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Field evaluation of some new biorationals and bio-insecticides against Litchi bug, *Tessaratoma javanica* Thunberg at Dehradun

Hitendra Kumar and Khilendra Singh

Abstract
We tested nine different insecticides including some biorationals and bio-insecticides, *viz*. Azadirachtin 1.0 %, *Verticillium lecanii* 01.15% WP, Emamectin Benzoate 5SG, Spinosad 45SC, Buprofezin 25.00% SC, Lufenuron 05.40% EC, Imidacloprid 70.00%, Chlorantraniliprole 18.50% SC, Lambda-cyhalothrin 05.00% EC against the litchi bug, *Tessaratoma javanicai* Thunberg. Chlorantraniliprole 18.50% SC, Imidacloprid 70.00% & Lambda-cyhalothrin 05.00% EC were recorded to check population buildup of litchi bug most efficiently and were at par in their action when compared together. Among other biorational insecticides and biopesticides Spinosad 45 SC and Buprofezin 25.00% SC were more effective and found superior to Azadirachtin 1.0 %, *Verticillium lecanii* 01.15% WP, Emamectin Benzoate 5SG and Lufenuron 05.40% EC.

Keywords: Biorationals, Bio-insecticides, litchi bug

Introduction
In India Litchi (*Litchi chinensis* Sonn.) (Sapindaceae) is cultivated in different states of India *viz*. Bihar, Uttarakhand, West Bengal etc. [6]. The litchi bug, *Tessaratoma javanica* (Hemiptera: Tessaratomidae) is considered as a important pest of litchi in India and fairly good incidence of pest has been reported from different litchi growing regions of Uttarakhand state [4]. An outbreak of this pest in Jharkhand in litchi has attracted attention of the researchers to find out effective management strategies for litchi bug [3]. This insect was also noticed to causes significant damage to the leaves, growing buds and tender young shoots of Kusum, *Schleichera oleosa* plants, which is an important host for *kusumi* strain of lac insect [5].
The adult as well as nymphs of litchi bug cause damage to flowers and fruits by sap feeding [8]. Some reports indicate that a secretion of this bug can cause wilting of young leaves and initiate brown spots development on leaves and fruits thus reducing economical value of litchi crop [1, 7]. A significant fruit fall may be found in case of severe attack of this pest on litchi crop. In any case use of insecticides has still been the first line of defense and last alternative to save the crop from such notorious pests. So, the present study was carried out to test comparative effectiveness of different insecticides including some bio-rational and bio-insecticides against litchi bug.

Materials and methods
The present research work was carried out at Litchi orchard, Horticulture Research Block, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India during litchi flowering and fruiting session in the year 2018 & 2019. We selected forty trees (total four rows and each row having ten trees) of litchi cv. Rose Scented. Thus each treatment was having four replications in Randomized Block Design (RBD). We selected nine insecticides and one untreated control thus a total of ten treatments were taken for our experiment as per the following details:

Treatment No.	Insecticide	Dose ml/gm per lit of water	Concentration (%)
T-1	Azadirachtin1.0% EC(10,000 ppm)	3 ml	0.003
T-2	*Verticillium lecanii* 01.15% WP	5 gm	0.006
T-3	Emamectin Benzoate 5SG	0.4 gm	0.002
T-4	Lufenuron 05.40% EC	1ml	0.005
T-5	Spinosad 45SC	0.4 ml	0.018
T-6	Buprofezin 25.00% SC	2ml	0.050
T-7	Imidacloprid 70.00% WG	0.5 g	0.035
T-8	Chlorantraniliprole 18.50% SC	0.5 ml	0.009
T-9	Lambda-cyhalothrin 05.00% EC	2ml	0.01
T-10	Control	-	-

In each treatment single spray of respective insecticide was given during second fortnight of May 2018 and again in 2019. One day before scheduled spray total insect number (both adults and nymphs) was counted from twenty randomly selected panicles in each replication. After insect counting each panicle was covered with nylon cage. Observations on insect mortality was taken after 1,3 and 7 days after giving insecticide spray. The recorded data was analysed statistically by following suitable procedure and principles of data analysis.

