



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2021; 9(2): 653-655

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Received: 07-12-2020

Accepted: 19-01-2021

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Comparative study of effect of insecticides chlorfenapyr 240 SC, Cyantraniliprole 10.26% OD and dimethoate 30% EC on leaf minor of tomato in Malwa region of Madhya Pradesh

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DOI: <https://doi.org/10.22271/chemi.2021.v9.i2j.11889>

Abstract

Tomato leaf minor was present throughout the crop duration; larvae can infest leaves flowers etc. causing important losses in Tomato. This study was carried out in College of Agriculture, Indore field. The population counted on 5 plants at 1, 3, 5, 7 and 10 day after each spray. Efficacy of Chlorfenapyr 240 SC 480 ml/ha was show more reduction in leaf minor population as compared to Cyantraniliprole and Dimethoate. The treatment T5-Chlorfenapyr 240 SC show high population reduction (93.00%) followed by T4-Chlorfenapyr 240 SC @ 288 g a.i./ha (90.91%), T3-Chlorfenapyr 240 SC @ 240 g a.i./ha (90.46%), T6-Cyantraniliprole 10.26% OD 100 ml/ha (89.70%), T2-Chlorfenapyr 240 SC @ 192 g a.i./ha (89.40%), T7-Dimethoate 30% EC @ 150 gm/ha (88.43%). The less reduction in population of leaf minor was found in T1-Chlorfenapyr 240 SC @ 144 g a.i./ha (86.45%) as compared to untreated control. The higher fruit yield also recorded in T5-Chlorfenapyr 240 SC @ 480ml/ha (32 t/ha) followed by T4- Chlorfenapyr 240 SC @ 288 ga.i./ha (27 t/ha).

Keywords: Tomato, chlorfenapyr, cyantraniliprole, dimethoate, leaf minor

Introduction

Tomato (*Lycopersicon esculentum* Miller) belongs to the Solanaceae family. Tomato is one of the most important "protective food" because of its special nutritive value. It is one of the most versatile vegetable with wide usage in Indian culinary tradition. Tomatoes are used for soup, salad, pickles, ketchup, puree, sauces and in many other ways. It is also used as a salad vegetable. It is a rich source of vitamin 'C' and many minerals like calcium, potassium, magnesium and phosphorus. It is also called as 'Poor Man's Orange'. Tomato has very few competitors in the value addition chain of processing.

Present world production of tomato is about 100 million tones. Fresh fruits produced on 3.7 M ha area. India ranks third in the area and second in production of tomato, after China. In India It is grown in 0.76 M ha area with 18.39 MT production and 16.1 MT/ha productivity. The major tomato producing states are Karnataka, Bihar, Uttar Pradesh, Maharashtra, Madhya Pradesh and West Bengal (Anonymous 2016) [1]. Madhya Pradesh is endowed with favorable climatic and soil conditions for cultivation of tomato with an area of 0.07 m ha, approximate production of 1.94 m MT and productivity of 29.5 MT/ha, Production of tomato is concentrated in Ratlam, Indore, Khargone, Indore, Jhabua, Ujjain, Sagar, Raisen, Bhopal, Shahjapur, Jabalpur, Chhindwara, Satna, Vidisha and Bhopal during 2016 (Anonymous, 2016) [2].

Tomato crop is mainly infested by insect pests like fruit borer, leaf miner, white fly and mites. American serpentine leaf miner, *Liriomyza trifolii* Burgess (Diptera: Agromyzidae) is one of the important pest which is expanding its distribution in the world. It is a notorious polyphagous pest and has recently attained a serious pest status in crops. Severe infestation was noted on cotton, tomato, castor, lima bean and ash gourds (Natrajan *et al.*, 1994) [8]. In tomato, damage caused by this pest has been reported from 30 to 40 per cent (Anonymous, 1995) [3].

Its extensive leaf mining activity reduces the photosynthetic rate to about 62 per cent within mined tissues as compared with unmined leaves, leads to adverse effects on young shoot growth and fruit formation which ultimately reduces the yield.

Objectives

1. To assess the bio efficacy of Chlorfenapyr with different doses against tomato leaf miner
2. To obtain the fruit yield for economic assessment.

