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Ijaz Ahmed

Pest Warning and Quality
Control of Pesticides Layyah,
Layyah, Pakistan

Ilyas Raza

Pest Warning and Quality
Control of Pesticides, Dera Gazi
Khan, Pakistan

Abdul Majid

Pest Warning and Quality
Control of Pesticides Layyah,
Layyah, Pakistan

Muhammad Aqil Qureshi

Pest Warning and Quality
Control of Pesticides Ahmadpur
East, Bahawalpur, Pakistan

Mubashar Iqbal

Pest Warning and Quality
Control of Pesticides Chishtian,
Bahawalnagar, Pakistan

Asmat Nawaz

Pest Warning and Quality
Control of Pesticides Chobara,
Layyah, Pakistan

Abdul Khaliq

Pest Warning and Quality
Control of Pesticides Fort Abbas,
Bahawalnagar, Pakistan

Corresponding Author:**Abdul Khaliq**

Pest Warning and Quality
Control of Pesticides Fort Abbas,
Bahawalnagar, Pakistan

Current scenario of efficacy of some chemical combinations for the control of whitefly (*Bamisia tabica*) on different genotypes of cotton crop

Ijaz Ahmed, Ilyas Raza, Abdul Majid, Muhammad Aqil Qureshi, Mubashar Iqbal, Asmat Nawaz and Abdul Khaliq

Abstract

White gold is very important fiber crop grown all around the globe. Plenty of insect pests attack on cotton crop including whitefly as most important one. Every year provoking whitefly infestation is inclining as a serious threat to our cotton crop. Farmers are regularly using many chemicals to manage all the stages of this pest. At farm level efficacy of different chemicals may varies due to different factors. Therefore, a study was planned to check the current scenario of efficacy of some chemical combinations for the control of whitefly (*Bamisia tabica*) on different genotypes of cotton crop. In this regard cotton varieties J5, BS15, FH490, CKC1 and IUB2013 were planted in field at area of 1 acre for each and sprayed three different chemical combinations as Fenpropethrin+ Buprofezin (P₁), Omathoate+ Buprofezin (P₂) and Dinotifuron+ Pymetrin+ Buprofezin (P₃). Results showed that application of P₃ performed best as both adult and nymphs were more killed. While P₂ proved second most effective combination that managed the adults and nymphs as well. P₁ combination was least effective as whitefly adults were not controlled. Therefore in severe whitefly infestation pesticide combination as Dinotifuron+Pymetrin+ Buprofezin proved best to check its population below economic threshold level. It can be incorporate as an important chemical tool in integrated pest management program.

Keywords: whitefly, Buprofezin, fenpropethrin, Omathoate, Dinotifuron, mortality

Introduction

Cotton known as a white gold is a major crop grown on a large area in Pakistan (Shah, *et al.*, 2020) [9]. On cotton plenty of insect pest attack during the growing season (Razaq, *et al.*, 2003) [7]. It is reported that in cotton crop more than 1350 different insect species attack all around the world (Amjad, *et al.*, 2009) [2]. These insect pest attack on the cotton crop there are two basic types one is suck the cell sap of the plant known as sucking insect pest wild rose feed on the different vegetative parts of the plant or chew with their mandibles known as chewing insect pests (Atwal and Dhaliwal, 2015, Shah, Paredes-Montero, Malik, Brown and Qazi, 2020) [4, 9]. After the start of cultivation of BT cotton some changing insects has been managed but II complex attack on all kind of varieties with same potential (Sharaf, 1986) [10].

Among sucking complex whitefly thrips, jassid and mealy bug are the most prominent insect pest of cotton that are attacking regularly and create a great loss quantitative Lee and qualitatively (Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003) [3]. It has been observed from last 3 years that infestation of whitefly is increasing regularly and disturb the Cotton crop in each season (Amjad, Bashir, Afzal and Khan, 2009, Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003) [2, 7]. Intensive sucking of the young ones of the whitefly weakens the plot and due to their secretion of the honey dews sooty mold deposition causes the blackening of the Cotton plants (Ali, *et al.*, 2017, Atwal and Dhaliwal, 2015) [1, 4]. In response to the deposition of sooty mold are black fungus on the leaves disturb the photosynthetic activity of the plant resulting decrease in the cotton production (Atwal and Dhaliwal, 2015, Gerling and Sinai, 1994) [4]. While the adult of the whitefly is a good flyer that multi fold its population and under suitable conditions female start egg lying intensively (Amjad, Bashir, Afzal and Khan, 2009, Atwal and Dhaliwal, 2015) [2, 4]. Female whitefly lay eggs singly at different places underside the leaf where the egg has within a week and the young one of the whitefly start feeding immediately after hatching and fixed himself moving a few mm only (Atwal and Dhaliwal, 2015, Sclar, *et al.*, 1999) [4].

