



## EFFICACY OF INSECTICIDES AGAINST AMERICAN SERPENTINE LEAF MINER *LIRIOMYZA TRIFOLII* (BURGESS) IN WATER MELON

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### ABSTRACT

A field experiment was conducted to evaluate the efficacy of certain selective insecticides against the serpentine leaf miner *Liriomyza trifolii* (Burgess) in water melon *Citrullus lanatus* (Thunb.) Matsum and Nakai. The hybrid F1 (Melody) was sown in protray and 13 days old seedlings were transplanted in the main field. Significant less live mines (1.48/ leaf) was observed with chlorantraniliprole 18.5%SC @0.6 ml/ l. This was followed by flubendiamide 39.35%SC @0.6 ml/ l (2.09/ leaf) and indoxacarb 14.5%SC @0.65 ml/ l (3.05/ leaf). Leaf damage/ plot was 2.72, 3.48 and 4.03%, with chlorantraniliprole, flubendiamide and indoxacarb, respectively. Significantly maximum yield of fruits (25.5 t/ ha) was obtained with chlorantraniliprole given as three sprays at 15 days interval. Thus, chlorantraniliprole 18.5%SC @0.6 ml/ l can be recommended against *L. trifolii* in water melon.

**Key words:** Water melon, kharif season, farmer field, Namakkal district, *Liriomyza trifolii* leaf damage, chlorantraniliprole, flubendiamide, indoxacarb, infestation reduction, fruit yield, ICBR

Water melon is an important commercial horticultural crop rich in vitamins A, B<sub>1</sub>, B<sub>2</sub> and C and minerals (Moniruzzaman, 1988). China is the largest producer and India occupies third position (Anonymous, 2019). Tamil Nadu has an area of 6.420 ha with water melon and with productivity of 32 t/ ha (Santosh et al., 2018), and the cultivation is restricted to Villupuram, Namakkal, Ariyalur, Coimbatore and Erode districts (Chadha, 2013). More than 35 varieties/ hybrids are grown in India. It is attacked by several insect pests at various stages (Anonymous, 2012). Serpentine leaf miner *Liriomyza trifolii* is its most destructive pest in its early growth stage. It causes loss of 15-70 % in French bean, 41% in cucumber and 35% in tomato (Krishna Kumar, 1998), and in water melon, maximum leaf damage (37%) has been observed (Patnaik, 2000). Apart from causing direct losses, it also causes wounds on the plant foliage and predisposes it to secondary infection by bacterial and fungal pathogens. Farmers resort to applying several rounds of insecticides that are harmful to human beings and environment (Anonymous, 1991). This study evaluates certain newer insecticides effective at lower doses against *L. trifolii* in water melon under field conditions.

### MATERIALS AND METHODS

The field experiment was carried out at farmer's field

at Muthur village (11° 6' 17"N, 78° 6' 7"E), Namakkal district of Tamil Nadu during kharif 2019. The selected insecticides were compared with farmers practice of foliar spray of profenophos 50%EC@ 2ml/ l. The insecticides evaluated include- T<sub>1</sub>-Thiamethoxam 25%WG@ 0.4g/ l; T<sub>2</sub>-Imidacloprid 17.8%SL@ 0.3 ml/ l; T<sub>3</sub>-Spiromesifen 22.9%SC@ 0.5 ml/ l; T<sub>4</sub>-Diafenthiuron 50%WP@ 0.8 g/ l; T<sub>5</sub>-Thiacloprid 21.7%SC@ 0.6 ml/ l; T<sub>6</sub>-Propargite 57%EC@ 1.25 ml/ l; T<sub>7</sub>-Chlorantraniliprole 18.5%SC@ 0.6 ml/ l; T<sub>8</sub>-Flubendiamide 39.35%SC@ 0.6 ml/ l; T<sub>9</sub>-Indoxacarb 14.5% SC@0.65 ml/ l; T<sub>10</sub>-Fenazaquin 10% EC@ 2 ml/ l; T<sub>11</sub>-Chlorfenapyr 10% EC@ 1 ml/ l; T<sub>12</sub>-Malathion 50% EC (Treated check) @ 1 ml/ l; T<sub>13</sub>-Untreated check (water spray) @500 l/ ha. Three replications were maintained with popular hybrid F<sub>1</sub> (Melody) sown in protray and 13 days old seedlings transplanted in the main field at a spacing of 2.5 x 0.5m and other recommended package of practices were adopted. The first spray was done with the onset of pest incidence after recording pretreatment count of leaf miner and subsequent ones repeated after 15 days interval using high volume sprayer. The post-treatment counts were recorded on 1, 3, 7, 14 days after spray. Ten plants were selected randomly from each replication and the infested live mines were recorded from 3 leaves/ creeping branches (one from unopened leaves and two