Material and Methods

The studies entitled "Assessment of impact of Chlorfenapyr 240 SC against Leaf minor of Tomato" carried out in Rabi season of 2016-17 at experimental site of Horticulture field no 5, College of Agriculture, Indore (M.P.). The present experiments were carried out on medium black cotton soil of the College of Agriculture, Indore having a uniform topography. Tomato Hybrid Pahuja 508 was transplanted on 8th November, 2016 with 60 x 45 cm spacing. Insecticidal spray was started at the ETL of insects @ 500 liter water per hectare with knapsack sprayer fitted with a flood jet nozzle. The eight treatments consist of Five doses of chlorfenapyr 240 sc @ 144, 192, 240, 288 and 480 g.a.i./ha-1, Cyantraniliprole 10.26% OD @ 90 g.a.i. ha-1 and Dimethoate 30% EC @ 200g.a.i. ha-1 including untreated control were sprayed thrice at 10 days interval. Leaf minor population was counted one day before and 1st, 3rd, 5th, 7th and 10th days after each spray from five randomly selected plants of each plot and population was counted on per plant. Per cent population reduction was calculated for each spray, averaged for three sprays and finally overall population reduction was calculated. Thus, data obtained from the observations for each character were tabulated and analyzed statistically.

Result and Discussion

It was revealed that the maggot population ranged from 4.56 to 5.03 and showed no significant difference before the application of treatments. After first spray the maximum reduction in population was recorded in T₅-Chlorfenapyr 240 SC @ 480 ml/ha (77.13%) followed by T₄-Chlorfenapyr 240 SC @ 288 g a.i./ha (72.11%), T₃-Chlorfenapyr 240 SC @ 240 g a.i./ha (68.64%), T₆-Cyantraniliprole 10.26%OD 100ml/ha (59.00%), T₂-240 SC @ 192g.a.i./ha (51.42%), T₇-Dimethoate 30% EC @ 150 gm/ha (48.20%). The minimum reduction in maggot population was observed in T₁-Chlorfenapyr 240 SC @ 144 g a.i./ha (46.98%). The similar findings was also recorded after second spray repeatedly in the highest dose of T₅-Chlorfenapyr 240 SC @ 480 ml/ha (60.00%) followed by T₄-Chlorfenapyr 240 SC @ 288 g a.i./ha (57.14%), T₃-Chlorfenapyr 240 SC @ 240 g a.i./ha (54.54%), T₆-Cyantraniliprole 10.26%OD 100ml/ha

(52.19%), T₂-240 SC @192 g a.i./ha (51.68%), T₇-Dimethoate 30% EC @150 gm/ha (51.02%) and T₁-Chlorfenapyr 240 SC @ 144 g a.i./ha (49.01%). After third spray the maximum reduction in fruit damage was calculated in T₅-Chlorfenapyr 240 SC @ 480 ml/ha (60.86%) followed by T₄-Chlorfenapyr 240 SC @ 288 g a.i./ha (58.33%), T₆-Cyantraniliprole 10.26%OD 100ml/ha (58.16%), T₃-Chlorfenapyr 240 SC @ 240 g a.i./ha (55.38%), T₂-Chlorfenapyr 240 SC @ 192 g a.i./ha (53.04%), T₇-Dimethoate 30% EC @ 150 gm/ha (52.52%) and T₁-Chlorfenapyr 240 SC @ 144 g a.i./ha (46.15%). (88.60%). Various researchers present findings are in accordance with the findings reported by Santos *et al.* (2011) [12] reported that chlorfenapyr 12.0 g a.i. was effective against serpentine leaf miner *Liriomyza* spp on tomato crop. Moussa *et al.* (2013) [7] reported that chemical pesticides chlorfenapyr 36% SC provided excellent control against *T. absoluta* T (Tomato leaf miner) on tomato crop. Sallam *et al.* (2015) [11] reported that chlorfenapyr average affected the insect population and the average percentages reduction of infestation with *T. absoluta* in tomato field. Hamdy *et al.* (2013) [4] revealed that chlorfenapyr (challenger) was the least effective in reducing infestation of *T. absoluta* on tomato plant.

Besides this, effectiveness of cyantraniliprole against tomato leaf miner, (*Liriomyza trifolii*) was reported by various workers. Misra (2013) [6] reported that cyantraniliprole (cyazypyr) 10% OD @ 90 and 105 g a.i./ha⁻¹ was highly effective with record of lowest number of serpentine leaf miner adults/5 plants at 7 days after spraying in comparison to other treatments registering a mean of 80.65-82.61% reduction in SLM adult population over control. Larrain *et al.* (2014) [5] concluded that formulations of cyantraniliprole were effective to reduce damage caused by the tomato leaf miner larva in both the foliage and fruit of tomato. Pereira *et al.* (2014) [9] indicated that novel insecticides, especially cyantraniliprole, are better suited to sustainable integrated management programmes of the tomato leaf miner. Silva *et al.* (2016) [13] reported that the resistance ratios (RR50) ranged from 1.0 to 18,423-fold for cyantraniliprole were strongly and very high resistance in *T. absoluta*.

