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## Evaluation of different insecticides against citrus leaf miner on Nagpur mandarin

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### Abstract

The present investigation was conducted at Centre of Excellence for Citrus (Indo- Israel Project) Bharat Nagar, Horticulture Section, College of Agriculture, Nagpur during kharif 2016-2017. treatments viz. (T<sub>1</sub>) Diafenthiuron 50 EC (0.05%), (T<sub>2</sub>) Triazophos 40 EC (0.06%), (T<sub>3</sub>) Spinosad 45 SC (0.03%), (T<sub>4</sub>) Imidacloprid 17.8 SL (0.06%), (T<sub>5</sub>) Acetamiprid 20 SP (0.04%), (T<sub>6</sub>) Chlorpyrifos 20 EC (0.06%), (T<sub>7</sub>) Thiamethoxam 25 WG (0.06%), (T<sub>8</sub>) Diflubenzuron 25 WP (0.08%) and Control (water spray) on Nagpur mandarin against citrus leaf miner. Observations on per cent leaves infestation of citrus leaf miner were recorded on 4 twigs per plant at 3 DAS and 7 DAS of each application in each treatment to work out per cent infestation per shoot per plant of all treatments. The cumulative effect of three applications of all the treatments revealed that, the (T<sub>7</sub>) Thiamethoxam 25 WG (0.06%) recorded lowest 5.47 per cent leaf infestation of leaf miner. (T<sub>3</sub>) Spinosad 45 SC (0.03%) which showed 7.23 per cent leaf infestation and found at par with (T<sub>4</sub>) Imidacloprid 17.8 SL (0.06%) showed 8.52 per cent leaf miner infestation and followed by (T<sub>8</sub>) Diflubenzuron 25 WP (0.08%) showed 11.99 per cent leaf miner infestation.

**Keywords:** Thimethoxam 25 WG, Spinosad 45 SC, Citrus leaf miner, Nagpur mandarin

### 1. Introduction

Citrus fruit production is the third largest food Industry in the country, which shows considerable importance in the economy of country. Citrus species is originated in the 18<sup>th</sup> century, from the citrus belts of California and the tropical and subtropical region of India. It is rich in vitamin C, minerals and alkaline salt. It is also a good source of vitamin A and B, fruit sugar, fruit acid, Calcium, Phosphorus and Iron respectively.

In India area under citrus fruit crop is about 1078 thousand hectare and its production is 115.15 million tonnes. <sup>[1, 2]</sup> In India, it occupies 14.93 per cent area the total area and 12.52 per cent production of the total fruit production in India. Productivity of citrus 12.35 MT/hectare. <sup>[1, 2]</sup> The leading state in citrus fruit production is Andhra Pradesh and gets first rank with 39.46 per cent from total fruit production of India <sup>[2]</sup>.

Maharashtra gets second rank with 15.79 per cent of total citrus fruit production. The area under citrus fruit crop is 275.0 thousand hectare, from which 1761.0 thousand MT citrus fruit produced. The productivity of citrus in Maharashtra is 5.57 MT/ha, while India's productivity is 12.52 MT/ha <sup>[1, 2]</sup>. In Maharashtra especially Nagpur, Amravati, Akola, and Wardha districts of Vidarbha are leading in citrus production. Citrus is the third important fruit crop in India. It occupies about 9 per cent of the total area of fruit crop. Nagpur mandarin (*Citrus reticulata*), the world famous, glorious fruit crop occupies the larger area in Vidarbha region of Maharashtra. Thus, it is also regarded as "GREEN GOLD" in Nagpur city. After which name of Nagpur city is given as "ORANGE CITY". Sweet oranges are cultivated in several states of India covering 1, 26,400 ha with a total production of 12, 10,400 tonnes. Highest area i.e. 85,100 ha under cultivation of Mosambi (sweet orange) in Maharashtra with a production of 5, 18,100 tonnes. The state having highest productivity in India is Maharashtra and Madhya Pradesh, whereas the lowest are Rajasthan and Himachal Pradesh. Citrus leaf miner *Phyllocnistis citrella* (Stainton) (Lepidoptera: Gracillaridae) is an important pest of citrus and it occurs all over the country from low to medium level of infestation. Mouth of citrus leaf miner is about the size of a mosquito with forewing are silvery in colour with darker strips and black spot on the tips, larvae translucent and yellow greenish in colour and make a serpentine mine on the underside of young citrus leaves. It pupates in the leaf margin, resulting in leaf

