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EFFECTS OF BIOPESTICIDES AGAINST JASSID [*AMRASCA DEVASTANS* (DIST.)] AND WHITE FLY [*BEMISIA TABACI* (GENN.)] ON OKRA

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ABSTRACT

Field studies on the effect of bio-pesticides against *Amrasca devastans* and *Bemisia tabaci* on okra were carried out at the University of Karachi. Seeds of *Abelmoschus esculentus* L. (Okra) were planted on March 2011 in a randomized complete block design with 4 replications. Treatment applied were T_1 (Neem Powder *Azadirachta indica*), T_2 (*Heeng, Asafotida*), T_3 (Tobacco *Nicotiana tabacum* extract), T_4 (Detergent, as the least toxic compound for comparison) and T_5 (untreated control). The pretreatment observations were recorded at 24 h before spray, whereas, post-treatment observations were carried out after 24, 48, 72 hrs and at one week intervals. The crop was sprayed twice during the experimental period. The results revealed that bio-pesticides reduced the population of *B. tabaci* and *A. devastans* up to one week interval. Maximum reductions in population of both the insects were recorded during both sprays. The means showed that Tobacco *Nicotiana tabacum* extract reduced population of *B. tabaci* up to 0.29 per leaf, (92.62%) followed by Neem powder *Azadirachta indica* 0.33 (91.50%) Heeng *Asafoetida* 1.83 (50.93%) and detergent 1.85 (53.16%) and *A. devastans* up to 0.04 (99.57%), 0.14 (98.18%) 3.17 (59.89 %) and 3.18 (59.64%) respectively. Similarly, in second spray the population of B. tabaci was reduced up to 1.87 (89.39%). 2.74 (84.04%), 5.88 (65.89 %) and 6.44 (63.49%) percent by *Azadirachta indica* power, *Nicotiana tabacum* extract, *Asafoetida* and Detergent, respectively. The population of *A. devastans* was reduced by these agents up to 0.33 (96.09%), 0.39 (95.41%), 3.37 (9.08%) and 3.40 (62.34%) respectively. Analysis of variance showed significant difference in the effectiveness of the biopesticides. However, LSD showed non-significant difference between 72 h in *Azadirachta indica* powder and *Nicotiana tabacum* extract, *Asafoetida* and Detergent. It is concluded that the bio-pesticides from *Azadirachta indica*, *Nicotiana tabacum* and *Asafoetida* are safer, easy and cheap.

Key word: Okra, bio-pesticides, Jassid, white fly

INTRODUCTION

Okra, *Abelmoschus esculentus (*L.*)* Moench (Malvaceae) is a main summer vegetable of Pakistan. It is cultivated twice a year (in spring and summer seasons). Unfortunately, the crop is being attacked by a number of insects and pests from sowing to harvesting. They destroy foliage and fruits of the crop. The common destructive insects are *Bemisia tabaci* and *Amrasca devastans, Thrips tabaci, Aphis gossypii,* and *Earias vittella* (Shaikh, 1997). Among sucking pests such as *Bemisia tabaci* and *Amrasca devastans* cause serious damage to the crop. It was reported that *Amrasca devastans Bemisia tabaci*, A*phis gossypii*, *Thrips tabaci* and *Earias vittella* caused great damages to the crop from sowing to harvesting in Pakistan. The whitefly, *Bemisia tabaci (Genn.)* is vector of many plant viral diseases and causes serious economic losses to different crops in various countries (Ashraf, 1980, Sharaf, 1986).

The assessment of biological control of jassids (*Amrasca*) by predatory spiders has recently been suggested by Kuhro *et al.* (2012). The effective method at present for the control of these pests is, however, by the use of synthetic insecticides that are widely used since a long time, but recent investigations have proved that the use of synthetic pesticides is hazardous to human health and have long residual effects. Beside these, the chemicals create harmful effects over the population of predatory spiders, ants and lady bird beetles (Solangi and Lohar, 2007). However, hazardous effects of these compounds are directly proportional to the pesticide exposure (Pingali *et .al.*, 1994). The agriculture workers are highly vulnerable to these pesticides during handling and usage. It was mentioned that two million people became affected and 40,000 died due to insecticide poisoning (Rajput, 2004). The natural bio-pesticides in commercial agriculture and horticulture is being practiced since long to circumvent the problems associated with indiscriminate use of pesticides and are earning reputation among the researchers and growers (Kumar *et al.*, 2003 and Henry *et al.*, 1990). The bio-pesticides offer desirable alternative derived from animals, plants, bacteria and certain minerals. Bio-pesticides are less toxic to non-targeted natural enemies and generally affect only the target pest (Patel *et al.*, 2009).

