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EVALUATION OF SOME SYNTHETIC INSECTICIDES AND BOTANICALS IN CONTROLLING OKRA JASSID (*Amrasca devastans)*

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ABSTRACT

The effectiveness of three synthetic insecticides (Milfan 20EC, Chloroced 20EC, Sumithion 50EC) and three botanical oils (Neem, Mahogany, Karanja) were evaluated in this study for controlling okra jassid. Findings of this study revealed that jassid population was significantly different with the application of different control measures. The highest reduction of jassid was 88.89% in Milfan 20EC treated plots. Percent area of burnt leaf, number of burnt leaf plant^{-1}, number of fruit plant^{-1} and plant height were significantly different with the application of different control measures. The highest plant height (245.7cm), lowest leaf burn (4.09%) plant^{-1}, lowest leaf area burnt (4%) and highest number of fruit plant^{-1} (36.67) were observed in Milfan 20EC treated plots. The results of Chloroced 20EC and Sumithion 50 EC were statistically similar with neem oil at very often. Botanical oils were effective to some extent but among the botanical oils neem oil was found most effective against jassid.

Key words*: Botanical oils, insecticides, okra, white fly*

INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is a popular vegetable in Bangladesh and grows at different parts of the world. Though okra is produced mainly in the kharif season it can be grown throughout the year round (Rashid, 1976). This crop is infested by many insect species, such as jassid, shoot and fruit borer, cutworm etc. Among these, jassid (*Amrasca devastans*) has been recorded as the most serious pest. Both adults and nymphs suck plant sap from under surface of the leaves which consequently affect the vegetative and reproductive growth. The affected leaves show "hopper burn symptoms". The insect has been reported to be the pest of okra throughout the year (Senapati and Khan, 1978). The common method for controlling of this pest infestation in Bangladesh is the application of chemical insecticides. Control of insect pests by the routine use of chemical insecticides create several problems in agro-ecosystem such as direct toxicity to the beneficial insects, fishes and human (Goodland *et al*. 1985, Pimentel, 1981) and increased environmental and social costs (Pimetel, 1980). Botanical insecticides are broad-spectrum in action safe to apply and can easily be processed. Locally available plant materials have been widely used to protect field and stored products against insect infestation (Golab and Webley, 1980). Among the botanicals neem oil has extensively been used and has proved its pest controlling efficacy against several insect pests both in field and storage (Mariappan and Saxena, 1984). The present research work was undertaken to investigate the efficacy of some indigenous plants oil such as neem (*Azadirachla indica*), karanja(*Pongania pinnata*), mahogany(*Swietenia mahogani*) and three insecticides such as Milfan 20EC, Sumithion 50EC and Chloroced 20EC on the incidence of jassid in okra field.

MATERIALS AND METHODS

The research work was conducted in the Entomology Field Laboratory of Bangladesh Agricultural University from January to May, 2004. The experiments consisted of seven treatment combinations with three replications following Randomized Complete Block Design (RCBD). Two adjacent unit

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plots and blocks were separated by 40 cm and 50 cm apart respectively. Each experimental plot comprised of 3.2 x 2.1 m^2.

Collection and sowing of seeds: Seeds were collected from the BARI, Gazipur, and sown in the experimental plots at the rate of 72 seeds/plot (three seeds per pit and 24 pits per plot). Seeds were shown on Plant to plant spacing was maintained as 70x40 cm.

Observation of jassid population: The population of jassid was recorded at 15 days interval. The counting was started form the very beginning of jassid infestation. Five jassid (nymphs and adults) infested plants were randomly selected from each plot by tagging and the nymphs on the leaf were removed from the plant on a white paper and counted. Adults were counted by covering with poly bag.
Application of treatments: The treatments comprised of Milfan 0.05%, Chloroced 0.2% Sumithion 0.2%, neem oil(0.5%), karanja oil (0.5%) and mahogoni oil (0.5%) and control. Spraying was done at 3: 30 pm to avoid scorching sun light. The treatments were applied at 15 days interval and a total of seven spraying were done during study period. Milfan (0.05%), Chloroced (0.2%), Sumithion (0.2%) were collected from the local shop. Spraying was done @ 5 ml 10 L^{-1}, 20 ml $10L^{-1}$ and 20ml $10L^{-1}$ for Milfan, Chloroced and Sumithion, respectively to get complete coverage of the plants, spraying was done uniformly on the entire plant with special care to cover the lower surface of the leaves.

