.1 | $8.6^{bc}$ | $1.6^{ab}$ | $0.6^{ab}$ |
| Saradine oil | 2.5 | $12.3^{cd}$ | $8.8^{d}$ | $8.8^{cd}$ |
| Triazophos | 0.1 | $2.8^{a}$ | 0.3ab | $0.1^{a}$ |
| Thiazopyr (P.E. 001/001) | 0.1 | $5.8^{ab}$ | $1.7^{ab}$ | 0.4ab |
| Untreated check | — | $19.8^{de}$ | $13.2^{e}$ | $15.2^{e}$ |

* Mean of five counts recorded after each application of concerned insecticides

$ Treatments followed by the same letters are not statistically different by D.M.R.T. (P = 0.05)

Peregrine (1983) reported that amitraz was harmful to phytoseiid mites, while El-Nawawy *et al.* (1983) reported profenophos as a detrimental insecticide to predators of whitefly. The studies of House *et al.* (1985) revealed that synthetic pyrethroids have depressed the beneficial insects in cotton ecosystem but did not totally exclude them. However, sharaf (1982) and El-Nawawy *et al.* (1983) felt that synthetic pyrethroids were highly toxic to parasitoids of whitefly.

All the insecticides evaluated against whitefly were found detrimental to varying degrees to parasites and predators of whitefly. However, natural products of plant and animal origin (nicotine sulphate, neem oil, fish oil insecticide soap) that are effective against whitefly were found least harmful to its parasitoids and predators which is an important point in their favour, indicating relevance of these products in integrated management of whitefly on cotton.

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