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Bio-efficacy of new molecules of insecticides and biorationals against thrips, *Thrips palmi* Karny on watermelon under field condition

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Abstract
Studies on the effect of new molecules and biorationals against thrips on watermelon were conducted at the University of Horticultural Sciences, Bagalkot during 2017-18. Mean data on efficacy of various treatments recorded after three rounds of sprays revealed that, cyantraniliprole 10.26 OD @ 1.5ml/l found to be highly effective in reducing the thrips population (1.39 thrips/vine) as compared to other insecticides evaluated. Acephate 75 SP @ 1g/l, diafenthiuron 50 WP @ 1g/l and thiamethoxam 25 WG @ 02g/l recorded to be the next best treatments in the order of efficacy (3.10, 3.29 and 3.61 thrips/vine, respectively). While, triazophos 40 EC @ 2ml/l found to be least effective (8.20 thrips/ vine). Among the biorationals tested, spinosad 45 SC @ 0.2ml/l (4.57) and azadirachtin 10000 ppm @1ml/l (5.09) were considered to be effective in reducing thrips on watermelon.

Keywords: *Thrips palmi*, watermelon, bio-efficacy, cyantraniliprole

Introduction
Watermelon, *Citrullus lanatus* (Thunb.) is a summer vegetable crop of India. It occupies a pivotal position among fruit vegetables. It is one of the major commercial crops, cultivated in tropical and subtropical climate. In India, it occupies an area of about 91,000 hectares with an annual production of 21, 82000 MT. Watermelon can be grown in India in almost all the parts. It is a major commercial crop of various river beds in Uttar Pradesh, Punjab, Haryana, Rajasthan, Bihar, Gujarat, Maharashtra, Andhra Pradesh and Karnataka. In Karnataka, it occupies an area about 1175000 ha with production of 38855000 tonnes, and it is commercially cultivated in Kolar, Mandya, Chamarajnagar, Mysuru, Haveri, Belgum, Bagalkot and Koppal (Annon, 2016) [1].

Watermelon is one of the major vegetable crops grown by farmers in India. It is a major source of income, especially to smallholder farmers. In recent years, the area under watermelon is increasing because of the crop value. But the productivity of the crop has declined as it is affected by number of pests. The most common and devastating pest is melon thrips, *Thrips palmi* which can cause significant damage to the crop. Besides causing direct damage, it is responsible for transmitting number of plant TOSPO viruses including watermelon silvery mottle virus and ground nut bud necrosis (GBNV). Now a day, GBNV is very severe on watermelon, resulting in 60 to 100 per cent yield loss depending upon the variety or hybrid and time of sowing (Krupashankar, 1998) [3]. Therefore, it has become necessary to evaluate the new molecules and biorationals for effective management of thrips on watermelon so as to increase the farmer's income, hence the present investigation was undertaken.

Materials and Methods
A field experiment was conducted at the College of Horticulture, Bagalkot during 2017-18 to study the efficacy of new molecules of insecticides and biorationals against thrips on watermelon. The hybrid, Sugar Queen was used for this experiment since it is commercially grown by the many farmers and covering larger area in and around Bagalkot. The experiment was laid out in RCBD consisting of ten treatments *viz.*, diafenthiuron 50 WP @ 1 g/l, thiamethoxam 25 WG @ 0.2 g/l, triazophos 40 EC @ 2ml/l, spinosad 45 SC @ 0.2ml/l, cyantraniliprole 10.26 OD @ 1.5 ml/l, *Beauveria bassiana* (2x 10^8 CFU/g) @ 2g/l, *Lecanicillium lecanii* (2x 10^8 CFU/g) @ 2g/l, azadirachtin 10,000 ppm @ 1ml/l, acephate 75 SP (standard check) @ 1g/l and untreated control and each treatment replicated thrice. Each

Each plot size was 6m × 4m. The healthy Sugar Queen seedlings of about 15 days old having uniform size were transplanted on raised bed covered with silver coloured UV reflective polythene mulch of 40-micron gauge by following the spacing of 2m×1m between the rows and the plants, respectively. Total of three sprays were taken by using knapsack sprayer at seven days intervals. Pre-treatment count on number of thrips (nymphs and adults) was taken one day before imposing treatments. For this purpose, five plants were selected at randomly in each replication and in each treatment plot. Both nymphs and adults were recorded by gently beating the tip of the plant on to a stiff black paper board (30 cm x 30 cm). Then, these fallen thrips were counted. At later stages of the plant growth, four vines per plant in each direction were selected for recording thrips. Post-treatment observations were made with an interval of 1, 3 and 7 days after each spray.

