

## Comparative Efficacy of Some Eco-Friendly Substances/Chemicals Against Cotton Whitefly (*Bemisia tabaci* Genn.)

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### ABSTRACT

Present studies were carried out to determine the comparative efficacy of some eco-friendly substances/chemicals viz; mustard oil, laundry detergent, tannery effluent and buprofezin against cotton whitefly (*Bemisia tabaci* Genn.). The treatments used included mustard oil @ 2 and 3%, laundry detergent @ 25 and 30 ml/L, tannery effluent @ 5 and 7.5 ml/L and buprofezin @ 80 gm/L. The highest population suppression was found with the application of mustard oil @ 3% followed by mustard oil @ 2%, while the lowest population suppression was found with tannery effluent @ 5 ml/L followed by the suppression with tannery effluent @ 7.5 ml/L. The intermediate suppression was found with laundry detergent @ 30 ml/L, laundry detergent @ 25 ml/L and buprofezin @ 80 gm/L.

**Key Words:** Insecticide; Mustard oil; Tannery effluent; Laundry detergent; Eco-friendly; Whitefly; Cotton

### INTRODUCTION

Cotton, the silver fiber, enjoys pivotal role by providing fiber, food and fuel. It sustains thousands of people for their livelihood by providing raw materials to 1035 ginning factories, 319 spinning mills, 8.1 million spindles and 5000 oil-exPELLING unites (Khan & Khan, 1995). Cotton also adds 35.46% to our foreign exchange earnings (Anonymous, 1997). Therefore, it is imperative need to produce maximum and best quality cotton in Pakistan. But unfortunately, production as well as quality of cotton is handicapped by a large number of insect-pests. Among these, whitefly (*Bemisia tabaci* Genn.) has become the most notorious sucking insect-pest. It desaps the leaves rendering stunted growth and depleted vigor to cotton (Mushtaq, 1995). It also produces honeydews on which sooty-mould grows which renders the fibre quality unfit for marketing (Denhoia & Birnie, 1990). Further more, whitefly also transmits deadly CLCV (Iqbal, 1993), which in 1992 affected an area of 243949 acres with significant production losses of 543294 bales (Anonymous, 1995). To overcome this threat, farmers totally depend on injudicious use of insecticides that are rendering to the environment with mutagenic, carcinogenic and teratogenic effects (Pedigo, 1996).

This threatening situation makes it imperative to study the efficacy of such substances/chemicals which are effective against insect pests but least hazardous to environment. In this regard, Bulter *et al.* (1991) used plant derived oil (cotton seed oils) and detergent on cotton against whitefly and reported a reduction of 62-75% in whitefly population with plant derived oil and 56% with laundry detergent. Bulter and Henneberry (1992) documented that

one or two applications of 1-2% plant derived oils (cotton seed oil and soybean oil) in water on cotton, water-melon, squashes and cucumber, repelled or killed the adults and immature of *B. tabaci* upto 7 days and caused no significant phytotoxicity. Ishaaya (1990) experimented that buprofezin was highly effective against *B. tabaci* at the rate of 125-150 gm/L. Keeping in view above, this study was planned to find out the efficacy of some other eco-friendly substances/chemicals against *B. tabaci*.

### MATERIALS AND METHODS

These studies were conducted at Ayub Agricultural Research Institute (AARI), Faisalabad. Seven treatments viz., mustard oil @ 2 and 3%; laundry detergent @ 25 and 30 ml/L; tannery effluent @ 5 and 7.5 ml/L, and buprofezin @ 80 gm/L had three replications each. A control plot was also left untreated to compare pest population with that of treated plots. All the treatments were applied when the tested-pest reached ETL. All the plots (30 x 15 ft each) were entertained with the same cotton variety (karishma) and uniform cultural operations during whole the season. The experiment was laid out in RCBD with seven treatments and three replications for each. The sprayable mixtures of each treatment in water were prepared and applied by knapsack sprayer for five times during whole the period of experimentation and data were collected 24, 48 and 72 hours after every application of treatments. For recording data, five plants were selected at random in each treatment. Then data were statistically tested by ANOVA. Means of whitefly population were calculated and subjected to DMR Test at 5% probability (Steel & Torrie, 1980).

## RESULTS AND DISCUSSION

The overall mean population of whitefly per leaf after the application of first, second, third, fourth and fifth spray revealed that all treatments, except tannery effluent @ 5 and 7.5 ml/L, gave significant results and kept the whitefly population below ETL (5 individuals per leaf) (Table I). Similarly, in case of mustard oils, laundry detergents and buprofezin the population reduction trend, was found positive (increasing) after 24, 48 and 72 h, respectively.

