



Repellent effect of neem formulation and aqueous extract of *Melia azedarach* on greenhouse whitefly (*Trialeurodes vaporariorum* Westwood, Hemiptera: Aleyrodidae)

Arvind Kumar^{*}, Rajpal Singh and K. C. Sharma

Dr Y.S. Parmar University of Horticulture and Forestry, Department of Entomology, Nauni, Solan-173230 (Himachal Pradesh), INDIA

^{*}Corresponding author. E-mail: aru.thakur21@gmail.com

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Abstract: The present study assessed the repellence activities of two biopesticides viz. a formulation of neem, neem baan and aqueous extract of *Melia azedarach* (Dharek) kernels against crawlers of greenhouse whitefly *Trialeurodes vaporariorum* (Westwood) (Hemiptera: Aleyrodidae). The maximum repellency (22.07%) was recorded at 10 % concentration of dharek extract followed by Neem Baan at 0.0025 % concentration (18.33%). The minimum repellency (4.71%) was observed at 0.0005 % concentration of Neem baan. These results indicate a potential use of neem baan and aqueous dharek kernel extracts in management of greenhouse whitefly.

Keywords: Biopesticide, Greenhouse whitefly, *Melia azedarach* extracts, Neem Baan, Repellency

INTRODUCTION

The greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) a small, soft bodied hemipteran insect belonging to family Aleyrodidae is the most serious pest of vegetables particularly in greenhouses. The nymphs and adults suck large quantities of phloem sap from the under surface of leaves (Paul and Tahir, 2014). Many species of whiteflies are responsible for transmission of plant pathogenic viruses (Jones, 2003), secrete a sticky viscous honeydew, on which sooty moulds grow that reduces photosynthesis. This results in withering, premature dehiscence and defoliation and finally the death of the plant. Due to development of a high level of resistance of the whitefly strains to the used insecticides, most of these become less efficient. Further their indiscriminate use has led to the development of resistance to various organophosphates, carbamates and synthetic pyrethroids (Aida-Buitrago *et al.*, 1994; Zheng and Goa, 1995; Denholm and Jespersen, 1998). In addition, increasing documentation of negative environmental and health impact of synthetic insecticides and increasingly stringent environmental regulation of pesticides was reported by Isman (2000). Botanical insecticides are one of the best alternatives for these hazardous chemicals. They are plant-derived insecticides, either naturally occurring plant materials or the products simply derived from such plants (Gupta *et al.*, 2005). In the present investigation, repellence activities of two biopesticides viz. a neem formulation Neem Baan and *Melia azedarach* (Dharek) kernelaqueous extract

were studied against crawlers of the greenhouse whitefly.

MATERIALS AND METHODS

Raising of insect culture: The culture of the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) (Hemiptera: Aleyrodidae) was raised from the field collected adults whiteflies on tomato plants. The established tomato seedlings (10-12 days old) grown in earthen pots (25 X 20cm) and these were further transferred into the rearing cages for further studies. The stock culture was maintained at room temperature throughout the study period. The seedlings were examined at regular intervals for the presence of whitefly eggs/nymphs and replaced by another potted plants as soon as yellowing and withering of leaves started.

Preparation of stock solutions

Neem Baan: A stock solution of 30 ppm (a.i. bases) was prepared by dissolving 2 ml of Neem Baan (1500 ppm) in distilled water to get final volume of 100 ml.

Dharek kernel extract: The aqueous extract of dharek was prepared under laboratory conditions as per the method of Sharma and Gupta (2009). A stock solution 10 % was made by dissolving 10 gm of powdered material soaked in 50 ml of water and kept in beaker for 24 hours (stirred in between thrice). The solution was passed through muslin cloth, the solution thus obtained was filtered through Whatman filter paper No.1 and the final volume was made 100 ml. Further dilutions were made from this stock solution with distilled water by using single dilution method.

Repellent effect: Repellency effects of Neem Baan and dharek extract were tested under laboratory conditions against the crawlers of the test insect. For each test, young leaves of the same maturity selected from the upper portion of uninfected plants were excised, dipped for one minute in different concentrations of Neem Baan and dharek extract and then left to dry in shade at room temperature for 15 minutes. Control leaves were similarly dipped in tap water and were used for comparison. Leaf discs (2 cm diameter) were obtained for each treated leaf, and then placed in Petri plate having filter paper at the base. For each treatment, 20 crawlers were released in the center of each dish. The dishes were then covered and sealed to prevent the nymphal escape and were placed on a flat surface at room temperature with uniform lighting. In control, the discs were treated with emulsified water. Observations were recorded 1, 2, 4, and 8 hours after treatments. The individuals which were repelled from the discs were considered as repelled and repellency was calculated as per the formula given by Abbott, 1925.

RESULTS AND DISCUSSION

Neem Baan: The repellent activity of Neem Baan evaluated at 0.0005, 0.0010, 0.0015, 0.0020 and

0.0025 % concentration upto 8 hours against the crawlers of *T. vaporariorum* is presented in Table 1. The study revealed that the maximum repellency of 18.33 % was observed at 0.0025 concentration followed by 14.79 % at 0.0020 % which were statistically different from each other. 0.0015 and 0.0010 % concentration, the repellency was 10.73 and 7.97 %, respectively and both were statistically at par with each other. However, the minimum repellency of 4.71 % was observed at 0.0005 % concentration (Table 1).

