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COMPARATIVE EFFICACY OF SOME INSECTICIDES AGAINST COTTON WHITEFLY, *BEMISIA TABACI* (GENNADIUS) (HOMOPTERA: ALEYRODIDAE) UNDER NATURAL FIELD CONDITIONS

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Comparative efficacy of five commonly used insecticides *viz*., acetamiprid, buprofezin, diafenthiuron, imidacloprid and endosulfan against nymph and adult population of cotton whitefly, *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae) under natural field conditions has been studied. Results showed that buprofezin was the most effective insecticide against nymph population of whitefly among the tested insecticides where nymphal population of *B. tabaci* was 0.2/leaf after 24h spray as compared to 1.9/leaf in control. Acetamiprid was the most effective against adult population of whitefly (0.3 to 1.3/leaf post 72 h spray, as compared to control with 6.9 to 8.2/leaf) followed by diafenthiuron and imidaclopirid. whereas, endosulfan was found to be the least effective on both populations as adult and nymph of whitefly. From the tested insecticides, acetamaprid gave effective control of both nymph and adult population of *B. tabaci*.

Keywords: Insecticide Efficacy, Cotton, Whitefly.

1. Introduction

Cotton, *Gossypium hirsutum* L., is the most important cash and fiber crop of Pakistan, known as “the white gold”. In Pakistan it is cultivated on an area of 2.820 million hectares with a production of 11819 thousand bales. It is the significant source of foreign exchange earning and accounts for 7.3% of the value added products in agriculture alongwith 1.6% to GDP in Pakistan [1]. Pakistan is the world’s fourth largest producer of cotton and the third largest exporter of raw cotton, nevertheless facing the problem of low yield per acre as 713 kg/ha which is low as compared to other cotton producing countries of the world. Many factors are contributing towards this low yield of cotton, among them the heavy insect pests attack are the significant one. These pests of cotton are mainly divided into two groups as sucking and bollworms. Among the sucking pests, whitefly, *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae) is the most detrimental pest of crop. It causes significant losses to cotton by sucking the cell sap from the lower side of leaves and secretes honeydews on which sooty mold develops which interferes with plant photosynthesis ultimately reducing the plant vigour and yield. Furthermore it is believed that adults of whitefly also serve as the vector of viral disease in cotton [7]. Among different control measures against sucking pests, the use of chemical pesticides for the control of insect pest is quick and rapid one are commonly in practice for integrated pest management of crop (IPM) [15]. But due to continuous use of these conventional insecticides in cotton, *B. tabaci* has developed different level of resistance in it [2, 3, 8]. Resistance in whitefly against insecticides has increased the cost of production owing to increase in number of sprays.

Efficacy of insecticides against sucking pests of cotton was carried out according to the required IPM of crop by the previous workers like Arif *et al* .[6] who have conducted their experiments by using buprofezin in comparison with some eco-friendly substances against whitefly in cotton under field environment. The mean population of whitefly was significantly alike post 24, 48 and 72 hours with

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3.81, 3.57 and 3.33/leaf after first spray respectively. Similarly Razzaq *et al.* [9] have studied the efficacy of five insecticides included diafenthiuron, acetamiprid, imidacloprid, thiamethoxam and fenpropathrin against whitefly and found its population below economic threshold level (ETL) in plots treated with acetamiprid (3.38/leaf) and diafenthiuran (2.69/leaf) post seven days of application. Almost a similar trend of population was observed after 2nd, 3rd, 4th and 5th spray. Presently, entomologists are in efforts to test and use the new chemistry insecticides against whitefly for its effective control. The present study was, therefore, conducted to compare the efficacy of some new chemistry insecticides with the conventional insecticide against the nymph and adult population of *B. tabaci* under natural field conditions.

2. Materials and Methods

The study was carried out under natural field conditions at Khakhawani agricultural farm, Multan, by sowing cotton cultivar MNH-786 during 1st week of May, 2008. The experiment was laid down under randomized complete block design with 6 treatments including control with each of in 3 replicates. An area of 4.6×7.6 m was maintained in each replicate of treatment. A path of 1.5 m between plot to plot was maintained as non experimental area. Distance of plant to plant (P×P) = 30 cm and row to row (R×R) = 75 cm was maintained in 6 experimental lines of cotton in each plot. All the recommended agronomic practices (Preparation of land, hoeing, weeding, irrigations and fertilization) were adopted from sowing to picking of cotton. The following insecticides were selected and tested against nymph and adult population of whitefly, *Bemisia tabaci*.

