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RESEARCH NOTE

Efficacy of insecticides against mango leaf webber, *Orthaga exvinacea* Hampson under laboratory conditions

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ABSTRACT: Laboratory studies were conducted to evaluate the efficacy of insecticides against mango leaf webber, *Orthaga exvinacea* Hampson, at the Post Graduate Research laboratory, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. Six insecticides viz., chlorpyriphos 20 EC, chlorantraniliprole 18.5 SC, chlorfenapyr 10 SC, carbosulfan 25 EC, imidacloprid 17.8 SL, and Azadirachtin 1 EC, were tested against *O. exvinacea*. Among them, the treatment with chlorantraniliprole 18.5 SC showed the highest mortality against *O. exvinacea*, followed by the treatments with chlorpyriphos 20 EC and chlorfenapyr 10 SC. Whereas, azadirachtin 1 EC showed the least mortality. Chlorantraniliprole 18.5 SC was the most effective in controlling *O. exvinacea,* while azadirachtin 1 EC was the least effective.

Keywords: Efficacy, insecticides, mango, *Orthaga exvinacea,* laboratory condition

Mango leaf webber is one of the important pests of mango. Two species *viz.*,, *Orthaga exvinacea* Hampson and *O. euadrusalis* Walker are commonly found on mango in India. In West Bengal, *O. exvinacea* was reported for the first time as a pest of mango. It was originally regarded as a minor pest but now has attained major pest status (Rafeeque and Ranjini, 2011). It is widely distributed in different agro-climatic zones of India and has gained the status of a serious pest in Uttar Pradesh, Uttaranchal, and Andhra Pradesh (Singh *et al.* 2006). It causes about 90 per cent of shoot damage, leading to improper fruit setting (Singh, 1988). The heavily infested trees present a burnt look. It affects the flowers as well as the growth of new flush (Kavitha *et al.* 2005). The early instars scrape the chlorophyll content of the leaves. After that, from the third instar onwards, they start forming the webs by webbing 3 to 4 leaves together initially. As the severity of the pest increases, they move on to the nearby leaves and web them with the older web and start chewing the leaves from inside the web. The larvae are very active in their movement inside the web, where they will have tunnels made up of silken webs to escape and hide. These larvae pupate inside the webbings itself in silken cocoon like case covered with its excreta outside. Severe infestation affects the yield (Verghese, 1998; Reddy *et al.,* 2022). The farmers are largely relying on the use of synthetic chemical insecticides for the management of the insect pests in mango. The broad-spectrum activity of new molecules at low dosages, coupled with low mammalian toxicity and safety to non-target organisms made them an alternative to conventional insecticides (Kumar, 2006). Overuse of non-selective pesticides in agriculture has several adverse effects like pest resurgence and killing natural enemies (Carmo *et al.,* 2010 ; Fernades *et al.,* 2010). To mitigate these problems, new molecules which are relatively safer to non target organisms need to be evaluated for sustainable insect pest management in mango. Keeping these facts in mind, the investigation was undertaken for the evaluation of some new insecticides against *O. exvinacea* Hampson.

An experiment was carried out at the Post Graduate Research laboratory, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India under laboratory condition, at 29.46±2.59^{o}C temperature and 38.66±6.52% relative humidity (RH). The experiment was conducted in randomized block design with six treatments; each replicated three times. In the control, only water was treated. The various treatments included chlorpyriphos 20EC (2ml/l water), chlorantraniliprole 18.5SC (0.3ml/l water), chlorfenapyr 10SC (1ml/l water), carbosulfan 25EC (2ml/l water), imidacloprid 17.8SL (0.3ml/l water), and azadirachtin 1EC (2ml/l water). The solution of each insecticide was prepared separately in the glass jars. Fresh leaves of mango plants were plucked and brought to the laboratory and were cleaned with a fine camel hair brush. Five leaves were treated with the solution of each insecticide with the help of continuous atomizer sprayer separately and were allowed to dry for some time and then transferred to Petri dish. For getting second generation, the larvae of *O. exvinacea* were collected from the mango orchard and reared in plastic jar on fresh mango leaves (Fig. 1). After pupation, the pupae were collected and the emerged adults were kept for mating. The identification of male and female was done in the pupal stage by examining the location of genital slit in relation to anal slit with help of stereo binocular microscope. The newly emerged pair of male and female adults were released in separate rearing cages for mating and egg laying. After egg hatching, the larvae were reared under laboratory condition and third instar larvae were collected. Ten third instar larvae were released on treated leaf kept in each treatment (Fig. 2). Two trials were carried out separately at 15 days interval. In both trials, the same number of larvae were released on the leaf before treatment, i.e., the same number of larvae (10) were found before the first spray and second spray. In both the trials, the mortality counts of larvae were taken at 1, 3, 5 and 7 days after spraying.

