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EFFICACY OF SOME INSECTICIDES AGAINST THRIPS AND YELLOW MITES IN CHILLI

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ABSTRACT

Efficacy of some insecticides new chemistry insecticides was evaluated against chilli thrips *Scirtothrips dorsalis* and yellow mite *Polyphagotarsonemus latus*, during kharif, 2019 and green and red chilli samples were subjected to residue analysis to evaluate the persistence of sprayed pesticides. Spinetoram 11.7SC at 60 g a.i./ ha was observed to be superior in managing chilli thrips with a mean reduction of 93.35% with least thrips population (0.53/ top 3 leaves) followed by cyantraniliprole 10.26OD at 60 g a.i./ ha and spirotetramat 15.31OD with 90.78 and 85.44 mean % reduction, respectively. Management of yellow mites was effective in plots treated with abamectin 1.9EC at 7 g a.i./ha of 85.73 mean per cent reduction followed by chlorfenapyr 10SC at 100 g a.i./ ha (83.48%) and emamectin benzoate 5SG at 10 g a.i./ ha (76.64%). Lambda-cyhalothrin and chlorantraniliprole residues were detected in green and red chilli among the sprayed pesticides.

Key words: *Scirtothrips dorsalis*, *Polyphagotarsonemus latus*, spinetoram, abamectin, residues, QuEChERS

Biotic ravages caused by insect pests and diseases limits the productivity and quality of chilli crop. There are more than 293 insects and mite species infesting the crop in the field as well as in storage (Girish et al., 2014). Prominently, 51 species of insects, 2 mites belonging to 27 families under 9 orders cause damage to chilli with yield loss from 50 to 90%. Among them, chilli thrips, *Scirtothrips dorsalis* Hood and yellow mite *Polyphagotarsonemus latus* (Banks) are known to be serious pests that can also cause indirect damage by transmitting virus diseases (Patel et al., 1970; Butani, 1976; Reddy and Puttaswamy, 1983; Girish et al., 2014; Tukaram et al., 2017). Where, thrips alone can cause 50% yield loss and transmits chilli leaf curl disease (Samota et al., 2017). Approximately, 13-14% of total pesticides are being used for vegetable crop production, 5.13% was used in chilli to overcome pest problem (Kodandaram et al., 2013). Hence, new insecticide molecules are only the choice for emergency management of insect pests reaching on or beyond economic threshold level (ETL) and keeping a check on the damage caused by the insects.

Most pesticides are sprayed on chilli crop with moderate persistence, leaving residues above the maximum residual limit (MRL). Therefore, the Quick, Easy, Cheap, Effective, Rugged and Safe (QuEChERS) method by Anastassiades et al. (2003) was used for extraction of the chilli samples which is known to be less expensive and less laborious to quantify the level of persistence of chemicals (Bilehal et al., 2017). Use of the pesticide with a different mode of action and chemical nature along with moderate to high persistence showed a high level of pesticide residues in chilli, which resulted in the rejection of chilli consignments at export point citing higher residues of insecticides, thus lots of foreign exchange lost by the way of rejection (Vanisree et al., 2017). In this regard, the present study evaluates the efficacy of some new insecticide molecules against the thrips and yellow mites along with their level of persistence in the chilli fruits for ensuring safety.

MATERIALS AND METHODS

The field trial was conducted at the experimental field of Department of Entomology, College of Agriculture, UAS, Raichur (16°15´N77° 20´E) during kharif, 2019. The experiment was designed with randomized block design (RBD) having ten treatments that were replicated thrice. Chilli cv. HPH-5380 (Red Rise) hybrid was transplanted with a spacing of 90x30 cm and a barrier crop maize was planted between the replications to avoid the spray drift. The insecticides evaluated include: T_1 (spinetoram 11.7SC @60 g a.i./ ha), T_2 (spirotetramat 15.31OD @60 g a.i./ ha), T_3 (fipronil 5SC @50 g a.i./ ha), T_4(cyantraniliprole 10.26OD@60 g a.i./ ha), T_5 (emamectin benzoate 5SG @10 g a.i./ ha), T_6 (lambda-cyhalothrin 5EC @15 g a.i./ ha), T_7 (chlorantraniliprole 18.5SC @30 g a.i./ ha), T_8(chlorfenapyr 10SC@100 g a.i./ ha), T_9 (abamectin 1.9EC @60 g a.i./ ha). The first spray was taken using a manually operated high-volume knapsack compression sprayer at the appearance of pests (mention the days after transplanting or stage) and subsequently, two sprays were given based on ETL. Thrips (adult and nymphs) and mites were recorded by counting (on leaf itself or by tapping on white paper) the number of fallen thrips and mites (stereoscopic binocular microscope under 20x magnification) on top three fully opened leaves from five randomly tagged plants from one day before spray and 1, 5, 10 and 15 days after each spray. The mean per cent reduction was calculated as per Henderson and Tilton (1955) formula. The data were then statistically analysed, after angular transformation using R software (R Core Team, 2016).

