

Efficacy of different neem oil concentrations against jassid on eggplant under field conditions

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Abstract:

*Field trials were carried out to test out the efficacy of different neem (*Azadirachta indica* A. Juss) oil concentrations at 1%, 2% and 3% compared to control against jassid on eggplant. The treatments were administered thrice from growing to harvesting and observations were recorded before one day while, post-treatment observations were taken after Day-1, Day-3, Day-7, Day-10 and Day-15. The results showed that most reduction of jassid population occurred at 7th day after application of sprays and after that the reduction % gradually started decreasing. Peak reduction appeared after three repeats of*

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sprays, however almost negligible reduction was found in control. The results reveal that maximum day's wise effects of neem oil against jassid at 3% reduced about 88.48% after 7 days of third spray followed by second spray 81.14% and first spray 78.86%, respectively. The overall results for spray-wise effects on reduction of jassid population show that 59.74% was recorded after third spray followed by second and first 37.06% and 24.11%, respectively. The results showed that there was no significant difference in effectiveness between neem oil and neem powder at ($P<0.05$) level.

Key words: neem oil, jassid, eggplant, efficacy, reduction%.

BACKGROUND

This present study lists the most common sucking pest called jassid on brinjal in Tandojam, Sindh-Pakistan. Here we focused on the effects of different neem oil concentrations at different time intervals for the possible reduction of jassid population as vital Integrated Pest Management tool with prospective resources available to the poor farmers.

Brinjal (*Solanum melongena* L.) is one of the widely used vegetable crops originated from India but grown in Central, South and South East Asia, with some parts of Africa and Central America (Harish *et al.*, 2011). Its importance is distributed with its nutrition point of view, containing minerals like iron, phosphorous, calcium and vitamins like A, B and C. Jassid, *Amrasca biguttula biguttula* (Ishida) (Hemiptera: Cicadellidae) is imperative pest having wide range of host plant within solanaceous and malvaceous crops including cotton, eggplant/brinjal, okra, tomato etc (Butani and Jotiwani, 1984; Barroga and Bernardo, 1993). This pest is found most severe in Thailand, Pakistan, Bangladesh, India and Southeast Asian countries (Mabbett *et al.*, 1984; Mahmood *et al.*, 1990; Ali *et al.*, 1993; Kumar and Singh, 2002; Atwal, 1976). To knockout jassid

completely from field crops, farmers extensively use various broad spectrum insecticides but unable to succeed completely, because of its development of resistance and frequent resurgence. In addition due to frequent use of insecticides non-target organisms and human health are under stressed (Solangi *et al.*, 2011). Besides this, due to the enormous disadvantages of chemical insecticides, farmers are motivating towards the IPM tool that relies on cheap and easy to their access. The use of neem oil is also of their approaches to be used. For the better survival of human beings and non-target organisms, botanical insecticides are one of the most cost-effective, easily available and safe method for jassid control. Due to the setting of restrictions by the WTO (World Trade Organization) for maximum residues levels, particularly for the fruits and vegetables, emphasis must be placed on the non-chemical means of pests control in vegetables and neem oil is one of them. Therefore, here in our manuscript we tried to find out maximum reduction of jassid population on brinjal through different neem oil concentrations of in the field.

MATERIALS AND METHODS

Preparation of Neem oil and different concentrations, Experimental field and Statistical Analysis:

(i)- Preparation of neem oil and different concentrations:

Tandojam and its surrounding areas have many neem trees so neem fruits were collected from those trees and were kept in shade for 10-20 days, then neem seeds were dehulled and oil was extracted using experimental oil extractor (150 lbs/inch). The Whatman 1 filter paper method was used for the filtration of oil. To prepare neem oil concentrations based on water field solution, 2gm of detergent with small quantity of water were dissolved together followed by adding required amount of neem

oil for obtaining homogenized water-based neem oil concentrations. Further for our desired concentrations of neem oil i.e. 1, 2 and 3%, water was added accordingly.

(ii) *Experimental field:*

The experiment was conducted near surroundings of Department of Plant Protection, Sindh Agriculture University, Tandojam, Sindh-Pakistan, from January to April of 2012. The commonly grown Hybrid eggplant variety was grown into five equally distributed sub-plot sizes of 6x7m (42m²) with Randomized Complete Block Design (RCBD) method. 40 to 50 days old seedlings of brinjal were transplanted with 60 cm row to row and 30 cm plant-to-plant distance. All the standard agronomic practices were applied at a proper time with proper requirement. Experiment had four treatments (3-neem oil concentrations i.e. 1, 2 and 3% and 1-control) each one was replicated three times. The crop was sprayed at the interval of 28 days at each replication with knapsack hand operated sprayer.