The data collected were analyzed using analysis of variance (ANOVA) technique following the method described by Panse and Sukhatme (1985). The appropriate standard errors (S.Em. ±) were calculated in each case and the critical difference (C.D.) at 5 per cent level of probability was worked out at the Department of Agricultural Statistics and Computer Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The percentage of co-efficient of variation (CV%) was also worked out for all the cases. The square root transformation of data was done wherever necessary.

The data on the mean number of dead larvae of *O. exvinacea* presented in table 1 showed that there was significant difference among the treatments in the mean number of dead larvae after 1, 3, 5 and 7 days of the first spray. After one day of spraying of insecticides, the maximum mortality was obtained in the treatment of chlorantraniliprole 18.5SC (4.0 larvae) and it was followed by chlorpyriphos 20 EC (3.67 larvae), chlorfenapyr 10SC (3.33 larvae), carbosulfan 25EC (3.0 larvae), and imidacloprid 17.8SL (2.67 larvae). The least mortality of larvae (0 larvae) was observed in the treatment of azadirachtin 1EC and control. A similar trend in the mean number of dead larvae among treatments was observed after three, five, and seven days of the first spray.

Pooled analysis of data over periods after the first spray presented in table 1 indicated that all the treatments were significantly superior to the control. The greatest number of dead larvae was recorded in the treatment of chlorantraniliprole 18.5SC (7.5 larvae), indicating its highest efficiency. It was followed by the treatment of chlorpyriphos 20EC (6.58 larvae), chlorfenapyr 10SC (6.16 larvae), carbosulfan 25EC (5.66 larvae), and imidacloprid 17.8 SL (4.91 larvae). The minimum mortality was obtained in the treatment of azadirachtin 1EC (2.33 larvae) indicating that it was the least effective against *O. exvinacea.*

The data pertaining to the evaluation of different insecticides after the second spray in table 1 showed that there was a significant impact of all insecticides over control. After one day of the second spray of insecticides, the maximum mortality was obtained in the

Fig. 1. Mass rearing of *Orthaga exvinacea*

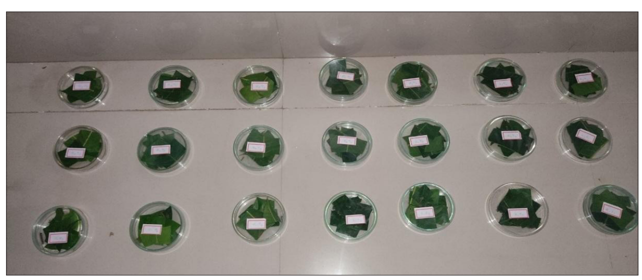

Fig. 2. Experimental set up

Table 1. The mean number of dead larvae of *Orthaga exvinacea* in different insecticidal treatments under laboratory conditions