Results and Discussion

Analysed data presented in table.1 indicated that after one day of insecticide application only Chlorantraniliprole 18.50% SC, Lambda-cyhalothrin 05.00% EC and Imidacloprid 70.00% WG provided significantly highest morality of litchi bug over other treatments and control with 99.5, 98.75 and 98.0 % respectively. No mortality (0.0%) was observed with the use of *Verticillium lecanii* 01.15% WP, Lufenuron 05.40% EC, Spinosad 45SC and Buprofezin 25.00% SC after one and three days of spray. After seven days of insecticide application and with overall comparison of results it is observed that Azadirachtin1.0% EC (10,000 ppm) and *Verticillium lecanii* 01.15% WP were at par in results with untreated control. Emamectin Benzoate 5SG and Buprofezin 25.00% SC were also similar in their effect but significantly inferior to other effective insecticides mentioned above.

Data given in table 2 shown that in second year of study *Verticillium lecanii* 01.15% WP has given 0.0 % mortality of litchi bug after seven days of observation. Again it was observed that Chlorantraniliprole 18.50% SC, Lambda-cyhalothrin 05.00% EC and Imidacloprid 70.00% WG given significantly higher control over other insecticides. Spinosad 45SC and Buprofezin 25.00% SC were at par in their effect and significantly superior over the control. Azadirachtin 1.0 % EC (10,000 ppm) gave significantly inferior control over other insecticides.

It is evident from study conducted during 2018 and 2019 that Chlorantraniliprole 18.50% SC, Lambda-cyhalothrin 05.00% EC and Imidacloprid 70.00% WG were best in their bio-efficacy against litchi bug at Dehradun. Spinosad 45SC,Buprofezin 25.00% SC and Emamectin Benzoate 5SG were almost similar in their effect but Azadirachtin1.0% EC (10,000 ppm) and *Verticillium lecanii* 01.15% WP gave poor results when compared with other treatments.

Table 1: Efficacy of different insecticides against litchi bug on litchi cv Rose scented during year 2018.

Treatment	Insecticide	Conc. (%)	Mean percent (%) insect Mortality			Total
			1 DAT	3 DAT	7 DAT	
T-1	Azadirachtin1.0% EC(10,000 ppm)	0.003	0.00	2.25	7.25	9.50
T-2	*Verticillium lecanii* 01.15% WP	0.006	0.00	0.00	1.25	1.25
T-3	Emamectin Benzoate 5SG	0.002	14.75	25.75	38.00	78.50
T-4	Lufenuron 05.40% EC	0.005	0.00	0.00	35.25	35.25
T-5	Spinosad 45SC	0.018	0.00	0.00	89.75	89.75
T-6	Buprofezin 25.00% SC	0.050	0.0	0.0	67.5	67.5
T-7	Imidacloprid 70.00% WG	0.035	95.75	2.25	0.00	98.00
T-8	Chlorantraniliprole 18.50% SC	0.009	98.25	1.25	0.00	99.50
T-9	Lambda-cyhalothrin 05.00% EC	0.01	98.00	0.75	0.00	98.75
T-10	Untreated control	-	0.00	0.00	1.25	1.25
SEM (±)			1.91	0.43	0.41	2.03
CD (5%)			3.61	2.31	2.25	8.17

Table 2: Efficacy of different insecticides against litchi bug on litchi cv Rose scented during year 2018.

Treatment	Insecticide	Conc. (%)	Mean percent (%) Insect Mortality			Total
			1 DAT	3 DAT	7 DAT	
T-1	Azadirachtin 1.0 % EC(10,000 ppm)	0.003	0.0	4.25	10.25	14.5
T-2	*Verticillium lecanii* 01.15% WP	0.006	0.0	0.0	0.0	0.0
T-3	Emamectin Benzoate 5SG	0.002	0.0	32.25	38	70.25
T-4	Lufenuron 05.40% EC	0.005	0.0	7.25	45.25	52.5
T-5	Spinosad 45SC	0.018	0.0	11.75	70.25	82.0
T-6	Buprofezin 25.00% SC	0.050	0.0	4.75	78.5	83.25
T-7	Imidacloprid 70.00% WG	0.035	90.75	5.25	0.0	96
T-8	Chlorantraniliprole 18.50% SC	0.009	97.25	2.25	0.0	99.5
T-9	Lambda-cyhalothrin 05.00% EC	0.01	95.75	0.75	0.0	96.5
T-10	Untreated control	-	0.0	0.0	3.25	3.25
SEM (±)			2.17	0.89	0.41	3.48
CD (5%)			6.6	2.72	1.26	10.58

Conclusion

With the help of presented study it can be concluded that Chlorantraniliprole 18.50% SC, Lambda-cyhalothrin 05.00% EC and Imidacloprid 70.00% proved to be most effective insecticides against litchi bug. It is also noticed that Spinosad 45SC and Buprofezin 25.00% SC can also be used as second choice insecticides.

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