Research Article

Efficacy of Neem Based Insecticides in Combination with Conventional Insecticides for Managing *Bemisia tabaci* (Genn.) on Cotton under Haryana Condition

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Abstract

An experiment was conducted to evaluate the efficacy of neem based insecticides in combination with conventional insecticides for managing *Bemisia tabaci* population on cotton during *Kharif* season, 2013 at cotton research area of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The experiment was laid out under randomized block design with four replication of each of the six treatments including control. Two sprays of different insecticides on recommended dosages were done at five days interval in each treatment during peak season of whitefly infestation *i.e.* mid-August. The results showed that the overall mean of Treatment-4 (Nimbecidine 300ppm @ 1000ml/acre-Ethion 50 EC @ 500ml/acre) recorded much lower population of whitefly adults *i.e.* 36.52 per plant followed by Treatment-5 (Nimbecidine 300 ppm@1000ml/acre-Nimbecidine 300 ppm@1000ml/acre) (40.28 adults per plant) and Treatment-3 (Nimbecidine 300 ppm @1000ml/acre - Triazophos 40EC @600ml/acre) (41.52 adults per plant) in comparison to control (64.69 adults per plant).

Keywords: *Bemisia tabaci*, Nimbecidine, Ethion, Triazophos, Dimethoate

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Introduction

Bemisia tabaci (Genn.) is the most important sucking pest of polyphagous nature which has been reported to feed on more than 600 plant species of different families [1]. Biotype B among twenty different biotypes is considered as most aggressive as it was widely distributed over various regions of the world [2]. Both adult and nymphal stages of whitefly cause direct and indirect damage to the plant by sucking the cell sap from undersides of leaf surface and excretion of honeydew which serves as the medium for the growth of sooty mould fungus in turn decrease the photosynthetic rate. Under heavy infestation reduction of plant vigour, death of seedling, premature dropping of leaves may occur that ultimately reflects the lower yield. It also acts as a vector of various plant diseases [3, 4].

In recent years, this insect has grown to the status of unmanageable levels leading to failure of control or management practices. Heavy reliance on pesticides and their unjudicious use has resulted in severe outbreak of this pest in early and mid stages of crop growth leading to emergence of problems like insecticide resistance, resurgence of pest population, toxicity to non-target organisms, contamination in food chain and alteration in species dynamics [5]. Due to many biological characterstics of *B. tabaci* such as short life cycle, multivoltinism, broad host range, high reproductive rate, high migration rate and capacity to vectoring a number of plant diseases has made this pest more resistant to different insecticides. Hence, keeping above in view present study was undertaken to develop effective management strategies against this pest.

Material and Methods

The experiment was carried out at cotton research area of Chaudhary Charan Singh Haryana Agricultural University, Hisar during *Kharif* season, 2013. *Bt* cotton hybrid BIO 6588 BG II was sown under randomized block design with four replication of each of six treatments including control. The dimensions of plot were 10.8x7.2 m^2 and consisted of 16 rows with a spacing of 67.5x60 cm^2 (row to row and plant to plant). The crop was raised according to recommended agronomic practices for the area. Two sprays of different insecticides on recommended dosages were done at five days interval in each treatment during peak season of whitefly infestation *i.e.* mid-August to evaluate the

effectiveness of chemicals (**Figure 1**). The observations were made one day before and 1, 5 days after each spray on three leaves from ten randomly selected plants (**Figure 2**) in each plot to check the efficacy of treatments as whitefly adults usually emerge from their pupal cases within five days. Different treatments and their dosages were as follows:

- T_1: Nimbecidine 300 ppm @1000ml/acre followed by Triazophos 40EC @600ml/acre
- T_2: Nimbecidine 300 ppm @1000ml/acre followed by Dimethoate 30EC @300ml/acre
- T_3: Nimbecidine 300 ppm @1000ml/acre followed by Triazophos 40EC @600ml/acre
- T_4: Nimbecidine 300 ppm @1000ml/acre followed by Ethion 50 EC @ 500ml/acre
- T_5: Nimbecidine 300 ppm @1000ml/acre followed by Nimbecidine 300 ppm @1000ml/acre
- T_6: Untreated control

Data obtained from present study was subjected to analysis of variance (ANOVA). Insect counts were transformed using square root transformation at 0.05 % level of significance.