Treatment (ml/l)	Mean number of dead larvae I Experiment				Mean number of dead larvae II Experiment				Mean mortality		
	1 DAS	3 DAS	5 DAS	7 DAS	1 DAS	3 DAS	5 DAS	7 DAS	First Experiment	Second Experiment	Pooled
Chlorpyriphos 20EC (2.0)	2.04 (3.67)	2.61 (6.33)	2.80 (7.33)	3.08 (9.0)	1.95 (3.33)	2.54 (6.0)	2.73 (7.0)	2.97 (8.33)	2.63 (6.58)	2.55 (6.17)	2.59 (6.38)
Chlorantraniliprole 18.5SC (0.3)	2.12 (4.0)	2.74 (7.0)	3.08 (9.00)	3.24 (10.0)	2.04 (3.67)	2.68 (6.67)	3.03 (8.67)	3.19 (9.67)	2.79 (7.5)	2.73 (7.17)	2.76 (7.33)
Chlorfenapyr 10SC (0.1)	1.95 (3.33)	2.48 (5.67)	2.73 (7.00)	3.02 (8.67)	1.87 (3.0)	2.41 (5.33)	2.67 (6.67)	2.91 (8.0)	2.54 (6.16)	2.47 (5.83)	2.50 (5.99)
Carbosulfan 25EC (2.0)	1.87 (3.00)	2.35 (5.0)	2.61 (6.33)	2.97 (8.33)	1.77 (2.67)	2.27 (4.67)	2.55 (6.0)	2.80 (7.33)	2.45 (5.66)	2.35 (5.25)	2.40 (5.45)
Imidacloprid 17.8SL (0.3)	1.77 (2.67)	2.19 (4.33)	2.41 (5.33)	2.79 (7.33)	1.68 (2.33)	2.20 (4.33)	2.41 (5.33)	2.73 (7.0)	2.29 (4.91)	2.25 (4.74)	2.27 (4.82)
Azadirachtin 1EC (2.0)	0.71 (0.0)	1.22 (1.0)	1.87 (3.0)	2.41 (5.33)	0.71 (0.0)	1.34 (1.33)	1.76 (2.67)	2.34 (5.00)	1.55 (2.33)	1.53 (2.25)	1.54 (2.29)
Control (Water spray)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)
S. Em. ± (T)	0.06	0.08	0.09	0.07	0.07	0.08	0.10	0.07	0.03	0.04	0.06
CD (T)	0.17	0.25	0.28	0.21	0.21	0.25	0.29	0.22	0.10	0.11	0.17
CV%	6.26	6.89	6.89	4.66	7.71	7.00	7.41	4.90	5.70	4.94	4.58

DAS- Day After Spray, DBS- One Day Before Spray; *Figures in parenthesis are original values whereas those outside parenthesis are square root $\sqrt{(x + 0.5)}$ transformed values.

treatment of chlorantraniliprole 18.5SC (3.67 larvae), which was significantly superior over other treatments. It was followed by chlorpyriphos 20 EC (3.33 larvae), chlorfenapyr 10 SC (3.0 larvae), carbosulfan 25 EC (2.67 larvae) and imidacloprid 17.8 SL (2.33 larvae). The least mortality was obtained in the treatment of azadirachtin 1EC (0.0 larva) and control (0.0 larva). Similar trend in the mean numbers of dead larvae among treatments were observed after three, five, and seven days of the second spray.

Pooled analysis of data over periods after the second spray presented in Table 1 indicated that all the treatments were significantly superior to control. The greatest number of dead larvae was recorded in the treatment of chlorantraniliprole 18.5SC (7.17 larvae), indicating its highest efficiency as compared to others. It was followed by chlorpyriphos 20EC (6.17 larvae), chlorfenapyr 10SC (5.83 larvae), carbosulfan 25EC (5.25 larvae), and imidacloprid 17.8SL (4.74 larvae), which were moderately effective in controlling *O. exvinacea*. The minimum mortality of larvae was obtained in the treatment of azadirachtin 1EC (2.25 larvae), indicating its least efficiency against *O. exvinacea*.

The overall pooled data pertaining to the evaluation of different insecticides after the first and second sprays in Table 1 showed that all the treatments were significantly superior to the control. The significantly greatest number of dead larvae was recorded in the treatment of chlorantraniliprole 18.5SC (7.33 larvae), indicating its highest efficiency as compared to others. It was followed by chlorpyriphos 20EC (6.38 larvae), chlorfenapyr 10SC (5.99 larvae), carbosulfan 25EC (5.45 larvae), and imidacloprid 17.8SL (4.82 larvae), which were moderately effective in controlling *O. exvinacea*. The minimum mortality of larvae was observed in the treatment of azadirachtin 1EC (2.29 larvae), indicating its least efficiency against *O. exvinacea*. These findings are supported by those of Mallikarjun *et al.* (2020) who revealed that chlorantraniliprole 18.5% SC @ 0.2ml/l recorded the least number of active webs per tree

(2.17) and the least number of larvae per web (2.82) as compared to other treatments. Similarly, Murthy *et al.* (2019) observed that chlorantraniliprole 0.03% was the best treatment by reducing 82.41% and 74.60% larvae per web, respectively. Masanori *et al.* (2005) reported the highest efficacy of flubendiamide as a novel insecticide and a very effective chemical against lepidopteran insects. These findings are similar to the present findings.

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