J.Biol.Control, **5** (1), 4-7, 1991

Effect of Insecticides on the Occurrence and Association of Whitefly, Aphid and Parasites on Cotton

T.SURULIVELU

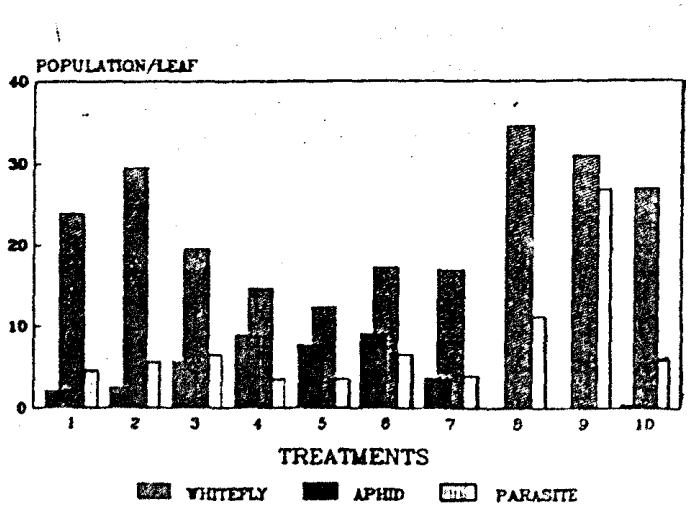
C.I.C.R.(Regional Station), Coimbatore 641 003

ABSTRACT

Observations in cotton field sprayed with insecticides showed that *Aphis gossypii* Glov. parsitism by *Aphelinus gossypii* Timberlake was very high in plots treated with fenvalerate. Triazophos and fenvalerate registered high populations of aphids which precluded the incidence of the whitefly *Bemisia tabaci* (Gennadius). Elimination of aphids by monocrotophos and methyl demeton provided a better habitat for *B.tabaci*. Positive association between the aphid and its parasite was seen in phosalone (r = 0.67), mineral oil (r = 0.52), endosulfan(r = 0.52), fish oil rosin soap (r = 0.51), methyl demeton (r = 0.50), neem oil (r = 0.48), fenvalerate (r = 0.48) and check (r = 0.65). Monocrotophos and triazophos had no association. The linear regressions showed that fenvalerate, phosalone and check plots permitted 96.9, 58.8 and 40.2 per cent parasitism respectively while only 13.8 to 31.5 per cent parasitism was observed in other insecticidal treatments. For occupation and development, there was a negative association between the aphid and whitefly in plots treated with phosalone (r = - 0.81), mineral oil (r = - 0.77), methyl demeton (r = - 0.72) and endosulfan (r = - 0.46).

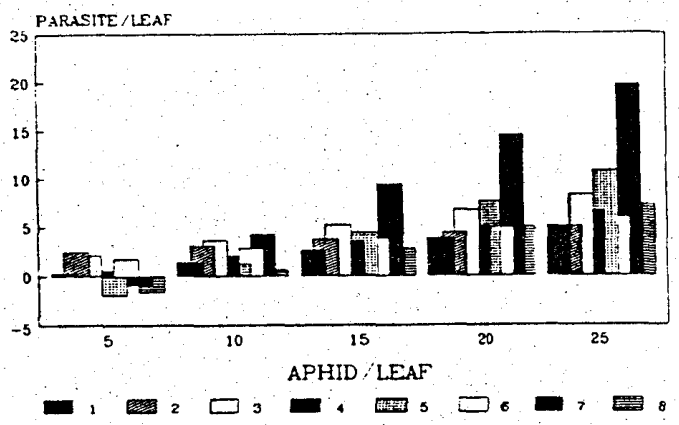
Key Words : Cotton, insecticide *Aphis Gossypii, Aphelinus gossypii, Bemisia tabaci*

Cotton crop is damaged by several sap feeding insects of which whitefly, *Bemisia tabaci* (Gennadius) and aphid,*Aphis gossypii* Glov. are very important. The repeated use of insecticides particularly synthetic pyrethroids in cotton, resulted in outbreak of *B.tabaci* (Greathead and Bennett, 1981; Wangboonkong, 1981; Johnson *et at.*, 1982; Musuna,



1. NEEM OIL 0.5%
2. FISH OIL ROSIN SOAP 2.5%
3. MINERAL OIL 1.0%
4. METHYL DEMETON 0.05%
5. MONOCROTOPHOS 0.05%
6. PHOSALONE 0.1%
7. ENDOSULFAN 0.1%
8. TRIAZOPHOS 0.05%
9. FENVALERATE 0.01%
10. CONTROL