Assessment of treatment effects: The effect of treatments on jassid population were determined by counting the number of jassids per plant before application and after 24 hours of application. The percent reduction of jassid $plant^{-1}$ was calculated using the following formula.

$$\% \text{ Reduction} = \frac{(Pr - Po) \times 100}{Pr}$$

Where, P_r = Pre count per plant and P_o = Post count per plant
Analysis of variance was done to calculate the variances and their level of significance against the control. The mean values were separated following Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Incidence of jassid: The number of jassids per leaf at different days after germination presented in Fig. 1. After 15 days of germination, infestation rate increased gradually and decreased after 45 days of germination. The lowest number of insects (4 insects/leaf) was recorded at 15 days after germination and the highest (35 insects/leaf) at 45 days after germination. At 105 days after germination, the number of insects was 12 insects /leaf. The peak infestation occurred in the last week of February. Findings pointed that the infestation of okra by jassid was lowest after germination of seedlings and highest at vegetative to flowering stage. Senapti and Khan (1978) reported that the largest population of jassid occurred from November to February which is in consonant with the present findings.

Effect of different insecticides and botanical oils: Significant variation was found in the percent reduction of jassid population. Reduction ranged from 46.67 to 88.89% at 1st spray, 45.57 to78.25% at 2nd spray, 49.05 to 70.55% at 3rd spray, 39.09 to 71.41% at 4th spray, 47.95 to 71.03% at 5th spray, 47.95 to 74.29% at 6th spray and 47 to 80.56% at 7th spray. The highest percent of jassid population reduction (88.89%) was observed in Milfan 20 EC treated plot and the lowest reduction (46.67%) was found in karanja oil treated plot at 1st. spray. Jassid population increased by 8.97% at control treatment. At 7th spray, the highest percent of jassid population reduction (80.56%) was in Milfan 20 EC and the lowest percent of jassid population reduction (47%) was found in karanja oil treated plot. The increased jassid population (7.14%) was found in the untreated plot. Among the botanicals, neem oil treated plants produced the highest percent reduction of jassid population (56.67) at 7th spray (Table 1).

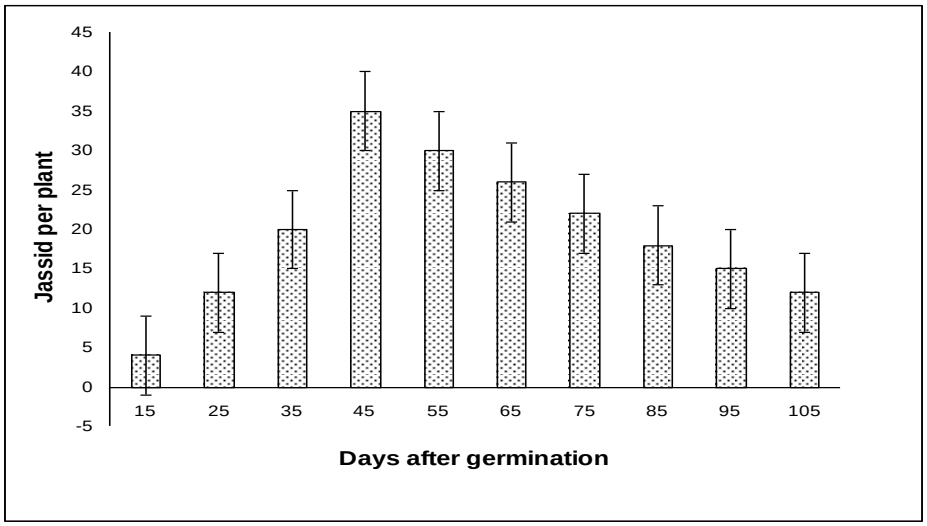

Figure 1. Mean number of Jassid per leaf at different growth stage of plants

Effect on plant height: Plant height was not adequate in untreated plots as found in the treated plots due to the infestation of jassid. Plant height ranged from 12.67 to 20 cm at 15 days, 13.56 to 38.67cm at 30 days, 24.67 to 71.33cm at 45 days, 31 to 130 cm at 60 days, 69 to 180cm at 75 days, 89.64 to 219cm at 90 days and 104 to 245.7cm at 105 days after germinations. The highest height (245.7cm) was observed in Milfan 20 EC treated plot. The lowest height (104.3cm) was found in control plots. Findings evident that all the treated plots had significantly different plant height at different age of the plant and among botanical, neem oil performed the best (219.00 cm) at 105 days age of the plant (Table 2).