The overall mean population of whitefly per leaf after the application of first spray revealed that mustard oil 3% showed maximum reduction in whitefly population (1.74 per leaf) which was statistically at par with mustard oil 2% (2.02 per leaf). Whereas, laundry detergent @ 30 and 25 ml/L and buprofezin 80 gm/L revealed intermediate reduction in whitefly population of 2.73, 2.80 and 3.75 per leaf, respectively and were statistically similar with one another and with mustard oil 2% (2.02 per leaf). Minimum population reduction of whitefly per leaf was observed in tannery effluent @ 7.5 and 5 ml/L (6.51 and 6.60 per leaf, respectively) and both treatments were statistically at par with each other but differ from all other treatments.

The overall mean population of whitefly per leaf after the application of second spray revealed that mustard oil 3% showed maximum reduction in whitefly population (1.49 per leaf) and was statistically at par with mustard oil 2% (1.84 per leaf), laundry detergent @ 30 ml/L (1.96 per leaf), laundry detergent @ 25 ml/L (2.11 per leaf) and buprofezin 80 gm/L (2.84 per leaf). While minimum population reduction of whitefly per leaf was observed with tannery effluent @ 7.5 and 5 ml/L (7.71 and 8.14 per leaf, respectively), which were statistically similar to each other but different from all other treatments.

The overall mean population of whitefly per leaf after the application of third spray revealed that mustard oil 3% showed maximum reduction in whitefly population (1.20 per leaf) which was statistically at par with mustard oil 2% (1.55 per leaf). While laundry detergent @ 30 and 25 ml/L and buprofezin 80 gm/L revealed intermediate reduction in whitefly population of 2.38, 2.53 and 2.97 per leaf, respectively and were statistically similar with one another

and mustard oil 2% (1.55 per leaf). Minimum population reduction of whitefly per leaf was observed in tannery effluent @ 7.5 and 5 ml/L (9.99 and 10.46 per leaf respectively) and both treatments were statistically at par with each other but different from all other treatments.

The overall mean population of whitefly per leaf after the application of fourth spray revealed that mustard oil 3% showed maximum reduction in whitefly population (1.07 per leaf) which was statistically at par with mustard oil 2% (1.41 per leaf). While laundry detergent @ 30 and 25 ml/L and buprofezin 80 gm/L revealed intermediate reduction in whitefly population of 2.03, 2.21 and 2.91 per leaf, respectively and were statistically similar with one another and mustard oil @ 2% (1.41 per leaf). Minimum population reduction of whitefly per leaf was observed in tannery effluent @ 7.5 and 5 ml/L (7.75 and 8.64 per leaf, respectively) and both treatments were statistically at par with each other but different from all other treatments.

The overall mean population of whitefly per leaf after the application of fifth spray revealed that mustard oil @ 3% showed maximum reduction in whitefly population (1.01 per leaf) which was statistically at par with mustard oil @ 2% (1.36 per leaf). While laundry detergent @ 30 and 25 ml/L and buprofezin 80 gm/L revealed intermediate reduction in whitefly population of 2.11, 2.22 and 2.53 per leaf, respectively and were statistically similar with one another and mustard oil @ 2% (1.36 per leaf). Minimum population reduction of whitefly per leaf was observed in tannery effluent @ 7.5 and 5 ml/L (6.52 and 6.64 per leaf, respectively) and both treatments were statistically at par with each other but different from all other treatments.

The results of this trial revealed that mustard oil @ 3 and 2%, laundry detergent @ 30 and 25 ml/L and buprofezin were effective for the control of whitefly. On numerical basis lowest mean value for whitefly involving a spray of mustard oil @ 3 and 2%, laundry detergent @ 30 and 25 ml/L and buprofezin would suggest these treatments to be more effective to the pest followed by tannery effluent @ 7.5 and 5 ml/L.