Green chilli fruits (1 kg) were collected at ten days after the application of three consecutive sprays. Red chilli fruits (250 g) were collected at the time of harvest from respective treatment in clean, dry and inert polythene bags and transported to the laboratory in dry ice condition for residue analysis (Sharma, 2013). The ground green and red chilli fruits samples were subjected for extraction and clean up following the modified QuEChERS method (Anastassiades et al., 2003). The prepared green chilli (10 g) and red chilli (5 g) samples were weighed in a 50 ml centrifuge tube and 20 ml of acetonitrile was added, homogenized at 10000 rpm for 3 min. Homogenized sample mixture was added with 2 g sodium chloride and centrifuged at 5000 rpm for 5 min. at 10 ºC. After centrifugation, 10 ml of supernatant was transferred in a test tube having 6 g of anhydrous sodium sulphate. From the test tube, 7 ml of extract was transferred into a 15 ml centrifuge tube containing 0.4 g of primary secondary amine (PSA) and 1.05 g of magnesium sulphate and vortexed the mixture for one min. Later, the content was centrifuged at 10000 rpm for 5 min. at 10 ºC. Finally, 1 ml supernatant was filtered using 0.22 µm PTFE nylon filter into LC vials for liquid chromatography coupled with mass spectrometry (LC-MS/ MS) analysis. Similarly, 3 ml of supernatant was transferred into a test tube and evaporated the content using nitrogen flash evaporator at 35 ºC to near dryness. Later, reconstituted the residue with 1.5 ml of ethyl acetate and then, 1 ml mixture was filtered using 0.22 µm PTFE nylon filter the content from test tube into GC vials for gas chromatography coupled with Mass spectrometry (GC-MS/MS) analysis.

Before subjecting the field collected green and red chilli samples for residue analysis. The spike and recovery test for 39 LC-MS/ MS and 40 GC-MS/ MS compatible pesticides in green and red chilli matrices were carried by laboratory developed method. The % recovery and residue (mg/ kg) in field samples were also calculated as per Sharma (2013).

RESULTS AND DISCUSSION

The efficacy of evaluated pesticides against chilli thrips before and after three rounds of treatment were presented in Table 1. This reveals that maximum reduction (93.35%) in thrips population in spinetoram 11.7SC@ 60 g a.i./ ha followed by cyantraniliprole 10.26OD @ 60 g a.i./ ha (90.78%) and minimum (16.57%) in chlorantraniliprole 18.5SC @ 30 g a.i./ ha over untreated control. These results were in accordance with the findings of Parhyar et al. (2019) indicated that spinetoram was highly effective against thrips with a mean reduction of 96.45% in leaves and 96.75% flowers of chilli. The findings of Mukade et al. (2018) and Kurbett et al. (2018) showed that cyantraniliprole 10OD was effective against chilli thrips with 60. 88 and 78.85% reduction, respectively.

The population of yellow mite was 2.80/top 3 leaves in abamectin 1.9EC @ 7 g a.i./ ha which was followed by chlorfenapyr 10SC @ 100 g a.i./ha with 3.37 mites per top 3 leaves against untreated control (20.20 mites) (Table 1). The findings were in line with Sujay et al. (2015) observed that abamectin was most effective in managing chilli mites with 0.17 mites/ leaf and Singh et al. (2017) who found that abamectin resulted in the highest mortality of 89.94% of yellow mite in chilli ecosystem. Sarkar et al. (2013) reported that chlorfenapyr 10SC at 100 g a.i./ ha was effective in controlling yellow mites in chilli with an 86.40 mean % reduction of mite population.

Nine pesticides applied for efficacy against thrips and mites did not record their residues in green chillies except chlorantraniliprole and in red chillies except lambda-cyhalothrin and chlorantraniliprole. Chlorantraniliprole residue in green chilli was 0.540 mg/ kg in the samples drawn at ten days after the third application and imidacloprid residue was 0.731 mg/ kg. Whereas, in red chillies lambda-cyhalothrin and chlorantraniliprole were recorded at 0.164 and 0.002 mg/ kg, respectively. Other pesticides detected are imidacloprid, bifenthrin, cypermethrin, deltamethrin and carbendazim residues in red chilli were 0.021, 0.066, 0.208, 0.184 and 0.023 mg/ kg (Table 1). The residues of unsprayed insecticides were detected in the green and red chilli samples which may be due to the contamination from irrigation water, drift from adjacent plots and chemicals that were retained in

Table1. Efficacy of insecticides against *S. dorsalis* and *P. latus* in chilli (kharif 2019-20)