opened leaves) and the infestation level was assessed. The observations on % leaf damage and score were done using the sampling grade as follows (% infestation, category of intensity: 0-10, Very low; 11-20, Low; 21-30 Moderate; 31-40 Severe; and >41 Very Severe). The observation on leaf damage (%) was converted as score values as given by Galande (2001) and Onkara Naik et al. (2019). Water melon fruits were harvested and pooled to arrive at the total fruit yield (t/ ha). The increase in yield and income over untreated check was worked out and the benefit cost ratio was calculated following the procedure- BCR = Gross income / (total cost of cultivation + cost of plant protection) and (cost of insecticide + labour charges for spraying) as adopted by Akila and Sundara Babu (1994). The data were analyzed for ANOVA. The data on incidence were transformed into square root transformation and analyzed in SPSS (version 22) (IBM Crop. Released 2013) software to identify the most effective treatments and their means were compared by significant difference at  $p < 0.05$  ANOVA following Tukeys' Honest Significant Difference test.

## RESULTS AND DISCUSSION

The results showed that all the insecticides were effective in reducing the *L. trifolii* incidence. The data on number of live mines/ leaf, % leaf damage, % reduction of live mines over untreated check, % reduction leaf damage and increase in yield are given in Table 1. The results revealed a significant less number of live mines with chlorantraniliprole (1.48/ leaf) followed by flubendiamide (2.09/ leaf), indoxacarb (3.05/ leaf), as against maximum in the untreated check (12.83/ leaf). The % leaf damaged was the least in chlorantraniliprole treated plants (2.72%) followed by flubendiamide (3.48%), indoxacarb (4.03%) as against maximum in the untreated plot (35.31%). The % reduction in leaf damage over untreated check was the highest (92.29%) with chlorantraniliprole followed by flubendiamide (90.14%) and indoxacarb (88.59%) when sprayed at 15 days interval. A significantly high fruit yield (25.50 t/ ha) and incremental cost benefit ratio (ICBR) (1:1.56) was obtained with chlorantraniliprole followed by flubendiamide (24.43 t/ ha; 1:1.49), indoxacarb (23.50 t/ ha; 1:1.44) as compared to the untreated check of 16.30 t/ ha).

Variya and Patel (2012) reported the efficacy of diafenthiuron, emamectin benzoate, thiamethoxam and spinosad in reducing the leaf miner incidence and increasing the yield of water melon. Radhakrishnan and Natarajan (2009) also reported a significant effect