Results

The population of thrips ranged from 5.67 to 7.25 per vine at a day before spray indicating uniform distribution throughout the experimental field and there was no significant difference between the treatments and results obtained are presented in Table 1.

A day after spray, among the new molecules tested, cyantraniliprole 10.26 OD @ 1.5ml/l treated plot recorded least number of 0.66 thrips per vine followed by diafenthiuron 50 WP @ 1g/l treated plot with 1.25. Thiamethoxam 25 WG 0.2g/l and acephate 75 SP @ 1g/l were recorded to be the next best treatments in reducing thrips population with 1.87 and 2.00 per vine, respectively. Among the different biorationals tested, azadirachtin 10,000 ppm @ 1g/l was found superior in reducing the thrips population (2.67/ vine) followed by spinosad 45 SC @ 0.2ml/l and *Lecanicillium lecanii* (2x10^8 CFU/g) @ 2g/l with the population of 3.26 and 3.54, respectively and these treatments were found on par with each other. Whereas, maximum number of 8.76 thrips per vine recorded in untreated control. At three days after first spray, population of thrips was almost nil in the plots treated with cyantraniliprole 10.26 OD @ 1.5ml/l followed by diafenthiuron 50 WP @ 1g/l with 0.20 and were statistically on par with each other. The next best treatments in the order were acephate 75 SP @ 1g/l and thiamethoxam 25 WG 0.2g/l recording 0.56 and 0.72 thrips per vine. These two treatments were found on par with each other. azadirachtin 10,000 ppm @ 1g/l treated plots recorded relatively less number of thrips as compared to *Lecanicillium lecanii* @ 2g/l and spinosad 45 SC @ 0.2ml/l with 1.20, 2.02 and 2.12 thrips per vine, respectively. On seventh day after spray, among the insecticides tested, the plot received the spray of cyantraniliprole 10.26 OD @ 1.5ml/l, spinosad 45 SC @ 0.2ml/l and diafenthiuron 50 WP @ 1g/l recorded 0.12, 1.00 and 2.09 thrips per vine, respectively followed by thiamethoxam 25 WG 0.2g/l with the thrips population of 2.86 and stood on par with *Lecanicillium lecanii* @ 2g/l recording 3.36 and it was remain on par with acephate 75 SP @ 1g/l (3.56).

A day after second spray, lowest number of 0.12 thrips per vine was noticed in cyantraniliprole 10.26 OD @ 1.5ml/l treated plots. The next best treatments were thiamethoxam 25 WG 0.2g/l and acephate 75 SP @ 1g/l with 1.25 and 1.29 thrips, respectively and these treatments were found on par with each other. Whereas, diafenthiuron 50 WP @ 1g/l recorded relatively higher number of 2.09 thrips per vine as compared to previous spray.

Table 1: Efficacy of new molecules of insecticides and biorationals against thrips on watermelon during 2017-18