Fig. 1. Association of whitefly, aphid and aphid parasite in cotton



1. NEEM OIL 0.5%
2. FISH OIL ROSIN SOAP 2.5%
3. MINERAL OIL 1.0%
4. METHYL DEMETON 0.05%
5. PHOSALONE 0.1%
6. ENDOSULFAN 0.1%
7. FENVALERATE 0.01%
8. CHECK

Fig. 2. Effect of insecticides on association of aphid and its parasite

1983; Natarajan *et al.*, 1986a and *A.gossypii* (Rangarajan *et al.*, 1986; Surulivelu and Sundaramurthy, 1986). Whenever *A.gossypii* appears in epizootic form, it provides a better habitat for the parasite *Aphelinus gossypii* Timberlake. The two species of insects and their parasites are affected at varying levels when insecticides are used frequently for the control of bollworms. The present investigation was designed to study the effect of certain insecticides of botanic and chemical origin on the phytophagy and zoophagy in the cotton system.

MATERIALS AND METHODS

Cotton (LRA 5166) was raised during 1986-87 crop season (Sept-Feb.) and an experiment was laid in randomized block design with three replication. Five applications with various insecticides (Fig.1) were made 87, 101, 118, 132 and 148 days after sowing (DAS). The populations of aphid and whitefly nymphs were recorded 90, 94, 101, 104, 108, and 118 DAS from ten randomly selected plants and in each plant, three leaves representing top, middle and bottom were considered. On the 166th day of sowing, live aphid, parasitized aphid (mummies) and whitefly nymphs were recorded on the same leaf from eight randomly selected plants. The data were transformed and analysed statistically. The relationship between whitefly, aphid and its parasites was also worked out (Fig.2).

RESULTS AND DISCUSSION

The population of whitefly nymphs and aphids for the periods 90 to 118 DAS showed less variation in various niches exposed to insecticides due to low level of population. While the population of whitefly ranged from 5.3 to 8.3 per 10 leaves, the population of aphids varied from 5.4 to 19.3 in the niches exposed to various toxicants except fenvalerate which had 107 aphids/10 leaves. On the other hand, there was a distinct variation among the niches exposed to the various insecticides 166 DAS. There was practically no whiteflies in the niches either unexposed or exposed to fenvalerate and triazophos. But the population of whitefly increased in niches exposed to other insecticides including fish oil rosin soap and neem oil(Fig.1).

The population of aphids was significantly low in monocrotophos (12.3 per leaf) and methyl demeton-treated niches (14.6) as com-

pared to the unexposed niche (27.0). Triazophos registered a very high population (34.5) followed by fenvalerate (30.9) and fish oil rosin soap (29.5). Application of either neem oil, mineral oil, phosalone or endosulfan induced a moderate build-up of aphid population ranging from 17.0 to 24.0 per leaf.

Parasitization of aphids was very high in the niches exposed to fenvalerate (26.8 per leaf) followed by triazophos (11.2), phosalone (6.5), mineral oil(6.5), fish oil rosin soap (5.6) and neem oil (4.6) as compared to unexposed niche (5.8). Methyl demeton, monocrotophos and endosulfan however recorded low build-up of the parasites on the existing population of aphids.

The presence of negligible population of whitefly in niches exposed to fenvalerate and triazophos and also the unexposed niche clearly showed that the environs prevailed in those niches were unacceptable to the whitefly for colonization. This might also be due to the preoccupation of aphid which debarred the whitefly multiplication (Fig.1). A similar interrelationship between whitefly and aphid in monocrotophos and synthetic pyrethroid-treated niches in the cotton system was reported earlier (Joyce, 1955, Schultz, 1961; Gour, 1986; Natarajan *et al.*, 1986b). The niches treated with methyl demeton, monocrotophos and endosulfan had less number of parasitized aphids as the level of population of aphid available for activity of parasite was minimum (Fig.2).

However, the static population of aphid seen in the niches unexposed, and exposed to fenvalerate, triazophos, and fish oil rosin soap was associated with the parasite variously (Fig.1). The higher rate of parasitism found in fenvalerate-treated niche might be due to the nutritional status of host (Sundaramurthy and Basul in press).

Association between the aphid and its parasite *A.gossypii* was positive and significant in the niches treated with phosalone (r=0.67) mineral oil (0.52), endosulfan (r=0.52), fish oil rosin soap (r=0.51), methyl demeton (0.50), neem oil (r=0.48), and fenvalerate (r=0.48) and the niche which received no chemical (r = 0.65) (Fig.2). The niches that were exposed to monocrotophos (r = 0.42) and triazophos (r = 0.15) showed no significant association.