of trap + dimethoate 30 EC@2 ml/ l and methyl demeton 25EC@ 2 ml/ l which registered lesser leaf miner incidence. Present results are in conformity with those of Saad Mousa et al. (2013) on the efficacy of chlorantraniliprole, chlorfenapyr, indoxacarb, and spinosad mixed with abamectin. Selvaraj et al. (2017) confirmed that chlorantraniliprole 4.3%+ abamectin 1.7% dose was significantly effective, while Sapkal et al. (2018) and Anjali et al. (2018) found that use of chlorantraniliprole, flubendiamide and indoxacarb is effective in tomato. Rohit et al. (2020) observed that during summer (2019), cyantraniliprole led to the least leaf mines (4.34%) and leaf damage (13.01%). Ramesh and Ukey (2007) observed the superiority of chlorantraniliprole and abamectin in tomato while Kousika et al. (2015) observed that chlorantraniliprole 4.3%+ abamectin 1.7% SC mixture was effective against *Tuta absoluta* (Meyrick) damage in tomato. Hafsi et al. (2012) and Braham et al. (2012) also obtained similar results. The fact that chlorantraniliprole, spinosad and chlorfenapyr are comparable in their efficacy was also observed by Smitha et al (2017), Connroy et al. (2008), Pereira et al (2014) and Naeem et al. (2016). Thus, it can be concluded that chlorantraniliprole is superior giving maximum fruit yield (25.50 t/ ha) and ICBR (1:1.56).

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Table 1. Evaluation of certain insecticides against *L. trifolii* in water melon

