Efficacy of biopesticides for the management of rice yellow stem borer *scirpophaga incertulas* (Walker) in rice at prayagraj

ABSTRACT

The present study entitled "**Efficacy of biopesticides for the management of rice yellow stem borer [*scirpophaga incertulas* (Walker)] at prayagraj"** The eight treatments comprised of different insecticides and biopesticides. *Metarhizium anisopliae* (T_1), *Bacillus thuringiensis* 1.15% (T2), *Beauveria bassiana* 1.15% (T3), *Verticillium lecanii1.15%* (T4), Neem oil 5% (T5), Eucalyptus oil5% (T6), Imidacloprid 17.8%SL (T7), one untreated Control (T8) were evaluated against rice stem borer.The different insecticides and biopesticides treatments revealed that the minimum dead hearts, were recorded in synthetic insecticides, Imidacloprid 17.8%SL followed by *Beauveria bassiana* 1.15%, Metarhizium *anisopliae*. The minimum dead heart percentages Imidacloprid 17.8%SL were observed in as compared to the natural dead heart of per cent being noticed in untreated control. The percent of the dead heart infestation among the treatments are notices as *Metarhizium anisopliae* (T1) *Bacillus thuringiensis* 1.15%WP (T2), *Beauveria bassiana* 1.15%WP (T3), *Verticillium lecanii*1.15%WP (T4), Neem oil 5% (T5), Eucalyptus oil5% (T6), Imidacloprid 17.8%SL(T7), The yield and cost benefit ratio of the data revealed that the highest yield was recorded in the Imidacloprid 17.8%SL @46.66q/ha with highest Benefit-cost ratio of 1:3.47 followed by *Bacillus thuringiensis* 1.15% @ 38.33 q/ha with benefit cost ratio of 1:2:77 *Beauveria bassiana* 1.15% @ 43.33q/ha with benefit cost ratio of 1:3:27, *Verticillium lecanii* 1.15%@ 36.66q/ha with benefit cost ratio of 1:2:73, Neem oil 5% @ 33.33q/ha with benefit cost ratio of 1:2:46, Eucalyptus oil5%@ 31.66 q/ha with benefit cost ratio of 1:2:35, *Metarhizium anisopliae* @41.66q/ha with benefit cost ratio of 1:3:13 The chemicals shows better results in combating to the pest infestation compare to biopesticides and botanicals.

KEY WORDS: Bio-pesticides, Chemicals, Cost benefit, Efficacy, Rice, stem borer *(scirpophagaincertulas*)

INTRODUCTION

Rice (*Oryza sativa* L.) occupies the prominent place in Indian agriculture. It is the most important staple food crop of the developing world for more than 3 billion people. The production and productivity of rice is low in Chhattisgarh and India as compared to world production. Chhattisgarh popularly known as "Rice Bowl of India" occupies an area around 3756.80 thousand hectares with the production of 5.22 million tones and productivity of 2050 kg per hectares (**Krishi Dairy, 2016**). Amongst various constraints for low productivity of rice the insect pests and diseases are very important.

The hot and humid environment in which rice is grown is very conductive for proliferation of insects and diseases. The rice plant is attacked by more than 128 species of insects, 20 of them can cause serious economic loss (**Kalode, 2005**). YSB causes 1% to 19% yield loss in early planted and 38% to 80% in late transplanted rice crops.

Various control strategies have been adopted to check insect pest of rice, use of synthetic insecticides is a common method of pest control. But The indiscriminate uses of insecticides have resulted in a number of undesirable side effects such as the development of resistant strain of insects, environmental pollution and health hazards to farmers (**Hasan *et al*.,2002**) . Pesticides have also entered into the food chain and have bioaccumulated in the higher tropic level. More recently, several human acute and chronic illnesses have been associated with pesticides exposure. Therefore, it has now become necessary to search for the alternative means of pest control, which can minimize the use of synthetic pesticides. Botanical pesticides are the important alternatives to minimize or replace the use of synthetic pesticides. Botanicals with different modes of action may minimize insecticide resistance and pest resurgence problems while being safe and ecologically acceptable.

Biopesticides are a good alternative to the synthetic pesticide. Neem is one of the most reliable botanical sources of biopesticides. Neem plant has been known for three decades for its potential against insect pests.

