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EFFICACY OF SOME INSECTICIDES AGANIST FRUIT BORER *HELICOVERPA ARMIGERA* (HÜBNER) AND TWO SPOTTED SPIDER MITE *TETRANYCHUS URTICAE* (KOCH) IN TOMATO

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ABSTRACT

Fruit borer *Helicoverpa armigera* (Hübner) and two spotted spider mite, *Tetranychus urticae* (Koch) are destructive pests exerting a high crop loss in tomato. The field experiment was carried out to evaluate the efficacy of some insecticides and acaricides against *H. armigera* and *T. urticae* at College of Agriculture, Vijayapura. The results revealed that chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by spiromesifen 22.9% SC @ 0.5 ml/ l was recorded lowest fruit borer larvae (1.25/ plant). The treatment chlorantraniliprole 18.5% SC @ 0.15 ml/ l recorded lowest fruit damage (8.91/ plant) at 15 DAS. The treatment spiromesifen 22.9% SC @ 0.5 ml/ l recorded lowest number of two spotted spider mites (2.30/ square inch of leaf area) at 15 DAS. The combination treatment of chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by spiromesifen 22.9% SC @ 0.5 ml/ l found most effective treatment to control both the above pests on tomato.

Key words: Tomato, *Helicoverpa armigera, Tetranychus urticae,* insecticides, efficacy, destructive, fruit damage, chlorantraniliprole, spiromesifen

Tomato (*Solanum lycopercsicum* L.) is cultivated throughout the world either outdoor or indoor for its edible fruits. The production and productivity of tomato crop is hampered by various biotic and abiotic factors. Amongst, tomato fruit borer, *Helicoverpa armigera* (Hübner) and the mite *Tetranychus urticae* (Koch) are the major biotic stress (James and Price, 2002). *H. armigera* is a cosmopolitan, polyphagous insect pest, which is distributed widely in Indian subcontinent (Jones et al., 2019). Being highly polyphagous in nature, it is reported to attack nearly 181 host plants and severally damage most of the economically important agricultural crops like cotton, tomato, pigeon pea, chickpea, oil seeds, cereals and vegetable crops. *H. armigera* is widely distributed key pest of tomato which mainly attacks buds, flowers and fruits of tomato. It causes about 70% marketable yield loss (Dabhi et al., 2013). Larvae affect almost all the aerial parts of the tomato plant from the early growth till to the fruit maturation stage (Thakur et al., 2019). Loss incurred to growing tomato crop is insurmountable and may extend up to 51.20% (Jones et al., 2019). The lack of effective pest management has resulted in extensive damage to tomato crop. The two-spotted spider mite, *T. urticae* is an important phytophagous mite pest. It feeds on more than 3,877 plant species belonging to more than 140 different plant families (Van Leeuwen et al., 2010). It is the most notorious pest responsible for nearly 50-60% yield loss in many fruits and vegetable crops worldwide (James and Price, 2002). Mite feeding produces noteworthy alterations in the biochemical configuration of leaves and fruits (Farouk and Osman, 2012). *T. urticae* feeding can damage protective leaf surfaces, stomata, the palisade layer and the lowest parenchyma layer. The present study evaluates combination spray of insecticides and acaricides at different intervals against two potential pests viz., *H. armigera* and *T. urticae*.