The losses due to whitefly are very high and increasing day by day in the developing countries like Pakistan with the increase of the whitefly infestation not only the new flowering and fruiting is disturbed but the balls formation immature bolls become slow and shedding of the new brackets take place in response to the intensive feeding of this insect (Amjad, Bashir, Afzal and Khan, 2009, Atwal and Dhaliwal, 2015, Sharaf, 1986) ^[2, 4, 10]. Therefore due to the less number of balls formation on each plant results decrease in the per acre yield (Shah, Paredes-Montero, Malik, Brown and Qazi, 2020, Žanić, *et al.*, 2008) ^[3]. It is therefore needed to manage this insect pest in order to save the per acre production long with other insect pests also Different chemical insecticides are available in the market that are being used in the field condition by the farmers (Amjad, Bashir, Afzal and Khan, 2009, Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003) ^[2, 7]. These insecticides belong to different group of chemicals for the control of all stages of the whitefly (Amjad, Bashir, Afzal and Khan, 2009, Kim, *et al.*, 2001, Žanić, Goreta, Perica and Šutić, 2008) ^[2, 6, 12]. Response of these chemical combinations is variable from farmers two farmer and it also variable in response to the population being controlled with the help of these pesticides combinations itself (Kim, Lee, Yoon, Kim, Yoo and Kim, 2001, Thumar, *et al.*, 2018) ^[6, 11].

As with the passage of time resistance against different insecticides is reported by the scientist in the field experimentation (Žanić, Goreta, Perica and Šutić, 2008) ^[12]. Therefore, it is mandatory to evaluate these insecticides with different combinations being used in the field level. In this regard a study was planned to estimate the response are efficacy of some insecticide combinations against white fly infestation at the field level this methodology plan 3 different insecticide combination groups were used as a treatment and was sprayed at one acre plot to check their status.

Materials and Methods

Selection of the experimental site

In the field condition three plots at different locations were selected in which whitefly infestation was equal because pest scouting was conducted before to start the experiments.

Selection of insecticide combinations

The most suitable chemical combinations were selected that were being used by the farmers at the field level for the control of whitefly infestation.

Pesticide Combinations

Sr. No.	Pesticide Combinations	Dose per Acre
01	Fenprothrin+ Buprofezin	125ml+600gm
02	Omthoate+ Buprofezin	500ml+600gm
03	Dinotifuron+Pymetrin+Buprofezin	250ml+600gm

In these combinations the insecticides were planned to control the both whitefly names and adults chemical combinations was afraid at recommended dose of per acre after proper calibration of these Chemicals the supply was performed at

the best time of the day after 5 p.m.

Experimental Procedure

Keeping in view the importance of this crop and the use of pesticide the present study was conducted to evaluate five cotton varieties against whitefly, to investigate its population trend and to evaluate best insecticide for its management. In this regard cotton varieties J5, BS15, FH490, CKC1 and IUB2013 were planted in field at area of 1 acre for each. Pest scouted the data of adults population at 2, 4 and 6th day of pesticide spray and the plants were marked for observation.

Experimental layout

Experimental layout the experiment was conducted and completely randomized design where the blocks were created at different sites including all experimental treatments (Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003) ^[7].

Data recording procedure to record the whitefly infestation after the application of each insecticide combination best scouting kids were utilized in which magnifying lens area measuring scale data recording book was the most important (Aslam, *et al.*, 2003, Sharaf, 1986) ^[3, 10].

After application of the pesticide spray the data was recorded on second 4th and 6th today or after application of treatment the data for the whitefly adults and nymphs was recorded from the same point where the best scouting spot was elected (Sharaf, 1986) ^[10]. Hair the end of the completion of the experiment how old additives analyzed with the help of statistical soccer and Takeys test was used for mean values of each treatment (Aslam, Razaq, Rana and Faheem, 2003, Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003, Sharaf, 1986) ^[3, 7, 10].

