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Effectiveness of Three Detergents in Suppressing Guava Whitefly, *Aleurodicus dispersus* Russell under Laboratory Condition

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Abstract: *Experiment was conducted in the laboratory of the Department of Entomology at Patuakhali Science and Technology University, Dumki, Patuakhali during January to March 2013 to evaluate the effectiveness of three detergents for suppressing whitefly in Sharupkhati variety of guava. Results revealed that Trix applied @ 7.5 g/l of water was found to be the most effective detergent in reducing the populations of 1st, 2nd, 3rd and 4th instars and adult stage of guava whitefly after 48, 72 and 96 hours after treatment. Jet powder @ 7.5 g/l of water was found moderately effective for the reduction of immature and adult stages of guava whitefly at different hours after treatments. The efficacy of detergents in decreasing order was Trix>Jet>Wheel powder.*

Keywords: *Detergents, effectiveness, guava whitefly, instar*

1. INTRODUCTION

Guava (*Psidium guajava*: Myrtaceae) known as the apple of the tropics is one of the most popular fruits in Bangladesh. It is mostly consumed as mature green or fresh ripen fruit. In addition, the ripen guava fruit is commercially used for the preparation of jam, jellies, cheese, ketchup, puree, powder, nectar and juice. It is grown throughout the country with little or no care, mainly in the backyards. But it is commercially cultivated in Barisal, Sylhet, Dhaka and Chittagong regions. The area and production of guava in Bangladesh are 8986 acres and 206425 M. ton, respectively (BBS 2016). It claims to be the 6th important fruit in production after Banana, Jackfruit, Mango, Pineapple and Melon (BBS 2016). With the release of Kazi Piara by BARI guava production surprisingly increased in Bangladesh. It has high yielding potential and year round bearing capacity. Guava production is seriously affected by the attack of many insect pests among which the guava whitefly, *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae) has become a serious problem to guava cultivation in Bangladesh. Both immature and adult stages of whitefly cause direct feeding damage by sucking plant sap, which can cause premature leaf fall (Butani, 1979). Indirect damage is due to the heavy production of honeydew and white waxy materials produced by this insect. Sooty mould by a black fungus develops on wax and honeydew which reduces the photosynthetic area of the plant and in turn affect the yield both in quantitative and qualitative terms (Byrnee *et al*., 1990; Kajita and Alam, 1996). Indirectly the whitefly also causes reduction of yield by transmitting viral pathogens (Alam *et al*., 1998; Berlinger, 1986).

Control of whitefly is very difficult as its immature stages remain under the waxy covering. However, the use of synthetic insecticides is the usual practice for controlling whitefly. The use of chemical pesticide creates resistance problem and pollutes environment (Amjad *et al*., 2009). Indiscriminate and frequent use of pesticide in the fruit crops has resulted in the development of the pest resistance to pesticides, environmental contamination, increased health hazards to the applicators, danger to the consumers for toxic residual on the market produce, destruction of beneficial insects and upset in the balance between the pest and the natural enemies leading to the increase in pollution. It is also hazardous to animals, fish, birds and wild lives. There is urgent need to apply non-toxic detergents for the management of guava whitefly which may reduce the use and bad effects of broad spectrum insecticides and thus increase the healthy guava production on a sustainable basis. Therefore, the present research work has been undertaken to evaluate the effectiveness of three detergents for the suppressing of guava whitefly.

2. Materials and Methods

The effectiveness of different detergents having three doses each along with a control were evaluated against guava whitefly at PSTU campus, Dumki, Patuakhali during January to March 2013. Nine treatments along with control were: T_1 = Wheel powder @ 2.5 g/L of water, T_2 = Wheel powder @ 5 g /L of water, T_3 = Wheel powder @7.5 g /L of water, T_4 = Jet @ 2.5 g /L of water, T_5 = Jet @ 5 g /L of water, T_6 = Jet @ 7.5 g /L of water, T_7 = Trix @ 2.5 g / L of water, T_8 = Trix @ 5 g/ L of water, T_9 = Trix @ 7.5 g / L of water and T_{10} = untreated control. Each treatment was replicated three times. The treatments were applied to the plant when the pest population was sufficient to cause damage. During application of detergents, care was taken to maintain the distance around 25 cm between the nozzle and twig. Spraying was done from the lower surface of the leaf and the plant was thoroughly covered with the fluid. The pretreatment data were taken at one day before application of detergents. Some specimens infested with whitefly were brought to the entomology laboratory for applying detergents. Data on survival and % reduction over control of nymphs and adult of guava whitefly were taken at 24, 48, 72 and 96 hours after treatment. Data were analyzed statistically after appropriate transformation and the means were separated using DMRT following Gomez and Gomez (1984) by computer MSTAT software.