MATERIALS AND METHODS

This study was conducted during kharif at the College of Agriculture, Vijayapura, University of Agricultural Sciences, Dharwad, during 2018-2019. The experiment was conducted with eleven treatments and three replications, and the variety Lakshmi (hybrid) was transplanted during July 2018 and grown following all recommended agronomic practices except for plant protection measures. The insecticides treatments were imposed two times as a spray in the cropping/iod at vegetative (60 DAT) and fruit development stage (90 DAT) after observing pest incidence. The treatment details are: spiromesifen 22.9% SC @ 0.5ml/ l (T_1), dicofol 18.5% EC @ 2.5ml/ l (T_2), fenazaquin 10% EC @ 2.0 ml/ l (T_3), propargite 57% EC @ 3.0 ml/ l (T_4), chlorantraniliprole 18.5% SC @ 0.15 ml/ l (T_5), flubendiamide 39.35% SC @ 0.075 (T_6), emamectin benzoate 5% SG 0.20 g/ l (T_7), untreated check (T_8), chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by spiromesifen 22.9% SC @ 0.5 ml/ l (after one week spray of T_5) (T_9), chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by fenazaquin 10% EC @ 2.0 ml/ l (after one week spray of T_5) (T_{10}) and chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by propargite 57% EC @ 3.0 ml/ l (after one week spray of T5) (T_{11}). Five plants were randomly selected from each treatment and number of larvae/ plants were recorded at one day before spray and one, three, five, seven and 15 days after spray. The % fruit damage and number of active mites/ square inch of leaf area (top, middle and bottom leaves of plant) was calculated by using formulas as followed by Usman et al. (2012) and Phukan et al. (2017) respectively. The data was analysed by using the statistical software SPSS.

RESULTS AND DISCUSSION

The results of the field trial revealed that the tomato fruit borer larval incidence was ranged from 1.35 to 1.78 larvae/ plant (Table 1). Fifteen days after spray, a significantly lower fruit borer larvae/ plant was

Table 1. Efficacy of different treatments against, *H. armigera* and *T. urticae* during kharif 2018-19 on tomato

Treatments	Number of larvae/ plant*		% fruit damage/ plant+		Number of mites/ square inch of leaf area*	
	DBS	DAS#	DBS	DAS#	DBS	DAS#
Spiromesifen 22.9%SC	1.35 (1.36)	1.64 (1.54)[d]	18.70 (25.62)	20.09 (26.36)[c]	5.09 (2.36)	2.30 (2.20)[a]
Dicofol 18.5% EC	1.42 (1.39)	1.56 (1.50)[bcd]	18.81 (25.70)	20.10 (26.38)[c]	4.84 (2.31)	2.83 (2.38)[b]
Fenazaquin 10% EC	1.38 (1.37)	1.58 (1.52)[cd]	18.90 (25.76)	20.23 (26.46)[c]	5.16 (2.38)	2.42 (2.40)[cb]
Propargite 57% EC	1.48 (1.41)	1.62 (1.59)[bcd]	18.69 (25.61)	20.33 (26.60)[c]	5.36 (2.42)	2.61 (2.41)[cb]
Chlorantraniliprole 18.5%SC	1.54 (1.43)	1.19 (1.30)[a]	19.84 (26.44)	8.91 (17.20)[a]	4.76 (2.29)	5.79 (2.62)[ed]
Flubendiamide 39.35%SC	1.65 (1.47)	1.33 (1.35)[abc]	20.99 (27.26)	9.87 (17.96)[ab]	4.90 (2.32)	5.73 (2.72)[ed]
Emamectin benzoate 5%SG	1.68 (1.48)	1.45 (1.40)[abcd]	20.86 (27.17)	10.19 (18.50)[ab]	5.50 (2.45)	5.78 (2.56)[dc]
Untreated check	1.78 (1.51)	2.21 (1.70)[e]	20.56 (28.73)	21.83 (30.50)[d]	5.60 (2.47)	6.53 (2.74)[e]
Chlorantraniliprole 18.5%SC @ 0.15 ml/ l followed by spiromesifen 22.9% SC	1.58 (1.44)	1.25 (1.31)[a]	21.08 (27.33)	9.25 (17.26)[ab]	4.77 (2.29)	4.58 (2.35)[dc]
Chlorantraniliprole 18.5%SC @ 0.15 ml/ l followed by fenazaquin 10 % EC	1.49 (1.41)	1.28 (1.32)[a]	21.46 (27.58)	9.44 (18.23)[b]	5.07 (2.36)	4.80 (2.40)[dc]
Chlorantraniliprole 18.5%SC @ 0.15 ml/ l followed by propargite 57%EC	1.62 (1.46)	1.31 (1.35)[ab]	21.54 (27.65)	9.61 (18.80)[ab]	4.70 (2.28)	4.55 (2.45)[cd]
S.Em.±		0.05		0.61		0.06
C.D.@ 5%		0.13		1.80		0.18
C.V. (%)	NS	12.25	NS	13.74	NS	13.41