The first application of neem oil was applied when jassid population reached at its Economic Threshold Level (1-2 adult per leaf). Pre-treatment data was recorded 24 hours before spray while post-treatment observations were taken after Day-1, Day-3, Day-7, Day-10 and Day-15 throughout the study. To assess the population of jassid data were recorded visually during early morning hours by counting number of adult jassids from three leaves at top, mid and bottom parts of the 5 randomly selected plants from each treatment including control plot. The reduction percent of pest population was calculated using Abbot Formula, 1925.

$$\text{Reduction\%} = \frac{\text{Pre-treatment} - \text{Post-treatment}}{\text{Pre-treatment}} \times 100$$

For the yield difference among all treatments, brinjal fruits were picked from randomly selected 25 plants and measured in Kilograms (Kgs).

(iii) Statistical Analysis:

The raw data were converted into mean reduction percent along with overall reduction percent by Microsoft Office Excel 2010. Finally the data were statistically analyzed with One-Way Analysis of variance (ANOVA) and means were separated using Least Significant Difference (LSD) test by using PASW Statistics 18 computer software program.

RESULTS

The present study was conducted shortly to recommend following three basic key facts to the farmers for the control of jassids. 1. To sort out the best concentration of neem oil, 2. To watch out the days effects of neem oil, 3. To select out appropriate repeats of spray. The significant results were found after application of different neem oil concentrations (1, 2 and 3%) against brinjal jassid. The results in figures (1, 2 and 3) show that most reduction of jassid population occurred at 7th day after application of sprays and after that the reduction % gradually started decreasing. Whereas, the figure-4 shows that the jassid population reduction almost reached at peak after three repeats of sprays.

The data in table-1 show that Jassid population most effectively reduced about 78.86% by neem oil concentration at 3% followed by 53.08 1% and 25.20% at 2 and 1% concentrations, respectively. The same trend was found in table-2 at 3% concentration about 81.14% highest reduction, followed by 2 and 1% concentrations. However, the highest reduction was found in table-3 about 88.48% with average reduction of 59.74% at 3% concentration followed by 37.06%,

24.11 and 0.04% at 2%, 1% and control, respectively. The overall three spray-wise effects on reduction of jassid population data in table-4 show that 59.74% was recorded after third spray followed by second and first 37.06% and 24.11%, respectively. The data further depict that control plot almost reduced negligible population of jassid throughout the study.

The statistical data showed highly significant reduction differences among all three different neem oil concentrations and control for spray-wise reduction of jassid population with ($F=194.29$; $df=3$,) at $P<0.001$ value. Further Tukey's HSD (Honest Significant Difference) test showed that all 4 means were significantly different from one another.

DISCUSSION

Use of neem oil is an alternate strategy to chemical insecticides in terms of hazardous effects to environment, cost rate and natural enemies (Riffat *et al.*, 2012). Up to date many plant extracts have been utilized for pest control among those neem oil has attracted special attention to the entomologists throughout the world because neem is assorted with some biologically active ingredients, of which azadirachtin is one of the best known. The results of present study showed maximum jassid population reduction at 7th day after application of neem oil and after that the reduction phenomenon gradually started decreasing. The study also concluded that almost the jassid population showed decline after three repeats of the neem oil foliar spray on brinjal.

Lots of literatures are attended to effectiveness of neem oil extracts as foliar such as agreement with work has been done by (Gupta *et al.* 1998; and Mann *et al.*, 2001; Solangi *et al.*, 2011, Riffat and Wagan, 2011). Solsoly and Solsoly (1987) tested efficacy of 2% seed oil against insect pests of cotton. Srisivasan *et al* (2000) tested efficacy of neem products against

leaf hopper, *Amrasca bigutella bigutella* on brinjal and for effective control of pest by neem insecticides. Our study shows agreement to (Shannag et al, 2014), who indicated that the neem-based formulations tested were highly effective in suppressing aphid population up to 50-75% of the control one week after neem-based products were applied as a foliar spray. The present study also partially agrees to (Dhaliwal et al., 1998) who proved that the treatments where neem oil alone (1 and 2%) was applied were more effective for the management of aphids. In terms of our conclusion, the present study also shows agreement to R. Sultana, *et al.*, who recommended that use of bio-pesticides (neem products), is most beneficial in controlling the incidence of jassid on brinjal crop successfully.