Biopesticides are effective even in small quantities and often decompose quickly resulting in lower exposures and less effects of pollution problems. The seeds of neem tree (*Azadirachta indica* A. juss.) have numerous effects on pests and have minimal toxicity to non target organisms (Isman *et al.*, 1990 and Mardue and Blackwell, 1993). Other plants products are also use for management of pests such as *Asafoetida*, *Nicotiana tabacum* L.; Aak,

Calotropis procera; Garlic, *Allium sativum*; Pongam, *Pongamia pinnata*; *Chrysanthemum cineraria folium* etc. For example, extracts from seeds of *P. pinnata* showed an antifeedant effect on *Scelodona tastrigiollis* Mots, *Spodopter alitura* F., *Tribolium castaneum* Herbst and *Trialeurodes vaporariorum.* Repellent and anti-feedant effects are often connected with pest reduction or oviposition deterrence effect (Chakraborty, 1988; Durairaj, 1991; Prakash, 1997; Pavela *et al*., 2008, Deka *et al.*, 1998 and Pavela *et al*., 2007). Moreover, *P. pinnata* seed oil shows significant fungicide effects (Kumar *et al.*, 2003).

Keeping in view the importance of the crop and its association with the pests' experimental study was conducted to evaluate the efficacy of bio-pesticides against white fly (*Bemisia tabaci*) and Jassid *(Amrasca devastans)* under field conditions on okra crop.

MATERIALS AND METHODS

Present studies on the effect of biopesticides against white fly (*Bemisia tabaci*) and Jassid (*Amrasca devastans*) were carried out in Experimental Field of University of Karachi. Seeds of okra VAR-Subzparri were procured from a certified seed dealer. Crop was sown in mid March, 2011, in a randomized complete block design with four replicates. Subsequent to the analysis of variance (ANOVA) Fisher's least significant difference ($LSD_{0.05}$) was performed.

Treatments

T_1= *Azadirachta indica*, T_2 = *Nicotiana tabacum*, T_3=*Asafoetida*, T_4=Detergent and T_5 = Control

The sub plot size of each treatment was 20x12 meters. The space between rows and plants were 12 and 9 inches. The recommended cultural practices were performed equally in sub plots throughout the cropping season.

The following methods were used to make the suspension of each bio-pesticide and detergent. 41.32 g of *Azadirachta indica* seeds were ground and kept merged in distilled water for overnight. In the next day morning, the suspension was sprayed on okra crop. *Asafoetida* (3.44 g) was ground and was put in distilled water for overnight. In next morning, after warming up to 80^{o}C than brought cool up to 50^{o}C then the water was sprayed on the crop. The leaves of *Nicotiana tabacum* (68 g) were ground and kept in the distilled water for overnight as well. Next morning, the water was filtered and sprayed on okra crop. Detergent (surf excel) was put in distilled water early in the morning and then sprayed on okra crop. All the preparations of these biopesticides and detergent sprayed on okra with the help of knapsack hand sprayer. The spray was made during early morning time.

The comparative effectiveness of the bio-pesticides was based on the reduction in the population of white fly *Bemisia tabaci* and jassid *Amrasca devastans* which was recorded after post treatments intervals i.e. 24, 48, 72 hours and one week. For this purpose, five plants were observed randomly from each plot. Five leaves were examined from each plant. These leaves were selected two from top and two from middle and one from bottom part of the plant.

Table 1. Doses of plant product used against sucking pests on okra crop.

Treatments	Bio-pesticides	Doses applied per acre	Dose applied on subplots
T_1	Neem Powder	3 kg	41.32 g
T_2	Assafoetida	250g	3.44 g
T_3	Tobacco Extract	5 kg	68 g
T_4	Detergent	250g	3.44 g
T_5	Control	Water	-

RESULTS

Effect of Biopesticides on Jassid – 1st Spray

The mean population of *A. devastans* on pre-treatment and post treatment is presented in Table-2. The difference in mean population at different time intervals i.e. pre-treatment and post-treatments (24 h, 48 h, 72 h and one week after treatment) during 1st spray were significant ($P<0.05$). Similarly, the differences among treatments were also significant ($P<0.05$). Decline in pest population during post-treatment observations showed the performances of these bio-pesticides and detergent. Maximum decline in population of *A. devastans* was observed at 48 h intervals. At this interval the mean population recorded was 0.03 ± 0.03 per leaf in the plots treated with

Nicotiana tabacum followed by *Azadirachta indica* power 0.14 ± 0.04, *Asafoetida* 3.43 ± 1.10, detergent 3.52 ± 0.86 and Control 7.48 ± 1.64.