Further, some researchers reported the effectiveness of dimethoate against tomato leaf miner, (*Liriomyza trifolii*). Variya and Patel (2012) [14] reported that dimethoate was least effective against leaf miner. Rai *et al.* (2013) [10] reported that diamethoate 50 EC was average effective to reduce the incidence of leaf miner on tomato crop when compared with the control. The findings of these researchers are in close association with the present investigation. Chlorfenapyr and cyantraniliprole belongs to novel group of insecticides and newer than dimethoate hence their effectiveness is justified as due to less susceptibility against the pest.

Table 1: Effect of insecticidal treatments on tomato leaf damage by *L. trifolia*

Treatments	Dose g a.i./ha	Pre treat Ment observation	Percent of damage/leaf			Over all damage reduction (%)
			1st spray	2nd spray	3rd spray	
			10 DAS	10 DAS	10 DAS	
T ₁ -Chlorfenapyr 240 SC	144	34.54 (35.99)	17.04 (24.38)	8.61 (17.06)	4.68 (12.49)	86.45
T ₂ -Chlorfenapyr 240 SC	192	34.08 (35.72)	15.03 (22.81)	7.25 (15.62)	3.62 (10.97)	89.40
T ₃ -Chlorfenapyr 240 SC	240	32.77 (34.92)	14.02 (21.99)	6.25 (14.48)	3.12 (10.17)	90.46
T ₄ -Chlorfenapyr 240 SC	288	32.25 (34.60)	13.57 (21.61)	5.47 (13.53)	2.93 (9.86)	90.91
T ₅ -Chlorfenapyr 240 SC	480	32.12 (34.52)	13.02 (21.15)	4.95 (12.86)	2.00 (8.13)	93.00
T ₆ -Cyantraniliprole 10.26% OD	99	33.96 (35.64)	14.75 (22.59)	6.99 (15.33)	3.55 (10.86)	89.70
T ₇ - Dimethoate 30% EC	200	34.51 (35.98)	16.48 (23.95)	7.99 (16.42)	3.99 (11.52)	88.43
T ₈ -Untreated control		34.52 (35.98)	35.32 (36.46)	37.01 (37.47)	39.01 (38.65)	---
S Em±		-	0.32	0.23	0.18	

CD at 5% (p=0.05)		NS	0.96	0.71	0.55	
CV %		-	13.10	12.409	11.12	

Yield and economics

Findings revealed that obtained marketable fruit yield was noted highest in T5- chlorfenapyr 240 SC @ 480 ml/ha (32.00 t/ha) followed by T4-Chlorfenapyr 240SC @ 288 g a.i/ha (27.00 t/ha), T3-Chlorfenapyr 240 SC @ 240 g a.i/ha (25.33 t/ha), T6-Cyantraniliprole 10.26% OD @ 99 g a.i/ha (24.67 t/ha), T2-Chlorfenapyr 240 SC @192 g a.i/ha (24.24 t/ha), T1-Chlorfenapyr 240 SC @144 g a.i/ha (23.84 t/ha) T7-Dimethoate 30% EC @ 200 g a.i/ha (20.00 t/ha) and T8-untreated check (14.10 t/ha).

Table 2: Effect of newer insecticides molecules on marketable Fruit yield of tomato

Treatments	Dose g a.i./ha	Dose gm or ml/ha	t/ha
T ₁ .Chlorfenapyr 240 SC	144	600	23.84
T ₂ .Chlorfenapyr 240 SC	192	800	24.24
T ₃ .Chlorfenapyr 240 SC	240	1000	25.33
T ₄ .Chlorfenapyr 240 SC	288	1200	27.00
T ₅ .Chlorfenapyr 240 SC	480	2000	32.00
T ₆ .Cyantraniliprole 10.26% OD	90	900	24.67
T ₇ . Dimethoate 30% EC	200	600	20.00
T ₈ .Untreated control			14.10
S Em±			0.09
CD at 5% (p=0.05)			0.27

Conclusion

The present study concluded that maximum reduction in population was observed in treatment Chlorfenapyr 240 SC @ 480 ml/ha. Under untreated control minimum population reduction was found. The marketable Okra fruit yield was recorded higher in higher dose of Chlorfenapyr 240 SC @ 480 ml/ha followed by T4-Chlorfenapyr 240SC @ 288 g a.i/ha and T3-Chlorfenapyr 240 SC @ 240 g a.i/ha as compared to untreated control.

Acknowledgement

We are grateful to Dr. S. N. Upadhyay, Professor and Head, Department of Entomology, COA, Indore for providing necessary facilities to carry out the research work and his critical review of an earlier version of the manuscript. We also feel grateful to the other faculty members of Department of Entomology for their needful help and comments.

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