Indian Journal of Entomology Online published Ref. No. e24689 DoI. No.: 10.55446/IJE.2024.1689

EVALUATION OF INSECTICIDES AGAINST PIN WORM *TUTA ABSOLUTA* (MEYRICK) ON TOMATO

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ABSTRACT

Tomato pin worm *Tuta absoluta* (Meyrick) is one of the most destructive pests. This experiment was undertaken to evaluate the performance of selected insecticides (chlorantraniliprole 18.5SC @ 0.3 ml/ l, spinosad 45SC @ 0.3 ml/ l and profenophos 40% + cypermethrin 04%EC @ 2ml/ l) during 2021 and 2022 under open field conditions. Results revealed that chlorantraniliprole 18.5 SC performed well in reducing the larva (2.80 and 2.60 larva/ plant), live mines (1.10 and 1.20/ plant) and fruit damage (7.58 and 6.08%) followed by spinosad larva (3.40 and 2.80 larvae/plant), live mines (3.40 and 3.20/ plant) and fruit damage (8.13 and 10.12%) during 2021 and 2022, respectively.

Key words: *Tuta absoluta*, chlorantraniliprole, spinosad, fruit damage, efficacy, spinosad, profenophos + cypermethrin, leaf damage, larva, mines fruit damage

Tomato (*Lycopersicon esculentum* Mill.) is one of the important vegetables grown in India and Andhra Pradesh tops in the country in cultivation of tomato with a production of 26.67 lakh mt from an area of 58,199 ha with productivity of 36 to 40 mt/ ha (Annual Report, 2022). Though there are dozens of pests on tomato, recently a serious invasive insect pest known as South American tomato pinworm, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) has invaded and causing devastation in both open fields of tomato and in protected crops (Nayana and Kalleshwaraswamy, 2015). In India incidence of the tomato leaf miner, *T. absoluta* was recorded for the first time on tomato at the Indian Institute of Horticultural Research (IIHR), Hessaraghatta, Bengaluru during the rabi 2014 (Sridhar et al., 2014). Pin worm attacks the apical buds, flowers, and new fruits. Damage can occur at any stage from seedlings to mature plant with mines and galleries. These mining activities lead to reduction of the photosynthetic potential (Biondi et al., 2018). Being an invasive pest the natural control of *T. absoluta* is challenging and rely on insecticides. Economic significance of crop compells the farmer to use insecticides in alternate days, and almost double the recommended doses. Such indiscriminate use leads to development of resurgence and resistance (Reddy et al., 2022). Hence, there is a need to search for newer chemicals that are selective and this study against *T. absoluta*.

MATERIALS AND METHODS

This study was conducted during kharif at the Krishi Vigyan K endra jurisdiction farmer adopted villages during 2021 and 2022. Field experiment was conducted in a randomized block design with four treatments including untreated control and five replications.The treatments were applied after pest incidence reached estimated threshold level. The treatment includes (T1): Chlorantraniliprole 18.5SC @ 0.3 ml/ l; (T2): Spinosad 45SC @ 0.3 ml/ l; (T3): Profenophos 40% + cypermethrin 04%EC @ 2 ml/ l, and (T4) as untreated control. Five plants were randomly selected from each treatment and number of live mines and larvae/ plant was recorded at one day before spray and one, three, five, seven and 15 days after spray. Number of damaged fruits and healthy fruits were selected separately for calculating % fruit damage during harvesting. Fruit damage (%) by *T. abosoluta* was calculated by using the formula as described by Usman et al. (2012).