CONCLUSIONS AND SUGGESTIONS:

The present manuscript elucidated neem oil very effective and compatible against jassids on brinjal. 3% neem oil concentrations appeared to be highly effective against jassids and their effects remained maximum upto 7 days after that gradually decreased. The study also concluded that for the successful control of jassids at least three sprays of neem oil should be carried out. It is further suggested that use of neem oil along with other plants extracts must be applied as IPM tools to replace synthetic insecticides for the betterment of natural enemies and the surroundings.

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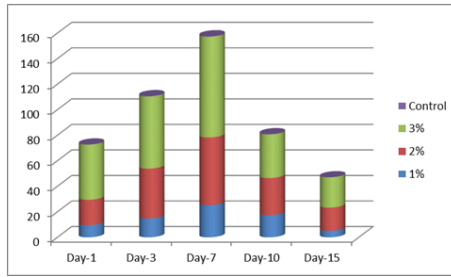


Fig-1 Day-wise effects of all four treatments after first spray

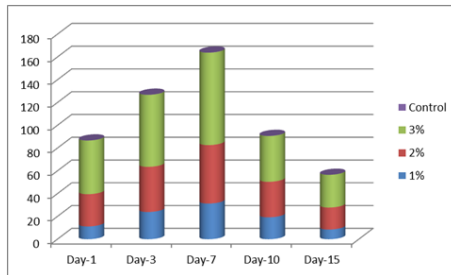


Fig-2 Day-wise effects of all four treatments after second spray

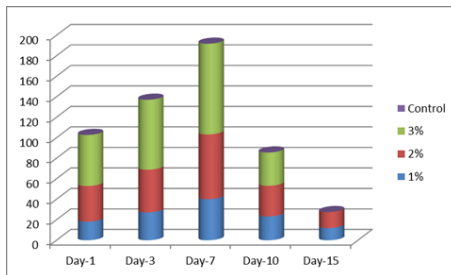


Fig-3 Day-wise effects of all four treatments after third spray

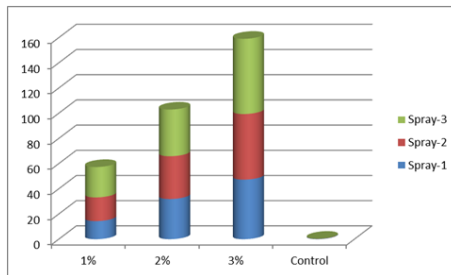


Fig-4 Spray-wise effects of all four treatments

Table-1 Effect of different neem oil concentrations in reduction of jassid population at different days after the application of first spray

Date of Spray	Treatments	Post-treatment Days effects					Average
		Day-1	Day-3	Day-7	Day-10	Day-15	
2012,01,25	1%	9.49	14.71	25.20	17.30	5.10	14.36
	2%	19.94	39.14	53.08	29.20	18.20	31.91
	3%	43.20	56.53	78.86	34.15	23.74	47.30
	Control	0.18	0.31	0.46	0.22	0.05	0.24

Table-2 Effect of different neem oil concentrations in reduction of jassid population at different days after the application of second spray

Date of Spray	Treatments	Post-treatment Days effects					Average
		Day-1	Day-3	Day-7	Day-10	Day-15	
2012,02,15	1%	11.24	23.92	31.32	19.25	8.53	18.85
	2%	28.33	39.67	51.36	31.20	19.32	33.98
	3%	47.14	63.23	81.14	40.21	28.74	52.09
	Control	0.06	0.11	0.16	0.12	0.02	0.09

Table-3 Effect of different neem oil concentrations in reduction of jassid population at different days after the application of third spray

Date of Spray	Treatments	Post-treatment Days effects					Average
		Day-1	Day-3	Day-7	Day-10	Day-15	
2012,03,15	1%	18.13	27.17	40.10	23.25	11.91	24.11
	2%	34.82	41.73	63.18	29.93	15.62	37.06
	3%	49.82	68.19	88.48	32.45	21.41	59.74
	Control	0.02	0.05	0.08	0.03	0.01	0.04

Table-4 Average effect of different neem oil concentrations in reduction of jassid population after the application of all three sprays

Treatments	Spray-wise effect			Mean ± S.E
	Spray-1	Spray-2	Spray-3	
1%	14.36	18.85	24.11	19.11±4.88 b
2%	31.91	33.98	37.06	34.32±2.59 c
3%	47.30	52.09	59.74	53.04±6.27 d
Control	0.24	0.09	0.04	0.12±0.10 a