Total four sprays were applied in cotton by the use of knack sap sprayer during July-August in early hours of morning when whitefly population reached above ETL (5/leaf). The data on whitefly nymphs and adults was recorded just before applying insecticides and 24, 48 and 72 hours post treated insecticides by selecting 10 plants in each replicate of respective treatment. From each plant, one leaf of average size was selected at each height *i.e*., upper, middle and lower portions and population count was noted, their average were taken as per leaf per plant basis. The collected data was analyzed by using MSTATC software programme and significant of means were compared by using DMRT [10].

3. Results and Discussion

3.1. Whitefly Nymphs

Results showed significant differences of pest population recorded in treatments after observed 24, 48 and 72 hours of 4 sprays of tested insecticide. The average nymph population of *B. tabaci* (per leaf) during 1st , 2nd, 3rd and 4th spray after 24, 48 and 72 hours were recorded as 0.4, 0.2, 0.2, 1.8, 1.2, 1.1, 2.2, 1.8, 1.6, 2.1, 1.8 and 1.6, respectively (Table 2). Other treatments gave control of nymph population of *B. tabaci* was in order of their effectiveness observed as imidachloprid, acetamiprid and diafenthiuron. Endosulfan gave the least control of nymphal population as compared to other insecticides. Failure of endosulfan for the control of *B. tabaci* may be due to the development of resistance in pest against this insecticide. In control treatment the average nymph population was observed as 1.8, 1.9, 2.0, 2.6, 2.7, 2.8, 4.2, 5.2, 5.4, 6.9, 5.2 and 5.0, respectively (Table 2). Findings of our results are comparable to that of Arif *et al*. [6], reported

Table 1. Insecticides with their formulations and doses used against *B. tabaci*.

Treatments	Common name	Formulation	Trade name	Source	Dose
T_1	Acetamiprid	20 SP	Mospilon	Arysta	150g/acre
T_2	Buprofezin	25WP	Buprofezin	AliAkbar	600g/acre
T_3	Diafenthiuron	500EC	Polo	Syngenta	250ml/acre
T_4	Imidacloprid	200SL	Confidor	Bayer	250ml/acre
T_5	Endosulfon	35EC	Thiodan	Bayer	800ml/acre

Table 2. Whitefly nymphs population/leaf at different time interval of spray.

Treatments	1st Spray			2nd Spray			3rd Spray			4th Spray		
	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
T_1	1.4 a	1.2 c	1.0 a	2.0 a	2.2 b	2.1 a	2.1 a	3.9 b	3.7 b	3.9 b	4.6 c	4.3 a
T_2	0.4 b	0.2 d	0.2 b	1.8 ab	1.2 d	1.1 ab	2.2 b	1.8 d	1.6 cd	2.1 c	1.8 f	1.6 c
T_3	1.2 a	1.0 bc	1.0 a	2.1 a	1.9 c	1.8 a	3.8 ab	3.2 c	2.9 c	4.2 ab	4.9 d	4.8 b
T_4	1.3 a	0.8 c	0.7 ab	1.8 ab	1.6 c	1.4 a	3.0 b	2.7 c	2.6 c	3.8 ab	4.5 e	5.2 b
T_5	1.7 a	1.4 ab	1.3 a	2.5 a	2.3 ab	2.2 a	3.1 a	3.8 a	3.9 b	5.6 a	5.4 b	4.2 ab
Control	1.8 a	1.9 a	2.0 a	2.6 a	2.7 a	2.8 a	4.2 a	5.2 a	5.4 a	6.9 a	5.2 a	5.0 a

Means sharing similar alphabets are statistically non significant ($P < 0.05$).

results of their experiments by using buprofezin in comparison with some eco-friendly substances against whitefly in cotton under field environment and observed its population 3.81, 3.57 and 3.33/leaf after application of first spray, respectively. Findings of Ishaaya and Mendleson, [14]; Ali *et al*. [4] are in agreement to our findings on the effectiveness of buprofezan against whitefly.