Keeping in view the importance of this crop and the use of pesticide the present study was conducted to evaluate five cotton varieties against whitefly, to investigate its population trend and to evaluate best insecticide for its management. In this regard cotton varieties J5, BS15, FH490, CKC1 and IUB2013 were planted in field at area of 1 acre for each. Pest scouted the data of adults population at 2, 4 and 6th day of pesticide spray and the plants were marked for observation. Among cotton varieties the CKC1 was proved more resistant for whitefly as compared to others. Pesticide combinations Fenprothrin+Buprofezin, Omthoate+Buprofezin and Dinotifuron+Pymetrin+Buprofezin at recommended dose proved that two aforementioned were poor to control the both nymphs and adults of whitefly population. While the last combination was highly effective to control the both stages of test insect as strongly recommended for whitefly management under field conditions (Aslam, Razaq, Rana and Faheem, 2003, Sharaf, 1986) ^[3, 10].

Statistical analysis

Data were analyzed statistically by using R version 3.4.3 (Kite-Eating Tree). ANOVA was used for comparison between pesticides and years by using factorial Completely Randomized Design.

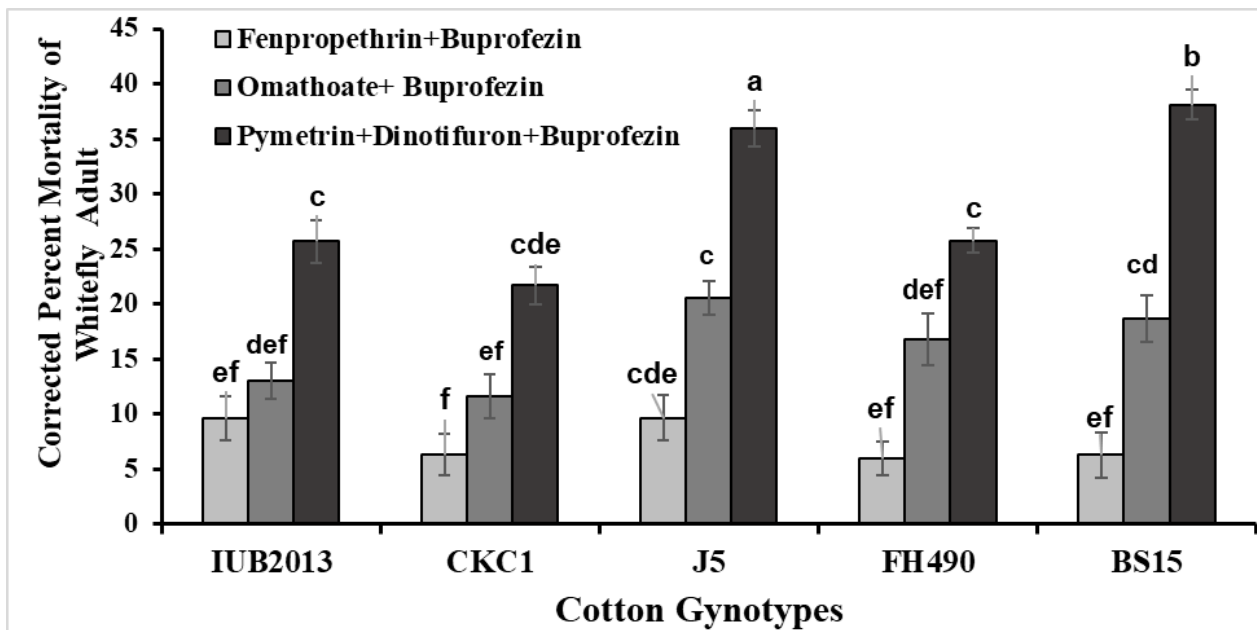


Fig 1: Data for the whitefly (adult) on upper middle and lower leaves was also significantly recorded at 2, 4 and 6th day of the pesticide application in the field for each treatment on same conditions.

Results

After conducting the experiment, significant mortality percentage was recorded at 2, 4 and 6th day of the pesticide application in the field for each treatment on same conditions. The results calculated significant increase in the mortality with the passage of time. The response of the whitefly mortality was variable against different cotton genotypes as showed in the figure no. 1. Highest mortality response against adults was observed in the combination of Pymetrin+

Dinotifuron+ Buprofezin at standard dose. While Fenpropethrin +Buprofezin proved least effective as lowest corrected mortality was recorded. In order to that Omathoate+ Buprofezin combination proved second most effective insecticides to kill whitefly. In case of varietal performance J5 was the second after BS18 cotton genotype on which maximum mortality of adult whitefly was observed. The CKC1 was the only cotton genotype which proved vulnerable towards this sucking insect.

