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Field Evaluation of Neem Seed Oil Against the Babul Whitefly *Acaudaleyrodes rachipora* (Singh) (Aleyrodidae: Homoptera) on *Acacia senegal* Seedlings

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Abstract : An experiment was conducted to study the bioefficacy of neem seed oil alone and in combination with two conventional insecticides, viz., monocrotophos and endosulfan against the babul whitefly *Acaudaleyrodes rachipora* on *Acacia senegal* seedling. The results demonstrated that the neem seed oil at 0.5% alone is good enough to control this pest and its combination with either 0.1% monocrotophos or endosulfan did not show any superiority than neem seed oil alone to *A. rachipora*.

Key words : Neem seed oil, monocrotophos, endosulfan, *Acaudaleyrodes rachipora* and *Acacia senegal* seedlings.

Injudicious and extensive application of neurotoxic chemicals for the control of insect pests poses malicious effects on the environment, which subsequently leads to "ecological backlash" as the development of resistance to insecticides and resurgence. This has led scientists to investigate the possibility of utilizing plant derived chemicals in the insect pest management programme. It encapsulates the fact that plants were not just store house of carbohydrates, lignin and proteins but also contained a vast array of other secondary metabolites such as nitrogenous compounds, primary alkaloids, terpenoids, phenolics, proteinase inhibitors and growth regulators relating to insect hormones and many of them exhibit a spectrum of bioactivity against insect pests. Neem (*Azadirachta indica* A. Juss.), which has emerged as a single most important source of pesticide with least or no side effects, is one of the important alternatives to reduce the use of synthetic insecticides (Rembold *et al.*, 1982 and Abdul Kareem *et al.*, 1989). The potential of neem seed oil and seed extracts against several crop pests have been well documented (Schmutterer and Ascher, 1984; Saxena and Khan, 1986). Neem seed oil was reported to be highly effective in reducing survival of *Nephotettix virescens* (Distant) (Mariappan and Saxena, 1983); disrupting the normal courtship and mating behaviour of *Nilaparvata lugens* (Stal) (Saxena *et al.*, 1989) and suppressing the egg laying of the cotton whitefly *Bemisia tabaci* (Gennadius) (Coudriet *et al.*, 1985). We investigated the efficacy of neem seed oil and two conventional insecticides, viz., monocrotophos and endosulfan against the babul whitefly, *Acaudaleyrodes rachipora*, on *Acacia senegal* seedlings which is emerging as one of the important pest of arid and semi-arid tree species and needs effective control in the nursery stage. The findings are communicated by this paper.

Materials and Methods

A. senegal seedlings were raised individually in polythene bags following recommended package and practices during September 1995 in the experimental nursery beds of Arid Forest Research Institute. Seven-month-old seedlings were used for the study. Each treatment consists of 150 plants in three groups of 50 plants

Table 1. Egg population of Acaudaleyrodes rachipora on Acacia senegal in different treatments

Treatments (%)	Mean no. of nymphs/leaf ± SD recorded at different DAT*						
	0	1	2	3	7	10	14
Neem seed oil 0.1	371.07^{a} ±90.42	69.76^{b} ±41.71	54.67^{b} ±25.64	25.00^{d} ±9.49	55.37^{d} ±14.74	205.87^{b} ±36.43	278.07^{a} ±18.12
Neem seed oil 0.3	399.23^{a} ±18.32	31.33^{b} ±9.88	31.27^{b} ±16.11	18.23^{d} ±5.56	41.30^{d} ±11.02	172.60^{bc} ±27.05	252.57^{a} ±37.27
Neem seed oil 0.5	339.93^{a} ±56.01	16.10^{b} ±3.55	18.57^{b} ±10.53	8.13^{d} ±4.08	24.70^{d} ±6.14	137.29^{c} ±21.87	227.63^{a} ±15.82
Endosulfan 0.2	344.67^{a} ±60.55	80.73^{b} ±53.98	70.80^{b} ±35.33	108.00^{c} ±19.32	172.93^{c} ±28.40	263.83^{a} ±41.54	238.46^{a} ±43.19
Monocrotophos 0.2	339.97^{a} ±56.10	87.46^{b} ±52.94	91.73^{b} ±46.51	169.67^{b} ±29.21	203.33^{b} ±10.08	276.67^{a} ±54.17	244.80^{a} ±30.75
Neem seed oil 0.5 + Endosulfan 0.1	311.60^{a} ±92.40	14.06^{b} ±5.89	13.46^{b} ±7.36	8.10^{d} ±7.33	17.10^{d} ±4.15	108.40^{c} ±18.79	267.26^{a} ±10.30
Neem seed oil 0.5 + Monocrotophos 0.1	422.47^{a} ±90.29	20.80^{b} ±5.33	16.36^{b} ±3.80	10.73^{d} ±1.91	18.33^{d} ±4.21	130.00^{c} ±16.05	218.60^{a} ±27.43
Teepol 0.2	331.93^{a} ±99.48	335.80^{a} ±139.31	295.67^{a} ±78.64	267.67^{d} ±48.77	253.53^{a} ±51.58	275.00^{a} ±26.60	247.17^{a} ±48.11
Control	373.43^{a} ±58.30	339.87^{a} ±83.52	351.33^{a} ±133.30	266.73^{a} ±55.41	270.63^{a} ±23.06	267.67^{a} ±36.84	246.57^{a} ±49.96

Means followed by the same letter, under each column are not significantly different at 5% level of significance.
* DAT- Days after treatment.

each per replication. Fully matured and freshly fallen neem fruits collected during July 1995 from in and around Jodhpur were processed for neem seed kernel. Neem seed oil was prepared by mechanically grinding neem seed kernels and six-month-old neem seed oil was used for the study. In all, there are nine treatments including control, viz., neem seed oil at 0.1, 0.3 and 0.5%, endosulfan (35EC) 0.2%, monocrotophos (36WSC) 0.2%, and Teepol 0.2% and combinations of neem seed oil 0.5% with endosulfan 0.1%, and neem seed oil 0.5% with monocrotophos 0.1%. In all the cases the ratio of mixing of neem seed oil with synthetic insecticides was 5:1. The neem seed oil was emulsified with water by using 0.2% teepol. The plants sprayed with water served as control. The spray solutions were applied by using knapsack sprayer. The egg population of the whitefly was taken by counting eggs on one leaf from top canopy of ten plants and the nymphal population was taken by counting the nymphs on one leaf from middle canopy of ten plants at random. The data collected were pooled and mean was computed for statistical analysis.