3.2. Whitefly Adults

Adult population (per leaf) of whitefly was recorded as the lowest with 24, 48 and 72 hours post spray after 1st, 2nd, 3rd and 4th spray with acetamiprid, with significantly less population of 0.7, 0.5, 0.3, 1.2, 1.0, 0.9, 1.6, 1.3, 1.2, 1.9, 1.5 and 1.3, respectively as compared to control (Table 3). Population trend of adult whitefly after 4 sprays of each 3 readings of hours were 1.3, 1.4, 4.0, 4.1/leaf as in diafenthirn, imidacloprid, buprofezin, whereas, the highest population (4.4/ leaf) among the treatments were recorded where endosulfan was sprayed. In control treatment, a population trend of adult whitefly was observed as 6.5, 6.7, 6.9, 7.0, 7.8, 6.0, 8.9, 9.2, 8.5, 8.9, 8.6 and 8.2 after 1st, 2nd, 3rd and 4th spray post 24, 48 and 72 hours, respectively. For the control of both nymph and adult populations, the effectiveness of pesticide was recorded in the order of acetamaprid, imidacloprid, diafenthiuron, buprofezin and endosulfan. 1st spray with buprofezin followed by acetamaprid in cotton crop proved to be the effective sequence for control of both nymph and adult population of whitefly.

Our findings in the present study are in conformity to those of the results reported by Natwick and Deeter [11], Parrish [12] and Aslam *et al.* [13] who recorded effective control of population of *B. tabaci* by the application of acetamaprid. Razzaq *et al.* [9] have reported the efficacy of five insecticides namely diafenthiuron, acetamiprid, imidacloprid, thiamethoxam and fenpropathrin against whitefly and found the population of whitefly below ETL in plots treated with acetamiprid (3.38/leaf) and diafenthiuran (2.69/leaf) are agreed to our findings where we observed acetamaprid as most effective for the mortality of *B. tabaci*. Contradictory results in comparison to present study were obtained by Amjad *et al*. [5], who reported that confidor (Imidacloprid) gave effective control of whitefly population while, in our study confidor proved to be the intermediate insecticide for the control of whitefly.

4. Conclusions

The overall results manifest that to get effective control of whitefly soon after its onset, buprofezin proved to be the most effective against nymphs of whitefly population among the tested insecticides. While, subsequent sprays with acetamiprid was recorded to be the most effective against adults population of whitefly followed by imidacloprid and diafenthiuron. Endosulfan was least effective for the control of both adults and nymphs population of whitefly amongst the tested insecticides.

Table 3. Whitefly adults population/leaf at different time interval of spray.

Treatments	1st Spray			2nd Spray			3rd Spray			4th Spray		
	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
T_1	0.7 c	0.5 c	0.3 c	1.2 c	1.0 c	0.9 c	1.6 c	1.3 c	1.2 b	1.9 c	1.5 c	1.3 c
T_2	2.8 b	2.6 b	2.4 b	3.8 b	3.7 b	3.5 b	5.8 b	4.9 b	5.0 b	5.3 a	4.7 b	4.7 b
T_3	1.1 c	0.8 c	0.8 c	1.5c	1.1 c	1.0c	1.8 c	1.5 c	1.5 c	1.9 b	1.6 c	1.5 c
T_4	1.4 c	1.0 c	0.9 c	1.6 c	1.3 c	1.2 c	1.9 c	1.6 c	1.6 c	2.0 c	1.7 c	1.5 c
T_5	3.2 b	3.0 b	2.8 b	3.8 b	3.7 b	3.7 b	5.0 b	4.8 b	4.8 b	5.5 b	4.1 b	3.9 b
Control	6.5 a	6.7 a	6.9 a	7.0 a	7.8 a	6.0 a	8.9 a	9.2 a	8.5 a	8.9 a	8.6 a	8.2 a

Means sharing similar alphabets are statistically non significant ($P < 0.05$).

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