3. Results and Discussion

Effect of different detergents against guava whitefly

Three detergents viz., Wheel powder, Jet and Trix were applied against different stages of guava whitefly in laboratory condition. The effectiveness of those materials as pesticides was evaluated on the basis of percent reduction of different stages of guava whitefly over control. The results are presented below under the following sub-headings:

Effect of different detergents on 1st and 2nd instar nymphs of guava whitefly

The pretreatment data on 1st and 2nd instar nymphs varied from 28.45 to 47.32 per leaf (Table 1). The reduction of population over control ranged from 57.81% to 88.56% after 24 hours of treatment application. Significantly the highest (88.56%) reduction of population over control was observed by Jet applied @ 7.5 g/l of water and it was followed by Trix sprayed @ @ 7.5 g/l of water. The lowest percent (57.81%) reduction of whitefly population over control was found in T_1 (wheel powder applied @ 2.5 g/l of water) treatment followed by T_2, T_4 and T_7 treatments except control where no reduction was recorded. After 48 hours of treatment application, Jet applied @ 7.5 g/l of water was also found to be the most effective (90.54%) in reducing the population of whitefly which was statistically similar with T_9 (88.43%) treatment (Trix applied @ 7.5 g/l of water). Wheel powder applied @ 7.5 g/l of water obtained 86.01% reduction of population over control. The lowest (61.43%) percent reduction was observed in T_1 treatment followed by T_2 (72.35%). The similar trend was found after 72 hours of treatment application where Jet @ 7.5 g/l of water was again found to be the most effective. The efficacy of detergents in decreasing order was: Jet>Trix>Wheel powder.

Table 1. *Effect of different detergents on 1st and 2nd instar nymphs of guava whitefly, A. disperses in guava plant*

Treatments	No. of whitefly one day before spray	Survival and % reduction (cumulative) of whitefly over control after spray at different time interval					
		24h		48h		72h	
		No. survived	% reduction	No. survived	% reduction	No. survived	% reduction
T_1	34.38	15.24	57.81d	14.23	61.43e	12.34	66.75e
T_2	47.32	11.58	67.94c	10.20	72.35d	9.15	75.35cd
T_3	30.59	6.45	82.14b	5.16	86.01b	4.87	86.88b
T_4	45.21	10.60	70.65c	9.45	74.38d	8.25	77.77c
T_5	32.29	7.45	79.37b	6.74	81.73c	5.48	85.24b
T_6	28.45	4.13	88.56a	3.49	90.54a	3.11	91.62a
T_7	40.36	11.45	68.30c	10.11	72.59d	9.25	75.08cd
T_8	31.24	6.28	82.61b	5.78	84.33b	4.89	86.83b
T_9	37.12	5.23	85.52a	4.27	88.43a	3.65	90.17a
T_{10}	34.33	36.12	-	36.89	-	37.12	-

Means followed by same letter in a column are not significantly different at 1% level by DMRT

T_1 = Wheel powder @ 2.5 g/L of water, T_2 = Wheel powder @ 5 g /L of water, T_3 = Wheel powder @7.5 g /L of water, T_4 = Jet @ 2.5 g /L of water, T_5 = Jet @ 5 g /L of water, T_6 = Jet @ 7.5 g /L of water, T_7 = Trix @ 2.5 g / L of water, T_8 = Trix @ 5 g/ L of water, T_9 = Trix @ 7.5 g / L of water and T_{10} = untreated control