Treatment	Dose (ml or g/l)	Mean number of thrips / vine									
		I Spray				II Spray			III Spray		
		DBS	1 DAS	3 DAS	7 DAS	1 DAS	3 DAS	7 DAS	1 DAS	3 DAS	7 DAS
T_1-Diafenthiuron 50 WP	1.0 g	6.25 (2.59)	1.25 (1.32) ^{g}	0.20 (0.84) ^{fg}	2.09 (1.61) ^{f}	2.09 (1.61) ^{f}	5.45 (2.43) ^{de}	8.34 (2.97) ^{g}	4.83 (2.30) ^{f}	2.75 (1.80) ^{fg}	2.61 (1.76) ^{e}
T_2-Thiamethoxam 25 WG	0.2 g	6.67 (2.67)	1.87 (1.54) ^{f}	0.72 (1.10) ^{de}	2.86 (1.83) ^{e}	1.25 (1.32) ^{g}	4.75 (2.28) ^{ef}	9.67 (3.18) ^{ef}	5.29 (2.40) ^{ef}	3.24 (1.93) ^{ef}	2.84 (1.82) ^{e}
T_3- Triazophos 40 EC	2.0 ml	5.67 (2.48)	4.85 (2.31) ^{b}	3.96 (2.11) ^{b}	4.25 (2.18) ^{b}	4.98 (2.34) ^{bc}	9.20 (3.11) ^{b}	13.86 (3.78) ^{b}	11.39 (3.44) ^{b}	10.26 (3.28) ^{b}	11.02 (3.39) ^{b}
T_4- Spinosad 45 SC	0.2 ml	5.95 (2.54)	3.26 (1.94) ^{d}	2.12 (1.62) ^{c}	1.00 (1.22) ^{g}	2.84 (1.82) ^{e}	5.98 (2.54) ^{d}	9.89 (3.22) ^{ef}	7.82 (2.88) ^{c}	4.32 (2.19) ^{f}	3.92 (2.10) ^{d}
T_5- Cyantraniliprole 10.26 OD	1.5 ml	6.56 (2.65)	0.66 (1.08) ^{h}	0.00 (0.71) ^{g}	0.12 (0.79) ^{h}	0.12 (0.79) ^{h}	2.45 (1.71) ^{g}	4.45 (2.22) ^{h}	2.85 (1.83) ^{g}	1.01 (1.23) ^{g}	0.86 (1.17) ^{g}
T_6- *Beauveria bassiana* (2x 10^8 CFU/g)	2.0 g	6.84 (2.70)	4.25 (2.17) ^{c}	4.42 (2.22) ^{b}	4.42 (2.22) ^{b}	5.26 (2.39) ^{b}	8.96 (3.06) ^{b}	12.46 (3.58) ^{c}	11.28 (3.42) ^{b}	11.98 (3.52) ^{c}	11.08 (3.40) ^{b}
T_7- *Lecanicillium lecanii* (2x 10^8 CFU/g)	2.0 g	7.14 (2.76)	3.54 (2.01) ^{d}	2.02 (1.58) ^{c}	3.36 (1.96) ^{de}	3.45 (1.98) ^{d}	6.89 (2.71) ^{c}	10.64 (3.33) ^{de}	7.28 (2.78) ^{cd}	6.49 (2.64) ^{d}	6.95 (2.73) ^{c}
T_8- Azadirachtin 10,000 ppm	1.0 ml	7.25 (2.78)	2.67 (1.78) ^{e}	1.20 (1.30) ^{d}	3.97 (2.11) ^{bc}	4.56 (2.25) ^{c}	7.29 (2.79) ^{c}	11.23 (3.42) ^{cd}	6.24 (2.59) ^{de}	4.92 (2.32) ^{de}	3.64 (2.03) ^{d}
T_9- Acephate 75 SP (Standard Check)	1.0 g	6.67 (2.67)	2.00 (1.58) ^{f}	0.56 (1.03) ^{ef}	3.56 (2.01) ^{cd}	1.29 (1.34) ^{g}	4.24 (2.17) ^{f}	8.94 (3.06) ^{fg}	3.23 (1.92) ^{g}	2.12 (1.61) ^{fg}	1.97 (1.57) ^{f}
T_{10}- Untreated control	-	7.25 (2.78)	8.76 (3.04) ^{a}	7.45 (2.82) ^{a}	10.36 (3.29) ^{a}	12.85 (3.65) ^{a}	15.91 (4.05) ^{a}	21.64 (4.70) ^{a}	22.32 (4.77) ^{a}	21.62 (4.70) ^{a}	22.39 (4.78) ^{a}
S.Em±			0.038	0.043	0.046	0.040	0.053	0.061	0.064	0.068	0.057
CD (P=0.05)		NS	0.111	0.126	0.134	0.116	0.154	0.177	0.189	0.198	0.167

Figures in parenthesis indicate square root √ x+0.5 transformed values.