The linear relationship found in the present study (Fig.2) indicated that fenvalerate and

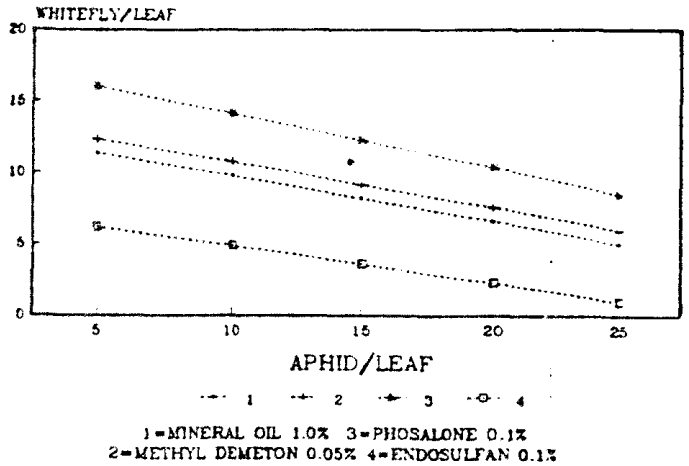


Fig. 3. Association of aphid and whitefly in cotton

phosalone-treated niches and the niche which was not treated with any insecticide recorded 96.96, 58.80 and 40.22 per cent parasitization of aphids respectively while it was only 31.57, 29.10, 23.10, 21.71, 19.67, 14.8 and 13.83 per cent in niches exposed to mineral oil, methyl demeton, neem oil, endosulfan, monocrotophos, fish oil rosin soap and triazophos respectively. The build-up of *A.gossypii* during the terminal phase of crop growth due to application of different insecticides and corresponding build-up of *Aphidencyrtus* sp.on *A.gossypii* were reported earlier by Sundaramurthy and Basu (in press). According to them, the abundance of the parasite was high in monocrotophos-treated niche followed by fluvalinate, carbaryl and DDT-treated ones. Negative association between the aphid and whitefly was also seen (Fig.3) in the niches exposed to phosalone (r= -0.81), mineral oil (r=-0.77) methyl demeton (r=-0.72) and endosulfan (r=-0.46) (Fig.3). In these niches, if there was an increase of 10 aphids, there would be a corresponding decrease of 3.8, 3.2, 3.2 and 2.6 nymphs of whitefly respectively. A similar species displacement effect was reported earlier by Natarajan *et al.* (1986b).

REFERENCES

GOUR,T.B. 1986. Factors influencing whitefly outbreak - A review. *Proc. Natl. Symp.* Resurgence of sucking pests, TNAU, Coimbatore, p.p. 95-102.

GREATHEAD,D.J., and BENNETT,F.D. 1981. Possibilities for the use of biotic agents in the control of whitefly, *Bemisia tabaci. Biocontrol News Inf.*, **2**, 7-13.

JOHNSON,M.W., TOSCANO,N.C., REYNOLDS, H.T., SYLVESTER,E.S., KIDO,K. and NATWICK, E.T. 1982.Whiteflies cause problems for southern California growers. *Calif. Agric.*, **36**, 24-26.

JOYCE,R.J.V. 1955. Cotton spraying in the Sudan Geizra, 'Entomological problem arising from spraying'. *FAO Plant Prot. Bull.*, **3**, 97-103.

MUSUNA,A.C.Z. 1983. A potential serious pest, whitefly. *Zimbabwe. Agric. J.*, **80**, 143-146.

NATARAJAN,K., SURULIVELU,T., SUNDARA MURTHY,V.T., BASU,A.K. and REDDY,A.S. 1986a. "Whitefly", *Tech. Bull. Central Institute for Cotton Research, Regional Station,* Coimbatore. pp 8.

NATARAJAN,K., SUNDARAMURTHY,V.T. and CHIDAMBARAM,P. 1986b. Whitefly and aphid resurgence in cotton as induced by certain insecticides. *Proc. Natl. Symp. Resurgence of sucking pests, Coimbatore,* pp 137-143.

RANGARAJAN,A.V., JAYARAJ,S., MUREGESAN, S. and THANGARAJU,D. 1986. Resurgence of cotton aphid, *Aphis gossypii* Glov. due to synthetic pyrethroids. *Proc. Natl. Symp. Resurgence of Sucking pests,* Coimbatore, pp144-159.

SCHULTZ,I.R. 1961. Further investigations on population trends of whitefly and jassid in cotton. *Ann. Rep. Res. Div.*, Min. of Agrl., Sudan 1960/61.

SUNDARAMURTHY,V.T. and BASU,A.K. Role of IPM in hybrid cotton production. Food and Agrl. Org.Bangkok (in press).

SURULIVELU,T. and SUNDARAMURTHY,V.T. 1986. Population behaviour of *Aphis gossypii* Glov. on cotton treated with certain insecticides and Neem oil. *Proc. Natl. symp. Resurgence of sucking pests*, Coimbatore, 1986, pp 150- 154.

WANGBOONKONG,S. 1981. Chemical control of cotton insect pests in Thailand. *Trop. Pest Mgmt.*, **27**, 495-500.