Effect of different detergents on 3rd and 4th instar nymphs of guava whitefly

The pretreatment data on 3rd and 4th instars nymphs recorded at the previous day of the detergent application varied from 29.89 to 48.56 per leaf (Table 2). The percent reduction of population over control due to application of different detergents at various doses and effectiveness recorded after application of treatments is presented in Table 2. The results revealed that significantly the highest population (91.73%) reduction over control was recorded with application of Trix @ 7.5 g/l of water which was statistically similar with T_6 (90.30%) while Jet applied @ 7.5 g/l of water and data were recorded after 48 hours of treatment application. Wheel powder applied @ 7.5 g/l of water gave 84.46% reduction of whitefly population which was statistically similar with T_8 (84.44%) while Trix was applied @ 5 g/l of water after 48 hours of treatment application. The lowest reduction (70.41%) was achieved with application wheel powder @ 2.5 g/l of water which was statistically similar with T_2 (72.85%) while applied wheel powder @ 5 g/l of water for the same hours of treatment application. After 72 hours of treatment application, significantly the highest population (93.33%) reduction over control was observed with application of Trix @ 7.5 g/l of water which was statistically similar with T_6 (91.55%) while Jet applied @ 7.5 g/l of water. Trix applied @ 5 g/l of water brought 87.61% reduction of population which was statistically similar with T_3 (87.37%) while wheel powder applied @ 7.5 g/l of water. The lowest reduction (67.93%) was achieved with application Jet @ 2.5 g/l of water followed by T_1 (73.44%) which was statistically similar with T_7 (74.38%) and T_2 (75.51%) while applied wheel powder @ 5 g/l of water for the same hours of treatment application. After 96 hours of treatment application, significantly the highest population (93.98%) reduction over control was observed with application of Trix @ 7.5 g/l of water which was statistically similar with T_6 (93.33%) while Jet applied @ 7.5 g/l of water. Trix applied @ 5 g/l of water brought 89.93% reduction of population which was statistically similar with T_3 (88.20%) while wheel powder applied @ 7.5 g/l of water. The lowest reduction (70.25%) was achieved with application Jet @ 2.5 g/l of water followed by T_1 (74.60%) while wheel powder applied @ 2.5 g/l of water for the same hours of treatment application.

Table 2. *Effect of different detergents on 3rd and 4th instar nymphs of guava whitefly, A. disperses in guava plant*

Treatments	No. of whitefly one day before spray	Survival and % reduction (cumulative) of whitefly over control after spray at different time interval					
		48h		72h		96h	
		No. survived	% reduction	No. survived	% reduction	No. survived	% reduction
T_1	38.36	12.21	70.41d	11.00	73.44d	10.98	74.60e
T_2	48.56	11.20	72.85d	10.14	75.51d	9.78	77.37d
T_3	31.36	6.41	84.46b	5.23	87.37b	5.10	88.20b
T_4	48.23	14.86	63.98e	13.28	67.93e	12.86	70.25f
T_5	37.00	8.74	78.81c	6.97	83.17c	6.78	84.31c
T_6	29.89	4.00	90.30a	3.50	91.55a	2.88	93.33a
T_7	41.00	12.10	70.67d	10.61	74.38d	9.45	78.14d
T_8	35.96	6.42	84.44b	5.13	87.61b	4.35	89.93b
T_9	41.23	3.41	91.73a	2.76	93.33a	2.60	93.98a
T_{10}	40.32	41.26	-	41.42	-	43.23	-

Means followed by same letter in a column are not significantly different at 1% level by DMRT

T_1 = Wheel powder @ 2.5 g/L of water, T_2 = Wheel powder @ 5 g /L of water, T_3 = Wheel powder @7.5 g /L of water, T_4 = Jet @ 2.5 g /L of water, T_5 = Jet @ 5 g /L of water, T_6 = Jet @ 7.5 g /L of water, T_7 = Trix @ 2.5 g / L of water, T_8 = Trix @ 5 g/ L of water, T_9 = Trix @ 7.5 g / L of water and T_{10} = untreated control

Effect of different detergents on adult guava whitefly

The pretreatment data on adult guava whitefly recorded at the previous day of the detergent application varied from 14.23 to 30.44 per leaf (Table 3). The percent reduction of population over control due to application of different detergents at various doses and effectiveness recorded after application of treatments is presented in Table 3. The results revealed that significantly the highest