RESULTS AND DISCUSSION

Both chlorantraniliprole 18.5SC @ 0.3 ml/ l and spinosad 45SC @ 0.3 ml/ l were on par with each other (Table 1). These results are in line with those of Sapkal et al. (2018) who reported both chlorantraniliprole 18.5SC @ 0.3 ml/ l and spinosad 45SC@ 0.3 ml/ l was effective. Chlorantraniliprole 18.5SC was highly effective in reducing live mines, larval population and less fruit damage after fifth day spray (Kandil et al., 2020; Swathi et al., 2021; Kumari et al., 2021; Karthik et al., 2023). Chlorantraniliprole is having unique mode of action causes multiple disruptions in the target insect's muscle function with greater toxicity contributed by its phthaloyl moiety and aliphatic amide moiety along with higher liphophilic nature contributed by aromatic amide moiety (Rajna et al., 2022). Present results are similar to various studies where spinosad 45SC @ 0.3 ml/ l performed well (Braham and Hajji, 2012; Sridhar et al., 2016; Dilipsundar and Srinivasan, 2019; Jeyarani and Prithiva, 2020; Kumar et al., 2021; Satpathi et al., 2023). The fruit damage was recorded least in chlorantraniliprole 18.5SC @ 0.3 ml/ l followed by spinosad 45SC @ 0.3 ml/ l and others (Table 1). Ayalew (2015) revealed that chlorantraniliprole was superior followed by spinetoram and spinosad. Diamide insecticides are more effective in controlling *T. absoluta* and they are in systemic in nature, watersoluble and less persistent in environment (Kachave et al., 2020; Kumari