Sl. No.	Treatment	Dosage (g a i/ha)	No. of thrips/ top 3 leaves*					No. of mites/top 3 leaves*				
			PC	Spray I	Spray II	Spray III	PR	PC	Spray I	Spray II	Spray III	PR
T_1	Spinetoram 11.7SC	60	8.83 (3.05)	2.53 $(1.72)^{a}$	1.23 $(1.31)^{a}$	0.53 $(1.01)^{a}$	93.35	19.87 (4.51)	20.33 $(4.56)^{cd}$	21.93 $(4.74)^{cd}$	18.83 $(4.39)^{d}$	7.44
T_2	Spirotetramat 15.31OD	60	8.37 (2.97)	3.40 $(1.95)^{ab}$	2.13 $(1.61)^{a}$	1.10 $(1.19)^{a}$	85.44	19.20 (4.44)	16.77 $(4.15)^{bcd}$	12.87 $(3.65)^{bc}$	9.53 $(3.16)^{bc}$	51.52
T_3	Fipronil 5SC	50	7.87 (2.89)	5.33 $(2.40)^{abc}$	3.07 $(1.87)^{a}$	1.67 $(1.40)^{a}$	76.49	18.80 (4.39)	20.07 $(4.53)^{cd}$	20.97 $(4.63)^{cd}$	18.53 $(4.40)^{d}$	3.73
T_4	Cyantraniliprole 10.26OD	60	8.77 (3.04)	3.57 $(2.01)^{ab}$	1.87 $(1.50)^{a}$	0.73 $(1.11)^{a}$	90.78	18.93 (4.40)	14.37 $(3.85)^{bc}$	13.13 $(3.69)^{b}$	12.77 $(4.36)^{cd}$	34.11
T_5	Emamectin benzoate 5SG	10	7.77 (2.87)	6.33 $(2.60)^{bcd}$	5.10 $(2.35)^{ab}$	3.77 $(2.02)^{abc}$	46.23	19.23 (4.44)	11.70 $(3.45)^{b}$	8.07 $(2.92)^{b}$	4.60 $(2.24)^{ab}$	76.64
T_6	Lambda-cyhalothrin 5EC	15	8.07 (2.89)	5.27 $(2.40)^{abc}$	5.23 $(2.35)^{ab}$	2.87 $(1.82)^{abc}$	60.59	19.57 (4.47)	14.87 $(3.91)^{bcd}$	12.47 $(3.60)^{b}$	10.67 $(3.64)^{c}$	46.75
T_7	Chlorantraniliprole 18.5 SC	30	8.50 (2.99)	8.47 $(2.99)^{cd}$	8.67 $(3.02)^{bc}$	6.40 $(2.62)^{bc}$	16.57	19.30 (4.44)	21.37 $(4.67)^{cd}$	21.93 $(4.74)^{cd}$	19.13 $(4.43)^{d}$	3.19
T_8	Chlorfenapyr 10SC	100	7.50 (2.78)	4.10 $(2.13)^{ab}$	2.93 $(1.83)^{a}$	1.97 $(1.52)^{ab}$	70.89	19.93 (4.51)	5.67 $(2.47)^{a}$	3.33 $(1.95)^{a}$	3.37 $(1.96)^{a}$	83.48
T_9	Abamectin 1.9EC	7	7.97 (2.86)	3.93 $(2.09)^{ab}$	3.37 $(1.92)^{a}$	2.33 $(1.63)^{abc}$	67.60	19.17 (4.43)	5.20 $(2.38)^{a}$	2.87 $(1.80)^{a}$	2.80 $(1.73)^{a}$	85.73
T_{10}	Untreated (control)	-	8.20 (2.91)	10.17 $(3.26)^{d}$	11.93 $(3.52)^{c}$	7.40 $(2.79)^{c}$	-	19.73 (4.49)	22.07 $(4.75)^{d}$	23.43 $(4.89)^{d}$	20.20 $(4.53)^{d}$	-
		S. Em (±)	NS	0.15	0.22	0.23	-	NS	0.18	0.14	0.20	-
		CD @ p=0.05		0.44	0.65	0.69			0.52	0.42	0.59	

*Mean of three replications; PC- Pre-treatment count; PR- Percent Reduction over control; NS: Non significant; Figures in the parenthesis indicate √x+0.5 transformed values; Values in the column followed by common letters are non-significant at p = 0.05 as per Tuckey's HSD (Tukey, 1965);

soil from the previous season. The results are similar to the findings of Sheikh et al. (2013) who found chilli contaminated with chlorpyrifos, profenophos, endosulfan, imidacloprid, emamectin benzoate, lufenuron, bifenthrin, diafenthiuron, and cypermethrin. Likewise, Bilehal et al. (2017) analysed thirty chilli samples and found eleven samples were contaminated with acetamiprid, thiodicarb, flubendiamide, mancozeb, spinosad and arbosulfan.