Effect of leaf burning: The leaves of okra plant were burnt in untreated plots severely due to the infestation of jassid. Table 3show that leaf burn ranged from 4.6 to 14.54% at 1st spray, 4.45 to 21.58% at 2nd spray, 4.5 to 28.12.4% at 3rd spray, 4.27 to 35.08% at 4th spray, 4.09 to 40.90% at 5th spray, 4.45 to 49.57% at 6th spray and 4.69 to 64.04% at 7th spray. At 7th spray, the lowest (4.69%) burnt leaves were observed in Milfan 20 EC treated plot. The highest burnt leaves (64.04%) were found in control plot. It was evident that all treated plots had significantly different burnt leaves than that of control plots.

Table 4 showed that area of leaf burn ranged from 4 to 34% at 1st spray, 4.67 to 86.67% at 2nd spray, 3.67 to 86 % at 3rd spray, 4.33 to 91.67% at 4th spray, 4 to 89.33% at 5th spray, 4.33 to 88.33% at 6th spray and 4.67 to 92.67% at 7th spray. At 7th spray, the lowest area of leaf burn (4.67%) was observed in Milfan 20 EC treated plot. The highest area of leaf burn (92.67%) was found in control plots. Findings revealed that all treated plots significantly differed from control plots. Neem oil was found the best among botanical oils regarding lowest area leaf burn at each spraying .

Effect on fruit production: Number of fruits per plant was seriously affected due to the infestation of jassid. In the untreated plots a maximum of 7 fruits was found per plant but it was 36.67 in Milfan treated plots. The number of fruits varied significantly with the age of plants as influenced by pesticide spray (Table 5). Number of fruits per plant ranged from 1 to 6.67 at 30 days, 3 to 10.33 at 45 days, 4.67 to 17.67 at 60 days of plant age, 6 to 27 at 75 days, 7.6 to 34 at 90 days and 7 to 36.67 at 105 days of plant age. At 105 days of plant age, the highest number of fruits per plant was (36.67) observed in Milfan 20 EC treated plot and the lowest (7) was found in control plot. Milfan 20 EC and Chloroced 20 EC treated plants produced the highest number of fruit per plant and were statistically identical followed by Sumithion 50, neem and mahogany oil which were also statistically identical. Findings evident that all the treated plots had significantly higher number of fruits from that of control plots. Neem oil treated plots were found as the best among the botanical oils and evident that neem oil (5%) significantly reduced the pest population compared to control. Mansurul, *et al*. (1996) reported that neem oil (@ 5 %) gave significant control of jassid which is in consonant with the present study.

Table 1. Effect of different botanical oils and insecticides on the population reduction of jassid

Treatments	% reduction of jassid population at different spraying

	1st	2nd	3rd	4th	5th	6th	7th
Milfan (0.05%)	-88.89a	-78.25a	-70.55a	-71.41a	-71.03a	-74.29a	-80.56a
Chloroced (0.2%)	-67.56b	-66.05b	-66.77a	-65.66b	-66.27b	-67.94b	-67.22b
Sumithion (0.2%)	-63.89c	-63.49c	-62.09b	-61.38c	-64.55b	-64.58c	-61.11c
Neem- oil (5%)	-56.67d	-56.55d	-59.96b	-39.09f	-58.40c	-57.93d	-56.67cd
Mahogany oil(5%)	-53.33e	-50.00d	-54.95c	-53.48d	-50.95d	-54.76e	-53.33d
Karanja oil (5%)	-46.67f	-45.57e	-49.05d	-50.03e	-47.95e	-47.95f	-47.00e
Control	+8.97g	+9.87f	+10.02e	-9.700g	-7.51f	-6.25g	-7.14f
CV%	4.88	5.91	11.01	4.59	7.42	6.21	6.44

(-) and (+) sign represent percent reduction and increase of jassid population respectively. Values with different letters in the same column are significantly different at (DMRT. $P \leq 0.05$)

Table 2. Effect of regular application of botanical oils and insecticides on the plant height of okra

Treatments	Plant height (cm) after germination						
	15 days	30 days	45 days	60 days	75 days	90 days	105 days
Milfan (0.05%)	20a	38.67a	71.33a	130.0a	180.7a	219.0a	245.7a
Chloroced (0.2%)	18ab	36.33ab	64.67b	118.7ab	170.3b	210.0ab	233.0b
Sumithion (0.2%)	17ab	34.67b	60.67c	109.7ab	159.7c	200.7ab	224.7c
Neem-Oil (5%)	16.67abc	29.33c	53.33d	102.7b	154.3d	194.7ab	219.0 cd
Mahogany oil (5%)	16abc	24.67d	50.33d	98b	150.0e	190.0ab	213.7de
Karanja oil (5%)	15.33bc	22.69d	35.00e	94.67b	145.0f	150.0b	208.7e
Control	12.67c	13.56e	24.67f	31c	69.0g	89.64c	104.3f
CV%	9.35	5.28	2.94	9.37	1.05	12.38	1.26