deformation, partial leaf chlorosis, necrosis, and some leaf dropping, respectively.

It has four life stages i.e. eggs, larva, pupa and adult. Adult do not damage plants and Survived only 1-2 weeks. Adult moths are most active in morning and evening hours and spend a day for resting on the underside of leaves, Therefore seen rarely. Soon after emerging from the pupal case, the female moth emits a sex pheromone that attracts males. After mating, female lays eggs singly on the underside of leaves, the newly sprouted leaves; particularly along the mid vein are the preferred sites. Eggs hatch out within one week and the newly emerged Larvae (grub) immediately starts feeding inside the leaf and produce tiny, nearly invisible, mines on the leaves. Mostly, leaf miner existence observed on the growing citrus trees and from last two decade it became a serious pest of citrus in Vidarbha. Leaf miner, *Phyllocnistis citrella*, larvae cause damage in the form of mine on immature foliage. Twisted and curled leaves are generally the first symptoms noticed. When larvae cause damages on leaf it become the severe infestation, ultimately the plant can retard the growth and yield, but their effect on mature trees is less serious than nursery, such infestations usually occur in late summer. They rarely occur in spring because the production of new growth is prolific and synchronized and quickly becomes immune to attack.

## 2. Objective

To study the effect of different insecticides against leaf miner on Nagpur mandarin.

## 3. Statistical analysis

The data generated in respect of per cent leaf infestation due to leaf miner on citrus was transformed into square root value when value in between 0-30% as per Gomez and Gomez,

(1984) and then subjected to statistical analysis to test the level of significance of treatment.

## 4. Materials and methods

The present investigation entitled, "Evaluation of different insecticides against citrus leaf miner on Nagpur mandarin" was carried out in the month of August to October 2016 at Centre of Excellence for Citrus (Indo- Israel Project), Bharat Nagar, Horticulture Section, College of Agriculture, Nagpur. Randomized Block Design (RBD) with three replications and nine treatment on cultivar Nagpur mandarin, 3-4 year plants. Pre-treatment observations were taken before 24 hours of treatment application and Post- treatment at 3<sup>rd</sup> and 7<sup>th</sup> days after spraying. Total leaves and infected leaves were counted on randomly selected 4 four twigs of tested plant to work out per cent leaves infestation of citrus leaf miner Total 3 sprayings were given at 15 days interval during the course of investigation

## 4. Results and discussion

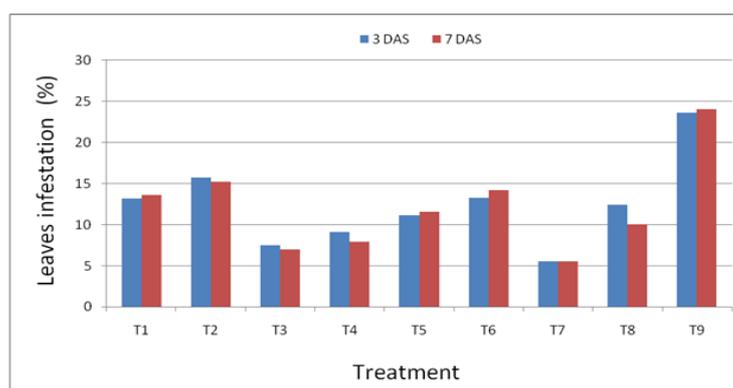
### 1. Cumulative per cent infestation of citrus leaf miner at 3 DAS:

The result shown in the Table 1 and depicted in Fig. 1 revealed that all the treatments were significantly superior over control (water spray) in recording of minimum per cent leaf infestation of citrus leaf miner in orchard. From the cumulative data of third day after spraying of all three applications revealed that (T<sub>7</sub>) Thiamethoxam 25 WG was significantly superior over all the treatments and recorded lower 5.42 per cent leaf miner infestation. Treatment (T<sub>3</sub>) Spinosad 45 SC was next superior with 7.45 per cent leaves infestation and found at par with (T<sub>4</sub>) Imidacloprid 17.8 SL, 9.11 per cent leaves infestation followed by (T<sub>5</sub>)

**Table 1:** Cumulative effect of different insecticides against citrus leaf miner on Nagpur mandarin

Sr. No	Treatments	Conc. (%)	Mean leaves infestation (%)	
			3 DAS	7 DAS
T <sub>1</sub>	Diafenthiuron 50 EC	0.05	13.21 (3.63)	13.61 (3.68)
T <sub>2</sub>	Triazophos 40 EC	0.06	15.75 (3.96)	15.19 (3.89)
T <sub>3</sub>	Spinosad 45 SC	0.03	7.45 (2.72)	7.01 (2.64)
T <sub>4</sub>	Imidacloprid 17.8 SL	0.06	9.11 (3.01)	7.93 (2.81)
T <sub>5</sub>	Acetamiprid 20 SP	0.04	11.10 (3.33)	11.54 (3.39)
T <sub>6</sub>	Chlorpyrifos 20 EC	0.06	13.26 (3.63)	14.23 (3.76)
T <sub>7</sub>	Thiamethoxam 25 WG	0.06	5.42 (2.32)	5.52 (2.34)
T <sub>8</sub>	Diflubenzuron 25 WP	0.08	12.37 (3.51)	10.01 (3.16)
T <sub>9</sub>	Control (water spray)	-	23.62 (4.85)	24.04 (4.90)
	'F' Test		Sig.	Sig.
	SE (m) ±		0.572	0.748
	CD at 5%		1.710	2.254

(Figures in parentheses are corresponding values of square root transformation.)



**Fig 1:** Cumulative effect of different insecticides against citrus leaf miner on Nagpur mandarin.

Acetamiprid 20 SP, 11.10 per cent (T<sub>8</sub>) Diflubenzuron 25 WP, 12.37 per cent infestation and found at par with each other, and followed by treatments *Viz.* (T<sub>1</sub>) Diafenthiuron 50 EC, 13.21 per cent, (T<sub>6</sub>) Chlorpyrifos 20 EC, 13.26 per cent, and (T<sub>2</sub>) Triazophos 40 EC and which recorded and 15.75 per cent leaves infestation of citrus leaf miner. Maximum per cent leaves infestation i.e. 23.62 per cent was noticed in Control (water spray).

## 2. Cumulative per cent infestation of citrus leaf miner at 7 DAS

The data presented in Table 1 and Fig. 1 indicated that all the treatments were significantly superior over control (water spray) in recording of minimum per cent leaves infestation of citrus leaf miner. Treatment (T<sub>7</sub>) Thiamethoxam 25 WG observed 5.52 per cent leaves infestation and found at par with (T<sub>3</sub>) (Spinosad 45 SC and (T<sub>4</sub>) Imidacloprid 17.8 SL was significant over the remaining treatments and recorded 7.01 and 7.93 per cent leaves infestation, followed by treatment (T<sub>8</sub>) Diflubenzuron 25 WP, 10.01 per cent, (T<sub>5</sub>) Acetamiprid 20 SP, 11.34 per cent, and found at par with each other. The next treatments were (T<sub>1</sub>) Diafenthiuron 50 EC, 13.61 per cent, (T<sub>6</sub>) Chlorpyrifos 20 EC, 14.23 per cent and (T<sub>2</sub>) Triazophos 40 EC, which recorded 15.19 per cent leaves infestation. Highest per cent leaves infestation i.e. 24.04 per cent was noticed in Control (water spray). Similar findings were also recorded by Salas *et al.* (2006) when they treated Thiamethoxam 25% WG @ 0.075 g. a.i. per plant and Imidacloprid 35 SC @ 0.105 g. a.i. per plant against citrus leaf miner exhibited lowest per cent leaf miner infestation than other treatments<sup>[11]</sup>