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AUTHOR CONTRIBUTION STATEMENT

HNR, BM, PA, PD and UN conceived and designed research. HNR, PG, RP and SM conducted experiments. HNR, BM, PA and UN contributed new reagents and/or analytical tools. PG, RP and SM analysed the data. PG and SM wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

Abhilash P C, Singh N. 2009. Pesticide use and application: an Indian scenario. Journal of Hazardous Materials 165(1-3): 1-12.

Anastassiades M, Lehotay S J. Stajnbaher D, Schenck F J. 2003. Fast and easy multiresidue method employing acetonitrile extraction/ partitioning and "dispersive solid-phase extraction" for the determination of pesticide residues in produce. Journal of AOAC International 86: 412-431.

Bilehal D C, Chetti M B, Khethagoudar M C. 2017. Analysis of pesticide residues in chili (*Capsicum annuum* L.) using ultra performance liquid chromatography with UV detection. Ideas and applications toward sample preparation for food and beverage analysis. pp. 97-108.

Butani D K. 1976. Pests and diseases of chilies and their control. Pesticides 10: 38-41.

Girish R, Srinivasa N, Shruthi H R. 2014. Occurrence and status of pests infesting chilli (*Capsicum annuum* L.). Environment and Ecology 32(3): 916-919.

Henderson C F, Tilton E W. 1955. Tests with acaricide against the brown Wheat mite. Journal of Economic Entomology 48: 157-161.

Kodandaram M H, Saha S, Rai A B, Naik P S. 2013. Compendium on pesticide use in vegetables. IIVR Extension Bulletin 50: 133.

Kurbett A, Gopali J, Allolli T, Patil S, Kumar V, Kurbett K. 2018. Evaluation of different IPM modules against pest complex of chilli (cv. Byadgi dabbi). Journal of Entomology and Zoology Studies 6: 1991-1996.

Mukade K K, Saindane Y S, Deore B V, Pawar S A. 2018. Bioefficacy of some newer insecticides against sucking pests of chilli (*Capsicum annum* L.). Trends in Biosciences 11(26): 3435-3437.

Parhyar R A, Mari J M, Bukero A, Lanjar A G, Hyder M, Khan N, Bukero A A, Soomro H U. 2019. Relative efficacy of synthetic insecticides against sucking insect pests of chilli crop. Pure and Applied Biology 8(4): 2248-2256.

Patel H K, Patel C V, Patel J R. 1970. Catalogue of crop pest of chilli. Gujarat state. Technical Bulletin 1(18):78.

R Core Team. 2016. R: A Language and environment for statistical Computing, Vienna, Austria. https:/www.R-project.org/.

Reddy D N R, Puttaswamy. 1983. Pests infesting chilli (*Capsicum annum* L.)-II in the transplanted crop. Mysore Journal of Agricultural Sciences 17(3): 246-251.

Samota R G, Jat B L, Chowdary M D. 2017. Efficacy of newer insecticides and biopesticides against thrips, *Scirtothrips dorsalis* Hood in chilli. Journal of Pharmacognosy and Phytochemistry 6(4): 1458-1462.

Sarkar P K, Timsina G P, Vanlaldiki H, Chakraborty S. 2013. Arylpyrroleacaro-insecticide chlorfenapyr-a tool for managing yellow thrips (*Scirtothrips dorsalis* Hood) and broad mite (*Polyphagotarsonemus latus* Banks) of chilli. Journal of Crop and Weed 9(1): 188-192.

Sharma K K. 2013. Pesticide residue analysis manual. Directorate of information and publications of agriculture, Indian Council of Agriculture Research. pp. 1-251.

Sheikh S A, Nizamani S M, Panhwar A A, Mirani B N. 2013. Monitoring of pesticide residues in vegetables collected from markets of Sindh, Pakistan. Food Science and Technology Letters 4(1): 41.

Singh A P, Sathua S K, Singh R N. 2017. Evaluation of novel and conventional acaricides against yellow mite, *Polyphagotarsonemus latus* (Banks) on chilli and their effect on prevailing natural enemies, *Amblyseius* sp. in Varanasi Region. International Journal of Current Microbiology and Applied Sciences 5: 2538-2544.

Sujay Y H, Giraddi R S, Udikeri S S. 2015. Efficacy of new molecules and botanicals against chilli (*Capsicum annuum* L.) pests. Madras Agricultural Journal 102(10-12): 348-352.

Tukaram C, Karnatak A K, Srivastava R M. 2017. Bioefficacy of newer insecticide molecules against pest complex of chilli. Octa Journal of Environmental Research 5(2): 129-139.

Vanisree K, Upendhar S, Rajasekhar P, Rao G R. 2017. Effect of newer insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). Journal of Entomology and Zoology Studies 5(2): 277-284.

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