population (91.51%) reduction over control was recorded with application of Trix @ 7.5 g/l of water which was statistically similar with T_5 (88.84%) while Jet applied @ 5 g/l of water and data were recorded after 48 hours of treatment application. Wheel powder applied @ 7.5 g/l of water gave 86.21% reduction of whitefly population which was statistically similar with T_8 (84.06%) while Trix was applied @ 5 g/l of water after 48 hours of treatment application. The lowest reduction (78.48%) was achieved with application Jet @ 2.5 g/l of water which was statistically similar with T_7 (79.56%) while Trix applied @ 2.5 g/l of water and T_2 (72.85%) while applied wheel powder @ 5 g/l of water for the same hours of treatment application. After 72 hours of treatment application, significantly the highest population (93.49%) reduction over control was observed with application of Trix @ 7.5 g/l of water which was statistically similar with T_5 (91.81%) while Jet applied @ 5 g/l of water. Trix applied @ 5 g/l of water brought 88.10% reduction of population which was statistically similar with T_3 (87.37%) while wheel powder applied @ 7.5 g/l of water and T6 (86.61%) while Jet applied @ 7.5 g/l of water. The lowest reduction (70.77%) was achieved with application wheel powder @ 2.5 g/l of water. After 96 hours of treatment application, the similar trend of population reduction over control was observed. Trix applied @ 5 g/l of water brought 90.93% reduction of population which was statistically similar with T_6 (88.71%) while Jet applied @ 7.5 g/l of water. The lowest reduction (76.51%) was achieved with application Wheel powder @ 2.5 g/l of water followed by T_2 (86.89%) while wheel powder applied @ 5 g/l of water for the same hours of treatment application. The efficacy in decreasing order was Trix>Jet>Wheel powder. Application techniques and force of liquid on the target surface may influence the effectiveness of detergents. The detergent properties of Trix to eliminate out the waxy layer of the pest along with viscosity might have made it more effective in reducing pest population. Alim *et al*. (2015) reported that detergent wheel powder of Liver Brothers Bd Ltd @ 15 g/l of water found effective against *A. dispersus*. Islam *et al*. (2003) conducted an experiment to control spiralling whitefly by using different concentrations of wheel powder among which wheel powder @ 10 g/l of water and 15 g/l of water were found more effective in controlling whitefly. Use of detergents against guava whitefly has been reported by other authors. Use of mild solution of soap, mixing an inexpensive liquid dish washing detergent @ 1 tablespoon per gallon of water, and thoroughly spraying the underside of infested leaves can control the guava whitefly (CABI, 1999). Puri *et al*. (1994) reported that the detergent Nirma, Rin, Surf and Wheel powder at concentration of 0.25, 0.5 and 1 % reduced the sweet potato whitefly *Bemisia tabaci* (Gennadious) adults by 69-91% and nymph by 97-99%.

Table 3. *Effect of different detergents on adult guava whitefly, A. disperses in guava plant*

Treatments	No. of whitefly one day before spray	Survival and % reduction (cumulative) of whitefly over control after spray at different time interval					
		48h		72h		96h	
		No. survived	% reduction	No. survived	% reduction	No. survived	% reduction
T_1	24.26	8.30	66.93d	7.64	70.77e	6.45	76.51d
T_2	19.24	4.50	82.07c	4.10	84.31c	3.60	86.89c
T_3	22.86	3.46	86.21b	3.21	87.71b	2.70	90.16b
T_4	18.22	5.40	78.48c	4.56	82.55d	3.46	87.39bc
T_5	14.23	2.80	88.84a	2.14	91.81a	1.82	93.37a
T_6	30.44	4.10	83.66bc	3.50	86.61b	3.10	88.71b
T_7	17.23	5.13	79.56c	4.56	82.55d	3.48	87.32bc
T_8	20.11	4.00	84.06b	3.11	88.10b	2.49	90.93b
T_9	18.24	2.13	91.51a	1.70	93.49a	1.00	96.36a
T_{10}	24.30	25.10	-	26.14	-	27.46	-

Means followed by same letter in a column are not significantly different at 1% level by DMRT

T_1 = Wheel powder @ 2.5 g/L of water, T_2 = Wheel powder @ 5 g /L of water, T_3 = Wheel powder @7.5 g /L of water, T_4 = Jet @ 2.5 g /L of water, T_5 = Jet @ 5 g /L of water, T_6 = Jet @ 7.5 g /L of water, T_7 = Trix @ 2.5 g / L of water, T_8 = Trix @ 5 g/ L of water, T_9 = Trix @ 7.5 g / L of water and T_{10} = untreated control

From the findings of the present study, it may be concluded that Trix @ 7.5 g/l of water was most effective in reducing the population of whitefly.

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