Values with different letters in the same column are significantly different (DMRT. $P \leq 0.05$)

Table 3. Percentage of burnt leaf of Okra after regular application of botanical oils and insecticides

Treatments	% burnt leaf after different spraying						
	1st	2nd	3rd	4th	5th	6th	7th
Milfan (0.05%)	4.6d	4.45g	4.5e	4.27f	4.09f	4.45e	4.69e
Chloroced (0.2%)	5.55d	6.82f	5.88e	6.10ef	6.47ef	6.03de	6.76d
Sumithion (0.2%)	8.89c	8.52e	7.08de	7.83de	8.24de	8.46cd	8.25d
Neem- oil (5%)	10.65bc	9.78 d	9.85cd	9.88cd	10.17cd	10.74bc	10.42c
Mahogany oil(5%)	11.20b	11.76c	11.71bc	11.69bc	12.7bc	12.68b	12.73b
Karanja oil (5%)	13.42a	13.22b	13.46b	13.20b	13.55b	14.04b	13.97b
Control	14.54a	21.58a	28.12a	35.08a	40.90a	49.57a	64.04a
CV%	7.71	3.49	10.05	8.97	8.16	9.87	4.33

Values with different letters in the same column are significantly different (DMRT. $P \leq 0.05$)

Table 4. Percent area of leaf burn after regular application of botanical oils and insecticides.

Treatments	% Area leaf burn after different spraying						
	1st	2nd	3rd	4th	5th	6th	7th

Milfan (0.05%)	4.0e	4.670e	3.67f	4.33g	4.0g	4.33g	4.67g
Chloroced (0.2%)	6.67e	5.0e	8.0e	8.33f	7.67f	8.33f	9.33f
Sumithion (0.2%)	12.0d	13.0d	14.0d	14.0e	13.0e	13.0e	12.67e
Neem- oil (5%)	15.0d	17.0cd	19.0c	18.0d	18.33d	17.0d	19.0d
Mahogany oil (5%)	20.0c	20.67bc	24.33b	24.0c	25.67c	23.67c	24.0c
Karanja oil (5%)	27.0b	26.0b	27.67b2	27.33b	28.33b	28.0b	26.33b
Control	34.0a	86.67a	86.0a	91.67a	89.33a	88.33a	92.67a
CV%	10.03	10.69	5.77	2.84	2.73	2.89	1.62

Values with different letters in the same column are significantly different (DMRT. $P \leq 0.05$)

Table 5. Effect of botanical oils and insecticides on the production of fruits

Treatments	Mean number of fruits per plant at different age (days)						
	15	30	45	60	75	90	105
Milfan (0.05%)	0	6.67a	10.33a	17.67a	27.0a	34.0a	36.67a
Chloroced (0.2%)	0	5.67b	9.0b	15.49b	24.67b	32.67ab	36.0a
Sumithion (0.2%)	0	5.57b	8.67b	15.0b	23.67b	30.67bc	34.0ab
Neem- oil (5%)	0	4.67c	8.67b	13.33c	21.33c	29.0c	33.33ab
Mahogany oil (5%)	0	4.67c	6.67c	12.0d	19.67c	26.33d	33.0ab
Karanja oil (5%)	0	3.0d	5.0d	11.0d	17.0d	23.67e	28.67b
Control	0	1.0e	3.0e	4.67e	6.0e	7.60f	7.0c
CV%	0	4.56	5.23	3.30	3.74	3.72	8.87

Different letters in the same column are significantly different (DMRT. $P \leq 0.05$)

Experimental results showed that the jassid population was significantly different with the application of different control measures. The highest plant height (245.7cm), lowest leaf burn (4.09%) per plant, lowest leaf area burnt (4%) and highest number of fruit per plant (36.67) were observed in Milfan 20 EC treated plots. The results of Chloroced 20 EC and Sumithion 50 EC were statistically similar with neem oil in very often. It can be concluded that jassid infestation varied in different growth stages of okra plants and hampered okra production severely. The chemical insecticide Milfan 20 EC was the most effective against jassid. Among the botanical oils, neem oil performed the most effective to control jassid in okra field. It may be suggested that Milfan may be used for controlling jassid when the population of jassid is very high but incase of low jassid population, use of neem oil is more suitable than other botanicals.

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