All these findings are highly compatible with those of Bulter *et al.* (1989), Bulter and Hennebery (1990), Bulter *et al.* (1991), Natarajan *et al.* (1991), Bulter *et al.* (1992),

**Table I. Comparison of overall means of whitefly population (number per leaf) at 24, 48 and 72 hours after different treatments on Karishma variety of cotton**

| Treat. | 1 <sup>st</sup> Spray |         |         |        | 2 <sup>nd</sup> spray |         |         |        | 3 <sup>rd</sup> spray |         |         |        | 4 <sup>th</sup> spray |         |         |        | 5 <sup>th</sup> spray |         |         |         |
|--------|-----------------------|---------|---------|--------|-----------------------|---------|---------|--------|-----------------------|---------|---------|--------|-----------------------|---------|---------|--------|-----------------------|---------|---------|---------|
|        | 24 hrs.               | 48 hrs. | 72 hrs. | Mean   | 24 hrs.               | 48 hrs. | 72 hrs. | Mean   | 24 hrs.               | 48 hrs. | 72 hrs. | Mean   | 24 hrs.               | 48 hrs. | 72 hrs. | Mean   | 24 hrs.               | 48 hrs. | 72 hrs. | Mean    |
| CL     | 7.33a                 | 8.04a   | 9.62a   | 8.33a  | 11.73a                | 11.88a  | 12.55a  | 11.99a | 13.57a                | 14.46a  | 16.28a  | 14.77a | 11.86a                | 12.06a  | 13.00a  | 12.31a | 8.453a                | 9.73a   | 11.96a  | 10.097a |
| TE5    | 5.730ab               | 6.00a   | 7.82a   | 6.60b  | 6.51b                 | 8.00b   | 9.99b   | 8.14ab | 8.88b                 | 10.26ab | 15.35ab | 10.46b | 6.527b                | 8.47b   | 10.93b  | 8.64b  | 4.40b                 | 6.71b   | 9.17a   | 6.636b  |
| TE7.5  | 5.6ab                 | 6.197b  | 8.02a   | 6.51b  | 6.39b                 | 8.13b   | 8.617b  | 7.71b  | 8.11b                 | 9.51ab  | 12.24bc | 9.99b  | 6.11b                 | 7.33b   | 9.80bc  | 7.75b  | 3.68bc                | 6.58b   | 8.93a   | 6.52b   |
| BP     | 3.81cd                | 3.57c   | 3.33b   | 3.57c  | 3.0c                  | 2.84c   | 2.69c   | 2.84c  | 3.15c                 | 2.98c   | 2.79d   | 2.97c  | 3.597cd               | 3.13c   | 2.18d   | 2.91c  | 3.30bc                | 2.28c   | 2.03b   | 2.53c   |
| LD25   | 2.84cd                | 2.797c  | 2.77b   | 2.80c  | 2.13c                 | 2.11c   | 2.10c   | 2.11c  | 2.553cd               | 2.52c   | 2.52d   | 2.53c  | 2.23d                 | 2.21cd  | 2.0d    | 2.21c  | 2.23cd                | 2.21c   | 2.21b   | 2.22c   |
| LD30   | 2.76cd                | 2.73c   | 2.70b   | 2.73c  | 1.99c                 | 1.95c   | 1.95c   | 1.96c  | 2.42d                 | 2.36c   | 2.37d   | 2.38c  | 2.06d                 | 2.03cd  | 2.01d   | 2.03c  | 2.13cd                | 2.11c   | 2.09b   | 2.11c   |
| MO2%   | 2.08d                 | 2.02c   | 1.97b   | 2.02cd | 1.88c                 | 1.83c   | 1.80c   | 1.84c  | 1.58de                | 1.59c   | 1.53d   | 1.55cd | 1.43d                 | 1.41d   | 1.40d   | 1.41cd | 1.39d                 | 1.35c   | 1.33c   | 1.36cd  |
| MO3%   | 1.797d                | 1.74c   | 1.69b   | 1.74d  | 1.53c                 | 1.50c   | 1.45c   | 1.49c  | 1.25e                 | 1.20c   | 1.153d  | 1.20d  | 1.13d                 | 1.08d   | 1.00d   | 1.07d  | 1.06d                 | 1.00c   | 0.97d   | 1.01d   |

The values sharing similar alphabets do not differ significantly; CL= control, TE5= Tannery effluent 5 ml L<sup>-1</sup>, TE7.5= Tannery effluent 7.5 ml L<sup>-1</sup>, BP= Buprofezin 80 g L<sup>-1</sup>, LD25= Laundry detergent 25 ml L<sup>-1</sup>, LD30= Laundry detergent 30 ml L<sup>-1</sup>, MO2%= Mustard oil 2%, MO3%= Mustard oil 3%

Anonymous (1985), Ishaaya and Mendleson (1988), Szabo and Mihaly (1988) and Ishaaya (1990). They reported the botanical oils, laundry detergents and buprofezin as major agents that reduced the whitefly population to the most significant level, rendering no phytotoxicity.

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