The maximum repellency of 19.19 % was observed after 1 hour of treatment and was statistically different from the repellency observed at other intervals. After 1 hour of application, a decreasing trend in repellency of 11.84, 8.33 and 3.93 % was observed after 2, 4 and 8 hours of treatment, respectively and all these were statistically different from one another. Maximum repellency (36.90%) was observed at 0.0025 % concentration 1 hour after treatment followed by 25.26 % repellency at 0.0020 % concentration and was statistically at par with each other. There was decrease in repellency with increase in time interval. However minimum repellency of 1.55 % was found at 0.0005 % concentration 8 hour after treatment followed by 2 % at 0.0010 % concentration and both were statistically at

Table 1. Repellent effect of Neem Baan against the crawlers of *T. vaporariorum*.

Conc. (%)	% crawlers repelled over control at indicated concentration and post treatment time				Mean
	1 hour	2 hours	4 hour	8 hour	
0.0025	36.90 (37.40)	16.62 (24.06)	10.81 (19.20)	9.00 (17.46)	18.33 (24.53)
0.0020	25.26 (30.17)	15.88 (23.49)	13.00 (21.13)	5.00 (12.92)	14.79 (21.93)
0.0015	21.07 (27.32)	10.91 (19.29)	8.86 (17.32)	2.09 (8.31)	10.73 (18.06)
0.0010	13.48 (21.54)	10.77 (19.16)	5.50 (13.56)	2.00 (8.13)	7.94 (15.60)
0.0005	8.79 (17.24)	5.00 (12.92)	3.50 (10.78)	1.55 (7.14)	4.71 (12.02)
Mean	19.19 (25.98)	11.84 (20.13)	8.33 (16.78)	3.93 (11.43)	

*Mean of five replications; Figures in parentheses are arc sin transformed values; CD (p=.05); Treatment (T): 3.09; Time (I): 2.47; T X I: 11.53

Table 2. Repellent effect of *Melia azedarach* extract against the crawlers of *T. vaporariorum*.

Conc. (%)	% crawlers repelled over control at indicated concentration and post treatment time				Mean
	1 hour	2 hours	4 hour	8 hour	
10.00	52.86 (46.64)	17.63 (24.8)	9.80 (18.24)	8.00 (16.43)	22.07 (26.54)
5.00	40.00 (39.2)	15.88 (23.49)	12.00 (20.27)	4.00 (11.54)	17.97 (23.63)
2.50	33.18 (35.17)	13.91 (21.90)	12.97 (21.11)	5.12 (13.08)	16.30 (22.81)
1.25	15.63 (23.29)	9.29 (17.74)	7.77 (16.19)	3.00 (9.97)	8.92 (16.80)
0.63	12.84 (21.00)	4.73 (12.57)	3.25 (10.38)	2.00 (8.13)	5.70 (13.02)
Mean	30.90 (33.07)	12.29 (20.10)	9.16 (17.24)	4.42 (11.83)	

*Mean of five replications; Figure in parentheses are arc sin transformed values; CD (p=.05) ; Treatment (T) : 2.10; Time (I): 1.68; T X I: 8.39

par with each other. Dreyer (1983) also found that neem has strong adult repellency to *Bemisia tabaci*. Singh *et al.* (2012) observed that *Azadirachta indica* extract at 10 % gave 99.0 % repellency of *Aphis gossypii* after 24 hrs of treatment.

Dharek extract: The repellent activity of dharek extract at 0.63, 1.25, 2.50, 5.00 and 10 % was evaluated against the crawlers of *T. vaporariorum*. Maximum repellency of 22.07 % was recorded at 10 % concentration and the least repellency of 5.70 % was recorded at 0.063 % concentration followed by 8.92 % repellency at 1.25 concentration (Table 2). At 2.5 % and 5.0 % concentration the per cent repellency was 16.30 % and 17.93 % respectively and both these were statistically on par with each other. As regard the repellency at different time interval, it was of 30.90 % after 1 hour of treatment which decreased to 12.29, 9.16 and 4.42 % at 2, 4 and 8 hours after treatment and was statistically different from one another. Maximum repellency of 52.86 % was found at 10 % concentration after 1 hour of treatment followed by 40.00 % at 5 % concentration and was statistically at par with each other. The minimum repellency 2.00 % was recorded at 0.63 % concentration after 8 hours of treatment. These results are more or less in agreement with the finding of Abou-Fakhr Hammad *et al.* (2000) who reported that *M. azedarach* extracts repelled whitefly adults, while the fruit extracts have shown a significant detrimental effect against early nymphal instars. In another study, Abou-Fakhr Hammad *et al.* (2001) also reported that extracts of *M. azedarach* leaves and fruits showed significant repellent activity (58.9–67.7%) against *Bemisia tabaci*. The effectiveness of Neem baan and dharek extract has earlier been reported by Kumar and Singh, 2014.

In the present studies both Neem Baan and aqueous extract of dharek have shown repellent effect against the crawlers of the greenhouse whitefly. However, as reported by Barnard, (2000) the effectiveness and duration of repellency of chemicals depend on the type of repellent (active ingredient and formulation), the mode of application and local conditions (temperature, humidity and wind). These results thus show a prospective utilization of Neem Baan and aqueous extract of *M. azedarach* in plant protection against greenhouse whiteflies.

Conclusion

The neem formulation, Neem Baan and aqueous extract of dharek had good repellent effects against crawlers of greenhouse whitefly. Neem baan (0.0025%) and dharek extract (10%) gave 18.33% and 22.07% repellency, respectively. Hence the results of this study suggest that these biopesticides at

these respective concentrations may have great prospectus for the integrated management of greenhouse whitefly.

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