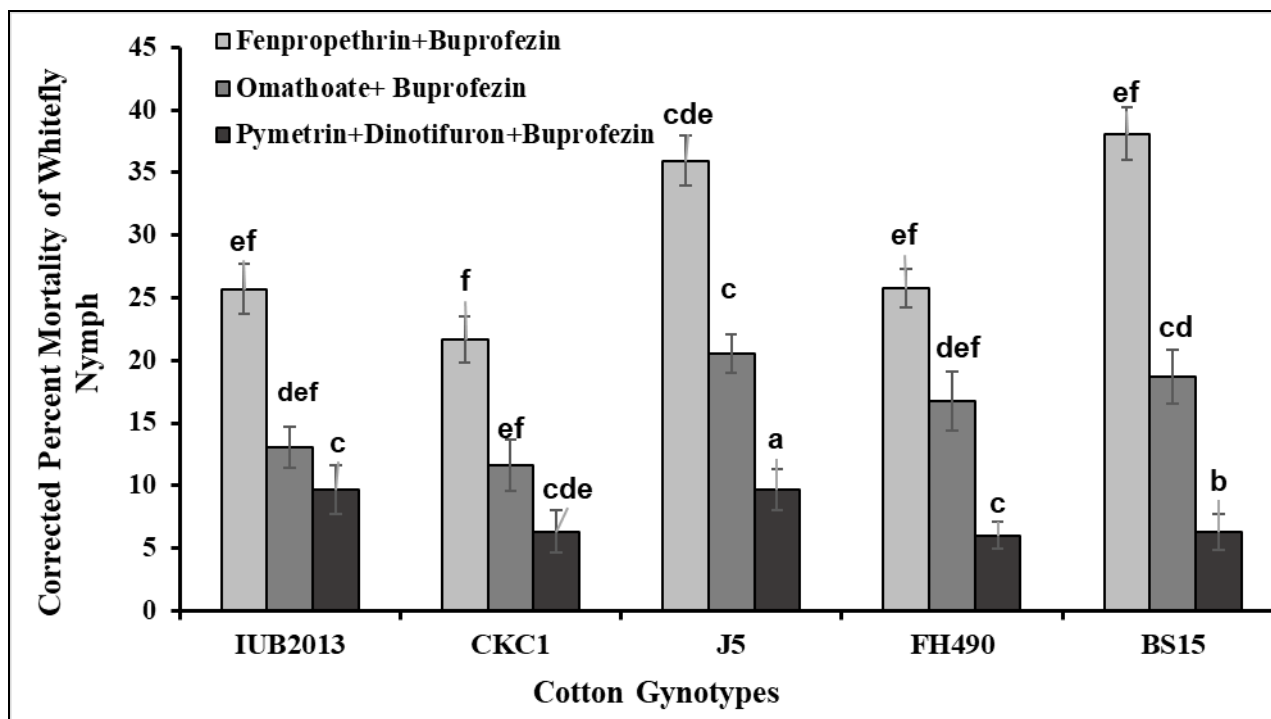


Fig 2: Graph for the whitefly nymphs on upper middle and lower leaves was also significantly recorded at 2, 4 and 6th day of the pesticide application in the field for each treatment on same conditions

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Discussion

Plenty of alternative hosts have been reported where whitefly can proliferate successfully (Shah, Paredes-Montero, Malik, Brown and Qazi, 2020) ^[9]. With the passage of time resistance is the major problem in cotton whitefly in different parts of the countries (Amjad, Bashir, Afzal and Khan, 2009) ^[2]. Study was dissimilar in response of insecticides like observed against sucking complex on cotton variety NIAB-98 (Razaq, Aslam, Iqbal, Hussain and Shahzad, 2003) ^[7]. Buprofezin and fenpropethrin among five other pesticides response was comparatively high when sprayed against *B. tabaci* at recommended dose (Amjad, Bashir, Afzal and Khan, 2009) ^[2]. Combination of adult and nymph insecticides (Diafenthiuron 25% + pyriproxyfen 5% SE (1000 and 1250 ml/ha) also performed well against white fly mortality (Thumar, Borad, Pathan, Bharpoda, Saiyad and Chaudhary, 2018) ^[11]. Results showed that buprofezin killed the early instars more as compared to the later instars (Gerling and Sinai, 1994) ^[5]. Another research revealed that timely application of these chemicals is very important to control the whitefly infestation properly (Sharaf, 1986) ^[10]. Use of buprofezin against whitefly not only manage the pest but it is also lethal for all stages of its parasitoids too (Sharaf, 1986) ^[10]. In a study spiromesifen and buprofezin tested against *B. tabaci* were highly effective to lower its nymphal stages applied for managing this pest on spring cantaloupes (Sharaf, 1986) ^[10].

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