Results and Discussion

The egg population of *A. rachipora* observed in different treatments is shown in Table 1. The pretreatment count of egg population varied from 311.60 to 422.47 per leaf in different treatments. All the treatments showed significant reduction in egg population than control and teepol, which are on par with one another in one and two days after treatment. The drastic reduction in the egg population after treatment was probably due to the hatching of viable eggs and due to the reduction in fresh egg laying by adults. Also the eggs affected by the treatment can be distinguished by discolouration and oozing

Table 2. Nymphal population of Acaudaleyrodes rachipora on Acacia senegal in different treatments

Treatments (%)	Mean no. of nymphs/leaf ± SD recorded at different DAT*						
	0	1	2	3	7	10	14
Neem seed oil 0.1	308.73^{a} ±97.43	101.97^{b} ±61.47	86.37^{cb} ±16.08	26.63^{c} ±3.23	67.30^{d} ± 14.03	209.83^{b} ±21.63	238.90^{a} ±38.31
Neem seed oil 0.3	304.63^{a} ±106.96	90.43^{b} ±61.49	58.57^{d} ±24.29	16.60^{c} ±2.20	32.26^{e} ± 7.82	149.17^{c} ±15.89	255.83^{a} ±54.40
Neem seed oil 0.5	328.50^{a} ±101.16	51.07^{c} ±57.58	20.47^{e} ±12.47	3.67^{c} ±3.12	22.46^{e} ± 4.22	150.27^{c} ±19.52	227.13^{ab} ±41.85
Endosulfan 0.2	362.03^{a} ±77.71	118.07^{b} ±94.43	133.27^{bc} ±18.03	129.57^{b} ±36.24	137.36^{c} ± 11.66	236.87^{ab} ±39.93	217.70^{ab} ±21.84
Monocrotophos 0.2	367.97^{a} ±108.66	162.10^{b} ±41.99	140.53^{b} ±37.97	133.27^{b} ±18.03	187.17^{b} ± 13.02	253.77^{a} ±16.59	252.00^{a} ±36.81
Neem seed oil 0.5 + Endosulfan 0.1	360.33^{a} ±60.11	18.06^{c} ±12.60	40.67^{b} ±31.14	2.80^{c} ±0.91	11.93^{e} ± 4.15	130.93^{ab} ±14.49	237.90^{a} ±51.00
Neem seed oil 0.5 + Monocrotophos 0.1	340.37^{a} ±82.66	55.43^{c} ±34.74	22.33^{e} ±6.67	2.87^{c} ±2.80	15.03^{e} ± 4.92	108.33^{d} ±9.37	185.13^{b} ±32.75
Teepol 0.2	346.90^{a} ±73.17	332.90^{a} ±102.72	307.33^{a} ±39.82	242.67^{a} ±40.62	234.23^{a} ± 37.57	240.53^{a} ±26.53	245.57^{a} ±25.64
Control	359.50^{a} ±59.51	334.60^{a} ±109.25	343.33^{a} ±33.68	247.33^{a} ±31.73	261.13^{a} ± 37.05	248.47^{a} ±28.00	241.27^{a} ±21.94

Means followed by the same letter, under each column are not significantly different at 5% level of significance.
* DAT- Days after treatment.

of fluid and such eggs are considered as dead. After three days of treatment neem seed oil at 0.5% recorded lowest number of egg population as being 8.13 per leaf which is on par with neem seed oil in combination of monocrotophos and endosulfan. A similar trend was observed till 7 days after treatment, where minimum egg population was recorded in combination of neem seed oil and monocrotophos and there was significant reduction in all the treatments till 10 days after treatment.

The pretreatment count of nymphal population per leaf ranges from 304.63 to 367.97 and the nymphal population invariably affected in all the treatments except that of teepol and control. The nymphal population in one day after treatment was minimum being 18.06 per leaf in combination of neem seed oil with endosulfan followed by combination of neem seed oil with monocrotophos and neem seed oil at 0.5% and which are at par with one another. A more or less similar trend was observed till 7 days after treatment and they were effective only for a period of 10 days after treatment (Table 2). In general, the neem seed oil at 0.5% and its combination with monocrotophos and endosulfan recorded less number of eggs and nymphal population while monocrotophos and endosulfan alone are less effective in reducing the incidence of egg and nymphal population of *A. rachipora*. This was corroborated by the earlier reports (Coudriet *et al.*, 1985; Nadarajan and Sundaramurthy, 1990) of the bioefficacy of neem seed oil against the whiteflies. Further, Sundararaj *et al.* (1995) reported that in microcage experiment application of neem seed oil at 0.5% inhibited the development of *A. rachipora*. The study also demonstrated that

the neem seed oil 0.5% alone is good enough to control this pest and its combination with either 0.1% monocrotophos or endosulfan did not show any superiority over neem seed oil alone to suppress *A. rachipora*.

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