Figures in each column followed by same alphabet (s) are not significantly different (P=0.05) by DMRT

NS- Non significant, DBS- Day before spray, DAS- Days after spray

Among the biorationals tested, spinosad 45 SC @ 0.2ml/l, *Lecanicillium lecanii* @ 2g/l and azadirachtin 10,000 ppm @ 1g/l recorded 2.84, 3.45 and 4.56 thrips, respectively and found more effective. At three day after spray, cyantraniliprole 10.26 OD @ 1.5ml/l found statistically superior over other treatments with a population of 2.45 thrips per vine, which was followed by acephate 75 SP @ 1g/l with 4.24 and it was on par with thiamethoxam 25 WG 0.2g/l recording 4.75 thrips per vine. The next best treatment is diafenthiuron 50 WP @ 1g/l with 5.45 thrips. Among the biorationals, spinosad 45 SC @ 0.2ml/l stood first in the order of effectiveness with 5.98 thrips, followed by *Lecanicillium lecanii* @ 2g/l and azadirachtin 10,000 ppm @ 1g/l with 6.89 and 7.29 thrips per vine, respectively and were found on par with each other. Rest of the treatments were found not effective in reducing the thrips on watermelon. Seven days after the second spray, the plants received a spray of cyantraniliprole 10.26 OD @ 1.5ml/l was found most superior in reducing thrips to the tune of 4.45 thrips per vine. Diafenthiuron 50 WP @ 1g/l and acephate 75 SP @ 1g/l was found on par with each other with 8.34 and 8.94 thrips per vine. Followed by, thiamethoxam 25 WG 0.2g/l and spinosad 45 SC @ 0.2ml/l by recording 9.67 and 9.89 thrips and found on par with each other. *Lecanicillium lecanii* @ 2g/l and azadirachtin 10,000 ppm @ 1g/l were found moderately effective with 10.64 and 11.23 thrips per vine, respectively. Whereas, *Beauveria bassiana* @ 2g/l and triazophos 40 EC 2ml/l were found least effective in reducing thrips population with 12.46 and 13.86 thrips per vine.

A day after third spray, plot receiving the treatments of cyantraniliprole 10.26 OD @1.5ml/l and acephate 75 SP @ 1g/l were found on par with each other and were effective treatments recording 2.85 and 3.23 thrips per vine followed by diafenthiuron 50 WP @ 1g/l and thiamethoxam 25 WG 0.2g/l, which were found on par with each other with the population of 4.83 and 5.29 thrips per vine respectively, thiamethoxam was on par with azadirachtin with 5.29 and 6.24 thrips, respectively. Relatively higher number of 7.28 and 7.82 thrips per vine recorded from the plots treated with spinosad 45 SC @ 0.2ml/l and *Lecanicillium lecanii* @ 2g/l. Whereas, *Beauveria bassiana* (2x 10^8 CFU/g) @ 2g/l and triazophos 40 EC 2ml/l found least effective in reducing thrips population with 11.28 and 11.29 thrips per vine, respectively. Three days after the spray the plots sprayed with cyantraniliprole 10.26 OD @ 1.5ml/l recorded least number of 1.01 thrips per vine. It was followed by acephate 75 SP @ 1g/l and diafenthiuron 50 WP @ 1g/l with 2.12 and 2.75, respectively and these two treatments were found on par with each other. Among the biorationals tested, spinosad 45 SC @ 0.2ml/l stood as best treatment by recording 4.32 thrips, followed by azadirachtin 10,000 ppm @ 1ml/l and *Lecanicillium lecanii* @ 2g/l with 4.92 and 6.49 thrips per vine, respectively. Seven days after the spray, cyantraniliprole 10.26 OD @ 1.5ml/l recorded significantly less number of thrips 0.86, followed by acephate 75 SP @ 1g/l with 1.97 thrips per vine and these were found statistically significant as compared to all other treatments tested. The next best treatments were diafenthiuron 50 WP @ 1g/l and thiamethoxam 25 WG 0.2g/l with 2.61 and 2.84 thrips, respectively and these were found on par with each other. The plot received the treatment of azadirachtin 10000 ppm and spinosad 45 SC were found effective in reducing thrips population among the biorational tested and both the treatments were found on par with each other with a population of 3.64 and 3.92. Whereas, the spray of *Lecanicillium lecanii* @ 2g/l found least effective by recording 6.95 thrips per vine.