DBS-Day before spray; DAS-Days after spary; *Figures in the parenthesis are $\sqrt{(x+0.5)}$ transformed; +Figures in the parenthesis are arcsine transformed; Mean followed by similar alphabets in the column do not differ significantly at 0.05% by DMRT; #Pooled mean of 15 days after spraying.

noticed in treatment chlorantraniliprole 18.5% SC @ 0.15 ml/l followed by spiromesifen 22.9% SC @ 0.5 ml/ l (1.25/ plant) and the untreated check recorded maximum fruit borer larvae (2.21/plant). These results are in concordance with the findings of Ghosal et al. (2012) who revealed that chlorantraniliprole 18.5% SC at 40 g a.i/ ha recorded 98.04% of *H. armigera* larval reduction and higher tomato yield (34.74 q/ ha). The results were on par with Gadhiya et al. (2017) who revealed that, chlorantraniliprole (0.006%), spinosad (0.018%) and emamectin benzoate (0.002%) were effective and statistically at par with each for control of *H. armigera*. Prasad and Rao (2010) also concluded that chlorantraniliprole @ 30 g a.i/ ha effective for control of *H. armigera*. The % fruit damage of *H. armigera* was ranged from 18.69% to 21.54% (Table 1). The lowest % fruit damage was observed in chlorantraniliprole 18.5% SC @ 0.15 ml/ l (8.91/ plant) after fifteen days after spraying. The untreated check recorded the highest % fruit damage (21.83/ plant). The highest reduction in *H. armigera* larvae (87.07%) and highest fruit yield (12.27 t/ ha) was recorded in treatment chlorantraniliprole @ 75 g a.i/ ha (Misra, 2010). Abbas et al. (2015) also revealed that Chlorantraniliprole, Flubendiamide and Indoxacarb had resulted better and recorded least % fruit damage aganist *H. armigera.* Patel et al. (2016) also revealed that chlorantraniliprole 35 WG @ 30 g a.i/ ha reduces larval population of *H. armigera* as well as lowest % of fruit damage compared to standard checks.

The incidence of mites/ square inch of leaf area ranged from 4.70 to 5.60 (Table 1). After fifteen days of spray, lowest mites population/ square inch was recorded in treatment spiromesifen 22.9% SC @ 0.5 ml/ l (2.30/ sq inch) and the untreated check recorded highest number of mites (6.53/ sq inch). Similarly present investigation, spiromesifen 22.9% @ 500 ml/ha showed high/ formance with least mite population (1.41) and it was par with its median and lowest doses with mite population (1.71 and 1.93) (Randhawa et al., 2020). Kavya et al. (2015) also revealed that spiromesifen (1.05 mites/ leaf) reduced the overall mite population more significantly than other acaricides within three days of application and led to increase in higher fruit yield. Among insecticides, chlorantraniliprole 18.5% SC @ 0.5 ml/ l was su/ior in management of fruit borer of tomato. The treatment spiromesifen 22.9% SC @ 0.5 ml/ l was effective in reducing two spotted spider mite population.The treatment chlorantraniliprole 18.5% SC @ 0.15 ml/ l followed by spiromesifen 22.9% SC @ 0.5 ml/ l (19.22 t/ ha) was one of the best treatments for a combined approach for the management of tomato fruit borer and two spotted spiders mites on tomato.

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AUTHOR CONTRIBUTION STATEMENT

CMK, APB and HTP conceived and designed research. CMK conducted experiment and analysed the data. CMK wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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