Figure 1 Spraying of insecticides by using knapsack sprayer

Figure 2 Whitefly adults on the cotton leaf

Results and Discussion

It is evident from the **Table 1** that there was homogeneous population of whitefly adults before applying the insecticides. It was observed that after one day of first spray, T_4 had 14.55 whitefly adults per plant which was found significantly at par with T_3 (17.33 adults/plant) and T_5 (18.25 adults/plant) over control. Five days after spray, minimum population of whitefly adults *i.e.* 10.28 per plant was recorded from T_4 as compared to all other treatments. [6] reported that both the neem products tested (Neem Oil and Neem Seed Kernel Extract) were found to reduce more than 50 and 60 per cent of whitefly population 3 and 7 days after spray, respectively, which supports the present findings. Similarly, [7] reported that neem oil @ 2 per cent and NSKE @ 3 per cent significantly reduced the whitefly infestation up to 12 days after spray as compared to that in the control.

Table 1 Effect of different treatments on population of whitefly adults

Treatment	Before spray	1st Spray		2nd Spray		Pooled mean
		1 DAS	5 DAS	1 DAS	5 DAS	
T1	120.6	39.63	32.65	27.2	53.93	54.8
	(11.02)*	(6.28)	(5.77)	(5.25)	(7.34)	(7.18)
T2	120.48	52.38	36.73	33.58	43.58	57.35
	(11.02)	(7.27)	(6.02)	(5.87)	(6.64)	(7.4)
T3	120.03	17.33	21.53	19.68	29.03	41.52
	(11)	(4.24)	(4.74)	(4.54)	(5.45)	(6.01)
T4	119.93	14.55	10.28	10.85	26.98	36.52
	(10.99)	(3.93)	(3.31)	(3.42)	(5.28)	(5.4)
T5	119.98	18.25	18.25	17.1	27.83	40.28
	(11.01)	(4.31)	(4.36)	(4.25)	(5.33)	(5.88)
T6 (Control)	120.73	74.48	40.48	49.13	38.65	64.69
	(11.03)	(8.63)	(6.42)	(7)	(6.24)	(7.9)
CD (p=0.05)	(N.S.)	(1.1)	(1.03)	(0.97)	(1.23)	(1.06)
SE(m)	0.02	0.36	0.33	0.31	0.4	0.35

*Figures in parentheses are the square root transformed values ($\sqrt{n+1}$). DAS- Days after Spray

In second spray, population of whitefly population (10.85 adults/plant) recorded one day after spray was found minimum in T_4 (Ethion 50 EC) followed by T_5 (Nimbecidine 300ppm) (17.10 adults/plant). After five days of spray, T_4 had lower population (26.98 adults/plant) as compared to T_1 (Triazophos 40 EC), T_2 (Dimethoate) and T_6 (Control). Also, it was found significantly at par with T_5 (Nimbecidine 300ppm) and T_3 (Triazophos 50 EC) with a population of 27.83, 29.03 adults/plant, respectively. The overall mean of different treatments revealed that T_4 (Nimbecidine 300ppm @1000ml/acre-Ethion 50 EC @500ml/acre) recorded much lower whitefly population *i.e.* 36.52 adults per plant over control (64.69 adults per plant). The present studies are in accordance with [8] who reported that spray of NSKE 5 per cent alternated with ethion and novaluron were the most effective treatments in controlling whitefly adult population on mungbean crop. The present findings are in confirmation with [9] who reported that alternate sprays of neem-based insecticides with conventional insecticides under field conditions reduces about 50 per cent of synthetic insecticide load on cotton. However, T2 (Dimethoate 30 EC) was the least effective and recorded a higher number of whitefly adults (57.35) after control. Earlier dimethoate was found to be the most effective at 15-days interval on cotton in Hisar [10]. This variation in the efficacy may be either due to resistance build up against insecticide or different environmental conditions at the time of investigation.

Conclusion

On the basis of above results it is concluded that the among different treatments employed for the management of cotton whitefly during mid-stages of crop growth T_4 (Nimbecidine 300pm followed by Ethion 50 EC) resulted in maximum reduction of whitefly population *i.e.* 36.52 adults/plant) followed by T_5 (Nimbecidine 300ppm-Nimbecidine 300 ppm) and T_3 (Nimbecidine 300 ppm -Triazophos 40EC) but the population was relatively higher than Economic Threshold level *i.e.* 6-8 adults per leaf. This may be due to hormoligosis effect of insecticides that leads to higher reproductive rates of the pest as well as favourable environmental conditions such as high temperature, poor rains (< 200 mm) during growth period.

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