Treatments details	Mean no. of live mines /leaf (PTC)	Mean no. of live mines / leaf (X± SE)***	Mean of % leaf damage/ plot (X± SE)***	% reduction of live mines over untreated check	% reduction of leaf damage over untreated check	Category of intensity	***Fruit yield (t/ ha)	% increasing yield over untreated check (t/ha)	ICBR
T -Thiamethoxam 25% WG @0.4g/l	10.65 (3.26)	3.33 (1.83)± 0.77 <sup>c</sup>	6.65 (2.58)± 2.29 <sup>cd</sup>	73.69 (8.58) <sup>b</sup>	81.17 (9.01) <sup>cd</sup>	Very low	19.93 (4.46) <sup>def</sup>	22.26 (4.72) <sup>f</sup>	1:1.23
T -Imidacloprid 17.8% SL @ 0.3ml/l	12.53 (3.54)	4.26 (2.06)± 0.78 <sup>d</sup>	7.70 (2.77)± 2.33 <sup>de</sup>	66.35 (8.15) <sup>c</sup>	78.20 (8.84) <sup>cd</sup>	Very low	18.50 (4.30) <sup>ef</sup>	13.49 (3.67) <sup>h</sup>	1:1.13
T -Spiromesifen 22.9% SC @ 0.5ml/l	12.25 (3.50)	3.23 (1.80)± 0.82 <sup>c</sup>	6.11 (2.47)± 2.37 <sup>c</sup>	74.48 (8.63) <sup>b</sup>	82.80 (9.10) <sup>bc</sup>	Very low	22.93 (4.79) <sup>bc</sup>	21.93 (4.68) <sup>f</sup>	1:1.14
T -Diafenthuiuron 50% WP @ 0.8g/l	10.25 (3.20)	4.19 (2.05)± 0.89 <sup>d</sup>	7.57 (2.75)± 2.40 <sup>de</sup>	66.9 (8.18) <sup>c</sup>	78.57 (8.86) <sup>cd</sup>	Very low	19.60 (4.43) <sup>ef</sup>	20.24 (4.5) <sup>ef</sup>	1:1.20
T -Thiacloprid 21.7% SC@ 0.6ml/l	11.92 (3.45)	3.09 (1.76)± 0.91 <sup>c</sup>	6.77 (2.60)± 2.43 <sup>de</sup>	75.59 (8.69) <sup>b</sup>	80.82 (8.99) <sup>cd</sup>	Very low	23.03 (4.80) <sup>bc</sup>	41.28 (6.42) <sup>c</sup>	1:1.29
T -Propargite 57% EC @ 1.25ml/l	13.25 (3.64)	4.30 (2.07)± 0.92 <sup>d</sup>	6.74 (2.60)± 2.45 <sup>cd</sup>	66.11 (8.13) <sup>cd</sup>	80.91 (8.99) <sup>c</sup>	Very low	21.50 (4.64) <sup>cd</sup>	31.90 (5.65) <sup>d</sup>	1:1.31
T Chlorantraniliprole 18.5%SC@0.6ml/l	10.13 (3.18)	1.48 (1.22)± 0.93 <sup>a</sup>	2.72 (1.65)± 2.47 <sup>a</sup>	88.30 (9.4) <sup>a</sup>	92.29 (9.61) <sup>a</sup>	Very low	25.50 (5.05) <sup>a</sup>	56.44 (7.51) <sup>a</sup>	1:1.56
T -Flubendiamide 39.35%SC@0.6 ml/l	13.85 (3.72)	2.09 (1.44)± 0.92 <sup>b</sup>	3.48 (1.86)± 2.48 <sup>ab</sup>	83.57 (9.14) <sup>a</sup>	90.14 (9.49) <sup>a</sup>	Very low	24.43 (4.94) <sup>ab</sup>	49.87 (7.06) <sup>b</sup>	1:1.49
T -Indoxacarb 14.5% SC@ 0.65ml/l	12.67 (3.56)	3.05 (1.75)± 0.93 <sup>c</sup>	4.03 (2.01)± 2.50 <sup>b</sup>	75.90 (8.71) <sup>b</sup>	88.59 (9.41) <sup>ab</sup>	Very low	23.50 (4.85) <sup>b</sup>	44.17 (6.65) <sup>c</sup>	1:1.44
T -Fenazaquin 10% EC@ 2ml/l	11.53 (3.40)	5.39 (2.32)± 0.94 <sup>f</sup>	6.89 (2.62)± 2.51 <sup>de</sup>	57.42 (7.58) <sup>e</sup>	80.48 (8.97) <sup>cd</sup>	Very low	19.50 (4.42) <sup>ef</sup>	19.63 (4.43) <sup>g</sup>	1:1.19
T -Chlorfenapyr 10% EC@ 1ml/l	10.13 (3.18)	4.88 (2.21)± 0.94 <sup>e</sup>	6.79 (2.61)± 2.53 <sup>de</sup>	61.45 (7.84) <sup>de</sup>	80.78 (8.99) <sup>cd</sup>	Very low	20.40 (4.52) <sup>de</sup>	25.15 (5.01) <sup>e</sup>	1:1.25
T -Malathion 50% EC @ 1ml/l	13.62 (3.69)	4.10 (2.02)± 0.93 <sup>d</sup>	8.24 (2.87)± 2.53 <sup>f</sup>	67.61 (8.22) <sup>c</sup>	76.67 (8.76) <sup>c</sup>	Very low	18.16 (4.26) <sup>g</sup>	11.41 (3.38) <sup>j</sup>	1:1.14
T -Untreated check -water@ 500 l / ha	13.92 (3.73)	12.83 (3.58)± 0.93 <sup>g</sup>	35.31 (5.94)± 2.53 <sup>f</sup>	-	-	Severe	16.30 (4.04) <sup>h</sup>	-	-
F	-	640.54	354.94	1609.82	770.15	-	1731.63	1225.09	-
P	*NS	**<0.000	**<0.000	**<0.000	**<0.000	-	**<0.023	**<0.000	-
SD	-	2.77	8.26	21.57	1.75	-	2.72	16.37	-
SE	-	0.77	2.29	5.98	0.51	-	1.34	4.54	-

PTC- Pre treatment count, \*NS – Non significant, F= F value of Tukeys Test, P=statistically significance, ICBR-Incremental cost benefit ratio; SE- Standard Error, \*\*Highly significant, SD-Standard deviation, \*\*\* Sale price of watermelon fruit was Rs.5 00 per kg, \*\*\* Each value is the mean of three replications; Figures in parentheses square root transformed values.; In a column, means followed by common letter(s) not significantly different (Tukey HSDs test at  $p=0.05\%$ )

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