The insecticidal evaluation against citrus leaf miner was carried out on two-year-old sweet orange (sathgudi) plant at citrus research station, Tirupati during 2011 and 2012. The result revealed that the treatment of Neem formulation @ 10000 PPM followed by Thimethoxam (0.025%) or Profenophos (0.1%) were found significantly superior with highly field efficacy providing >90 percent leaf miner control followed by Spinosad (0.002%) and thiodicarb (0.075%) till 14 day after spraying.

Evaluated different insecticides against citrus leaf miner (*Phyllocnistis citrella*, stainton) (Lepidoptera: Gracillaridae) on citrus seedling<sup>[12]</sup>. All the insecticides were effective to reduce leaf miner infestation at variable levels as compared with the untreated control, regarding foliar spray. Thimethoxam 25 WG, Abamectin 1.9 EC and Spinosad 48 SC proved best significant result on lemon seedling for two weeks respectively.

Studied the efficacy of insecticide against citrus leaf miner under field condition and reported that Imidacloprid 0.005% was better than other insecticide in controlling of citrus leaf miner<sup>[9, 10]</sup>. Regarding Acetamiprid, Showed significant results against citrus leaf miner infestation<sup>[4, 5, 6, 13]</sup>

On the basis of cumulative result obtained in terms of per cent leaf infestation of *P. citrella* after three spraying applied at 15 days interval, finally revealed that (T<sub>7</sub>) Thiamethoxam 25 WG (0.06%) 5.57 per cent leaves infestation was found most effective treatment in management of citrus leaf miner infestation in orchard. Treatment (T<sub>3</sub>) Spinosad 45 SC (0.03%) 7.23 per cent infestation and became a second best treatment, followed by (T<sub>4</sub>) Imidacloprid 17.8 SL (0.06%) 8.52 per cent, (T<sub>8</sub>) Diflubenzuron 25 WP (0.08%) 11.19% per cent and (T<sub>5</sub>) Acetamiprid 20 SP (0.04%) 11.32 per cent were also found effective to control the infestation of leaf miner in citrus orchard. While except Control, (T<sub>6</sub>) Chlorpyrifos 20

EC @ 0.06, (13.74%) found least effective for management on citrus leaf miner.

## 5. Conclusion

From the above findings of present investigation following conclusions could be drawn. Infestation of citrus leaf miner was more in newly sprouted leaves than older one. All the treatment effect showed similar trend of effect on per cent leaves infestation of citrus leaf miner at 3 and 7 days after spraying of each application. Minimum three sprayings of different insecticide were required for keeping the infestation of citrus leaf miner below EIL. Amongst different insecticides tested against citrus leaf miner in orchard, (T<sub>7</sub>) Thiamethoxam 25 WG (0.06%) was significantly superior and followed by (T<sub>3</sub>) Spinosad 45 SC (0.03%), (T<sub>4</sub>) Imidacloprid 17.8 SL (0.06%), (T<sub>8</sub>) Diflubenzuron 25 WP (0.08%), (T<sub>5</sub>) Acetamiprid 20 SP (0.04%), and (T<sub>1</sub>) Diafenthiuron 50 EC (0.05%) respectively. Selection of different insecticides was not only important for the management of targeted pest but, also important to use the formulation, stages of the crop, its toxicity to natural enemies, its persistence and residual toxicity is also important, therefore further research work also needed on these aspects.

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