Table 2. Mean population per leaf of *A. devastans* during 1st spray of biopesticides on okra crop.

Treatment	Mean number of *A. devastans* per leaf					
	Pretreatment	Post-treatment				
		24 h	48 h	72 h	1 week	Mean
T_1	7.73± 1.25	0.65 ±0.09	0.14± 0.04	0.28 ±0.08	1.62± 0.56	2.06 ±0.40
T_2	7.75± 1.43	3.65 ±0.95	3.43± 1.01	3.17 ±0.96	5.57± 1.03	4.71 ±1.07
T_3	7.00± 1.04	0.70 ±0.12	0.03± 0.03	0.39 ±0.09	2.38± 0.72	2.10 ±0.40
T_4	7.88± 0.92	5.78 ±0.76	3.52± 0.86	3.18 ±1.06	6.56± 1.28	5.38 ±0.97
T_5	8.75± 1.65	8.85 ±1.81	7.48± 1.64	5.73 ±0.86	8.17± 1.57	6.59 ±1.36

LSD (treatment)= 2.78, LSD (time)= 2.52

2nd Spray

The data regarding overall performance of different bio-pesticides against *A. devastans* population after different time intervals of 2nd spray is shown in Table-3. The data revealed that biopesticides caused a significant decline in the population of *A. devastans* during 2nd spray ($p<0.05$); however their effectiveness did not go beyond 72 hours. After 72 hours interval the population of *A. devastans* was increased. Overall performance showed that *Azadirachta indica* powder was more effective, which caused a decline of the pest population from 8.46 ± 1.36 to 2.44 ± 0.47 followed by *Nicotiana tabaccum* extracted, 8.51 ± 1.72 to 2.70 ± 0.99, *Asafoetida*, 8.60 ± 1.58 to 5.07 ± 1.16 and Detergent 9.03 ± 2.01 to 5.91 ± 1.29. Analysis of variance showed significant difference between time intervals ($P<0.05$) and treatments ($P<0.05$). Application of bio-pesticides resulted in the decline of pest population up to 72 hours.

Table 3. Mean population of leaf of *A.devastans* during 2nd spray of bio-pesticides on okra crop.

Treatment	Mean number of *A.devastans* per leaf					
	Pretreatment	Post-treatment				
		24 hrs	48 hrs	72 hrs	1 week	Mean
T_1	8.46 ± 1.36	0.46 ±0.21	0.33± 0.06	0.44 ±0.24	2.54± 0.48	2.44 ±0.47
T_2	8.60 ± 1.58	3.52 ±1.04	4.31± 0.95	3.37 ±0.76	5.56 ± 1.49	5.07 ±1.16
T_3	8.51 ± 1.72	0.63 ±0.09	0.39± 0.15	0.61 ±0.24	3.38 ± 0.76	2.70 ±0.59
T_4	9.03 ± 2.01	6.40 ±1.42	4.67± 0.86	3.40 ±0.68	6.06 ± 1.52	5.91 ±1.29
T_5	8.68 ± 1.52	10.25±2.08	6.72± 1.08	4.50 ±1.42	9.14 ± 2.43	7.85 ±1.70

LSD (treatments) =2.88, LSD (time) =2.65

Effect of biopesticides on Whitefly – 1st Spray

The data regarding overall performance of different bio-pesticides against *B. tabaci* population after different time intervals of 1st spray is shown in Table-4. The data revealed that bio-pesticides resulted in the suppression of population of *B. tabaci* up to 1 week compared to controls ($p<0.05$). Among bio-pesticides *Azadirachta indica* powder was found much effective which declined the pest population from 3.91 ± 0.47 to 1.25 followed by *Nicotiana tabacum* extract 3.93 ± 0.78 to 1.65. *Asafoetida* 3.73 ± 0.56 to 2.98 and Detergent 3.95 ± 0.93 to 3.30. Analysis of variance showed significant difference ($p<0.05$) in performance of the treatments and time intervals ($P< 0.05$).