Table 1. Efficacy of insecticides against *T. absoluta*

Insecticides	Live mines/ plant (2021)				Fruit damage (%) (2021)			
	PTC	3 DAS	7 DAS	15 DAS	PTC	3 DAS	7 DAS	15 DAS
Chlorantraniliprole 18.5SC @ 40 g. a.i ha^{-1}	7.00 (2.63)^{b}	1.10 (1.90)^{c}	2.40 (1.54)^{c}	3.20 (1.78)^{c}	22.79 (29.21)^{c}	8.50 (16.91)^{c}	9.94 (18.18)^{c}	11.97 (20.22)^{d}
Spinosad 45SC @ 73 g. a.i ha^{-1}	8.00 (2.82)^{ab}	3.40 (1.95)^{b}	5.40 (2.32)^{b}	6.00 (2.44)^{b}	25.57 (32.7)^{ab}	9.05 (17.14)^{c}	11.95 (20.20)^{bc}	16.16 (23.68)^{c}
Profenofos 40% + cypermethrin 04 %EC @ 440 g. a.i ha^{-1}	7.00 (2.64)^{b}	4.40 (2.19)^{b}	6.00 (2.44)^{b}	6.60 (2.55)^{b}	23.61 (31.39)^{bc}	14.17 (22.05)^{b}	15.38 (22.64)^{b}	20.88 (27.14)^{b}
Untreated check	8.80 (2.96)^{a}	7.60 (2.84)^{a}	8.70 (2.94)^{a}	9.00 (2.99)^{a}	28.47 (33.93)^{a}	30.83 (33.70)^{a}	23.87 (29.22)^{a}	25.57 (30.33)^{a}
S Em.±	0.92	0.83	0.69	0.71	0.83	0.56	0.52	0.45
CD (p=0.05)	0.205	0.380	0.235	0.288	2.314	2.290	3.926	1.756
CV(%)	5.372	13.46	7.379	8.540	5.276	7.377	12.626	5.028
Insecticides	Live mines/ plant (2022)				Fruit damage (%) (2022)			
	PTC	3DAS	7DAS	15DAS	PTC	3DAS	7 DAS	15DAS
Chlorantraniliprole 18.5SC @ 40 g. a.i ha^{-1}	5.80 (2.39)^{b}	1.20 (1.25)^{d}	1.80 (1.33)^{d}	3.00 (1.72)^{d}	22.42 (28.12)^{c}	6.49 (14.61)^{d}	9.95 (17.62)^{b}	13.01 (21.11)^{c}
Spinosad 45SC @ 73 g. a.i ha^{-1}	6.60 (2.56)^{ab}	3.20 (1.91)^{c}	4.60 (2.14)^{c}	5.40 (2.31)^{c}	26.60 (31.04)^{ab}	12.08 (19.79)^{c}	11.80 (20.61)^{b}	15.10 (22.82)^{c}
Profenofos 40% + cypermethrin 04 %EC @ 440 g. a.i ha^{-1}	7.40 (2.71)^{a}	4.60 (2.24)^{b}	6.20 (2.48)^{b}	7.20 (2.68)^{b}	25.38 (30.23)^{b}	15.67 (23.25)^{b}	14.24 (20.43)^{b}	19.35 (25.98)^{b}
Untreated check	7.80 (2.79)^{a}	8.00 (2.91)^{a}	9.60 (3.09)^{a}	9.00 (2.99)^{a}	28.79 (32.40)^{a}	28.40 (32.17)^{a}	26.71 (31.21)a	28.70 (32.35)^{a}
S Em.±	0.89	0.52	0.78	0.56	0.97	0.85	0.74	0.79
CD (p=0.05)	0.271	0.274	0.192	0.246	1.792	3.340	5.108	2.618
CV(%)	7.522	9.550	6.144	7.355	4.267	10.789	16.94	7.31
Insecticides	Live larvae/ plant (2021)				Live larvae/ plant (2022)			
	PTC	3DAS	7DAS	15DAS	PTC	3DAS	7DAS	15DAS
Chlorantraniliprole 18.5SC @ 40 g. a.i ha^{-1}	10.40 (3.21)^{b}	3.00 (1.71)^{d}	4.20 (2.04)^{c}	6.80 (2.60)^{b}	11.20 (3.34)^{bc}	3.20 (1.72)^{c}	4.40 (2.09)^{c}	6.60 (2.56)^{b}
Spinosad 45SC @ 73 g. a.i ha^{-1}	11.20 (3.34)^{b}	4.40 (2.08)^{c}	5.60 (2.36)^{b}	7.40 (2.71)^{b}	12.60 (3.54)^{ab}	4.60 (2.14)^{b}	5.20 (2.26)^{c}	7.20 (2.68)^{b}
Profenofos 40% + cypermethrin 04 %EC @ 440 g. a.i ha^{-1}	11.40 (3.37)^{b}	6.40 (2.52)^{b}	6.20 (2.48)^{b}	8.20 (2.86)^{b}	11.00 (3.31)^{c}	6.20 (2.48)^{b}	7.40 (2.71)^{b}	8.40 (2.89)^{b}
Untreated check	14.40 (3.78)^{a}	17.80 (4.21)^{a}	18.80 (4.33)^{a}	21.60 (4.61)^{a}	14.00 (3.73)^{a}	20.40 (4.51)^{a}	21.20 (4.59)^{a}	21.00 (4.56)^{a}
S Em.±	0.73	0.57	0.54	0.66	0.96	0.49	0.73	0.45
CD (p=0.05)	0.28	0.352	0.257	0.439	0.219	0.382	0.275	0.357
CV(%)	6.017	9.686	6.651	9.97	4.554	10.210	6.830	8.149

Figures in parentheses transformed value; DAS- Days after spraying.

et al., 2021). It is concluded that chlorantraniliprole 18.5SC @ 0.3 ml/ l is effective in reducing larval incidence, live mines and fruit damage.

ACKNOWLEDGEMENTS

The authors acknowledge the Krishi Vigyan Kendra, Ananthapuramu.

FINANCIAL SUPPORT

This research is a part of approved technical programme under plant protection division for the years 2021 and 2022 and financial support received from ICAR (ATARI Zone X, Hyderabad) is acknowledge.

CONFLICT OF INTEREST

No conflict of interest.

AUTHOR CONTRIBUTION STATEMENT

BK Kishore Reddy designed research, BK Kishore Reddy conducted experiments, BK Kishore Reddy analysed the data and wrote manuscript and all authors reviewed, updated and finalized the manuscript. All authors read and approved the manuscript.

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(Manuscript Received: October, 2023; Revised: January, 2024;
Accepted: February, 2024; Online Published: February, 2024)
Online First in www.entosocindia.org and indianentomology.org Ref. No. e24689