Discussion

Mean data on efficacy of various treatments recorded after three rounds of sprays revealed that, all the treatments were significantly effective over the untreated control in reducing thrips population on watermelon. The population of thrips per vine in different treated plots ranged from 1.39 to 8.24 as against 16.22 in untreated control. Among the new molecules of insecticides evaluated, three sprays of cyantraniliprole 10.26 OD @ 1.5ml/l found to be highly effective in reducing the thrips population (1.39 thrips/vine). Acephate 75 SP @ 1g/l, diafenthiuron 50 WP @ 1g/l and thiamethoxam 25 WG @ 02g/l recorded to be the next best treatments (3.10, 3.29 and 3.61 thrips/vine, respectively). While, triazophos 40 EC @ 2ml/l found to be least effective (8.20 thrips/ vine). Among the biorationals tested, spinosad 45 SC @ 0.2ml/l (4.57) and azadirachtin 10000 ppm @1ml/l (5.09) were considered to be effective. *Lecanicillium lecanii* (2x 10^8 CFU/g) @ 2g/l and *Beauveria bassiana* (2x 10^8 CFU/g) @ 2g/l were found least effective in reducing thrips on watermelon. The Present findings are in confirmation with the findings of Seal (2011) who reported that, cyantraniliprole 10.26 OD @ 0.07 lb *a.i.* per acre was found effective in providing 50 to 65 per cent thrips reduction on watermelon**.** Krishna Kumar *et al*. (2006) reported acephate when sprayed @ 500g *a.i/*ha at 10 days interval significantly reduced thrips infestation on watermelon as compared to other chemical insecticides. Findings of present investigation are also in comparison with Shruti *et al*. (2017) who reported that, seed treatment with imidacloprid 45 FS @ 10 ml per kg seeds followed by foliar application of acephate 70 SP @ 1 g/l was found to be most effective in managing thrips on watermelon followed by diafenthiuron (1.25g/l), imidacloprid (0.30ml/l), thiamethoxam (0.20 g/l). Application of azadirachtin 1500 ppm (3 ml/l) and a fungal based bio-pesticide, *Lecanicillium lecanii* (1x 10^8 CFU/g @ 2.0g/l) found to be moderately effective biorationals.

Conclusion

It can be concluded from the present investigation that, three rounds of spraying of cyantraniliprole 10.26 OD @ 1.5ml/l found to be highly effective in reducing the thrips population which was followed by Acephate 75 SP @ 1g/l, diafenthiuron 50 WP @ 1g/l and thiamethoxam 25 WG @ 02g/l. Of the biorationals evaluated, spinosad 45 SC @ 0.2ml/l and azadirachtin 10000 ppm @1ml/l were found most effective against thrips on watermelon.

References

1. Anonymous, 2016, Indian horticulture database, NHB.
2. Krishnakumar NK, Venkatesh N, Kalleshwaraswamy C M, Ranganath HR. Seasonal incidence of thrips and bud necrosis virus on water melon. Pest Manag. Hort. Ecosyst. 2006; 12:85-92.
3. Krupashankar MR. Studies on bud necrosis virus disease of watermelon (*Citrullus lanatus* Thunb.). *M*. Sc. (Agri.) Thesis, Univ. Agril. Sci., Bangalore (India), 1998.
4. Seal DR. Abundance and Management of Melon Thrips, *Thrips palmi* Karny (Thysanoptera: Thripidae). Proc. Fla. State Hort. Soc. 2011; 124:140-143.
5. Shruthi CR, Narabenchi GB, Rhohini BS, Nandi C. Bioefficacy of synthetic insecticides, bio-pesticide and botanical against thrips and watermelon bud necrosis viral disease on watermelon. Int. J Curr. Microbiol. App. Sci. 2017; 6(9):540-548.