2nd Spray

During second spray, it was observed that pre-treatment population of *B. tabaci* was four times more as compared to 1st spray (Table 5). The trend in declining the population of the pest was similar as that of 1st spray. The bio-pesticide (*Azadirachta indica* powder) showed the similar performance in declining the population of *B. tabaci* from 17.64 ± 2.31 to 7.51 ± 1.24 followed by *Nicotiana tabacum* extract 17.13 ± 3.01 to 8.24 ± 1.75, *Asafoetida* 17.24 ± 2.46 to 10.34 ± 1.61 and Detergent 17.64 ± 2.89 to 11.25 ± 2.11. Analysis of variance showed

significant difference in treatments ($p<0.05$). However time was non-significant. It is noteworthy that the population of B. *tabaci* declined significantly at 72 h of application ($P<0.05$).

Table 4. Mean population per leaf of *B. tabaci* during 1st spray of bi-pesticides on okra crop.

Treatment	Mean number *B. tabaci* of per leaf					
	Pretreatment	Post-treatment				
		24 hrs	48 hrs	72 hrs	1 week	Mean
T_1	3.91 ± 0.47	0.77 ±0.17	0.33± 0.07	1.55 ±0.72	1.35 ± 0.32	1.25
T_2	3.73 ± 0.56	1.88 ±0.36	3.25 ± 1.20	4.25 ±1.06	1.83 ± 0.64	2.98
T_3	3.93 ± 0.78	0.29 ±0.07	1.45 ± 0.08	3.76 ±0.96	1.46 ± 0.61	1.56
T_4	3.95 ± 0.93	3.73 ±0.76	2.58 ± 1.01	4.36 ±1.11	1.85 ± 0.74	3.30
T_5	3.91 ± 0.82	9.33 ±1.44	2.35 ± 0.94	5.03 ±0.94	3.80 ± 0.94	4.94

LSD (treatments) = 3.72, LSD (time) = 2.45

Table 5. Mean population per leaf of *B. tabaci* during 2nd spray of bio-pesticides on okra crop.

Treatments	Pre-treatment	Post-treatment				
		24 h	48 h	72 h	1 week	Mean
T_1	17.64 ± 2.31	7.50 ±1.06	4.08± 0.49	1.87 ±0.86	6.50± 1.49	7.51
T_2	17.24 ± 2.46	11.85 ±2.01	6.89± 0.31	5.88 ±1.20	9.88± 2.08	10.34
T_3	17.13 ± 3.01	9.28 ±2.42	4.84 ± 1.11	2.74 ±0.49	7.22± 1.72	8.24
T_4	17.64 ± 2.89	12.66 ±2.06	9.03± 2.04	6.44 ±1.26	10.50± 2.30	11.25
T_5	18.88 ± 3.46	19.48 ±3.62	16.91± 3.09	8.94 ±2.03	15.65 ± 3.11	15.87

LSD (treatment) = 6.22, LSD (time) = 2.15

DISCUSSION

The results obtained in the present experiment are in agreement with those of Rajput (1997) who reported that bio-pesticide such as extracts of *Azadirachta indica* seed, *Allium sativum, Nicotiana tabacum*, soap emulsion reduced *Amrasca devastans* (Dist.) and *Bemisia tabaci* (Genn.) populations after different time interval of sprays. Higher initial killing was lowered with increased time interval. *Nicotiana tabacum* and *Azadirachta indica* seed extracts were better in controlling than other bio-pesticides. The maximum reduction in pest population was observed after 48 h. Thereafter, the population started to increase. (Lowery 1993) reported *Azadirachta indica* powder to be highly suitable for controlling aphid (*Homoptera*). (Misra, 2002) reported that plant product *Azadirachtin* at 3g /ha was effective against leaf roller, *Sylepta derogata Fab*. (Price, 1991) reported *Azadirachta indica* was slower to display an initial effect; it ultimately yielded a level of control comparable to that of many synthetic insecticides in respect of *B. tabaci* population. Boopathi *et al.*, (2010) reported that the neem extracts were found effective in reducing the aphids' populations. Nderitu (2008) reported that the neem based products were found effective for controlling the aphids and could be used as alternative of chemical pesticides. Dhingra (2008) reported that extracts of *Azadirachta indica* were found effective against the jassids feeding on okra crop. Bagade (2010) reported that bio-pesticides extracted from the neem were effective for reducing the jassids feeding on okra. Our results are generally in agreement with the above given findings. Some variations observed could be due to differences in the environmental conditions, extraction processes, varieties of the plants and geographical variations in the pest populations.

CONCLUSION

The present studies indicated that the bio-pesticides including *Azadirachta indica*, *Nicotiana tabacum* and to a lesser degree *Asafoetida* were effective in controlling the okra pest by causing the minimum losses to environment, beneficial insect and okra agro-ecosystem.

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