Leaves and seed extract of Neem plant have been observed for their deleterious effects on insects. The principle component that has insecticidal activity in Neem extracts is a limonoid, Azadirachtin. Azadirachtin is non-toxic to mammals, rat, oral acute LD_{50} is more than 5000 mg/kg. A 90 day oral feeding of rats with 10,000ppm of Azadirachtin did not show chronic toxicity (**Mehlhorn *et al*., 2011**).

MATERIALS AND METHODS

Field experiment was conducted at the Central Research Farm of Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, U.P. during *kharif* season 2022. Trail was laid out in Randomised Block Design consisting of eight treatments including control. Each treatment was replicated thrice and C84 was sown and transplant date spacing of 30x35cm. Standard agronomic practices were followed to ensure a good crop stand. the treatments Imidacloprid 17.8%SL, *Beauveria bassiana1.15%, Bacillus thuringiencis115%,* Neem oil 5%, *Metarhizium anosopliea verticillium lecanni 1*.15% Eucaylptus oil 5% The observations on account of Dead hearts and White heads were recorded on five randomly selected plants per treatment. First count was done one day before insecticide application and post treatment counts were made after 3,7,14 days. Two sprays was given with an interval of 15 days. In order to assessthe per cent of Dead hearts and White heads on five randomly selected and tagged plants per net plot. Dead hearts and White ears due to rice yellow stem borer pest was recorded from each net plot and the population was worked out per plant.

Observations.S

The observations on the number of rice yellow stem borer pest were recorded from the ten randomly selected and tagged plants from each plot. The observations were recorded a day before followed by 3^{rd}, 7^{th}, 14^{th} days after spraying. Dead hearts and White ears due to riceyellow stem borer pest were recorded from each net plot and the population was worked out per plant.

The per cent dead hearts and whit ears calculated by using given formula.

$$\text{Percentage of dead hearts} = \frac{\text{Total no dead hearts}}{\text{Total no of tillers}} \times 100$$

$$\text{Percent of White ears} = \frac{\text{Total number of white ears}}{\text{Total number of tillers}} \text{ X } 100$$

RESULT AND DISCUSSION

All the insecticides were significantly superior over control in reducing the infestation percent of stem borer which were the mean of 3, 7, and 14 DAS after insecticidal application. Imidacloprid 17.8SL was found significantly superior (4.92), these findings are supported by the **Chatterjee *et al*. (2014),** Followed by *Beauveria bassiana* 1.15WP (6.37) these findigs are supported by **(singh *et al.*2021)** *Metarhizium anisopliae* (6.59) was found next best treatment similar results are recorded by by **Chormule *et al*.(2014),** *Bacillus thuringiensis* 1.15WP (6.80) was found next similar result recorded by **(Madhu *et al.*2019)** *Verticillium lecanii* (7.00), similar findings are also reported in Rice by **(Samanta *et al*.(2017),** Neem oil 5% (7.80) was next best treatment these similar findings are with those of **Choudhary *et al.*(2017),** Eucaylptus oil 5% (8.43) found to be least effective but comparatively superior over the untreated control recorded (23.51) these results were in supportive with **Longkumar *et al*.(2022).**

Table 1.) "Effect of biopesticides for the management of rice yellow stem borer [*scirpophaga incertulas* (walker)] at prayagraj" infestation after first spray

TREATMENTS		MEAN % OF Dead hearts/5 plants				
		1DBS	**3DAS**	**7DAS**	**14DAS**	**MEAN**
T0	Control	16.17	16.95	19.15	23.35	19.81
T1	*Metarhiziu m anisopliae*	10.17	7.71	5.73	8.60	7.347
T2	*Bacillus thuringiens is* 1.15%wp	10.58	7.96	6.10	8.83	7.630
T3	*Beauveria bassiana* 1.15%wp	9.90	7.58	5.14	8.58	7.100
T4	*Verticillium lecanii 1.15%wp*	11.86	8.18	6.36	9.24	7.927
T5	Neem oil 5%	12.96	9.32	7.51	10.83	9.220

T6	Eucalyptus oil 5%	13.98	10.01	7.85	11.19	9.683
T7	Imidacloprid 17.8%SL	9.72	5.61	3.38	6.91	5.300
F-TEST		**NS**	**S**	**S**	**S**	**S**
C.V		--	3.58	1.97	3.04	1.01
CD (5%)		--	3.31	2.46	3.05	1.76

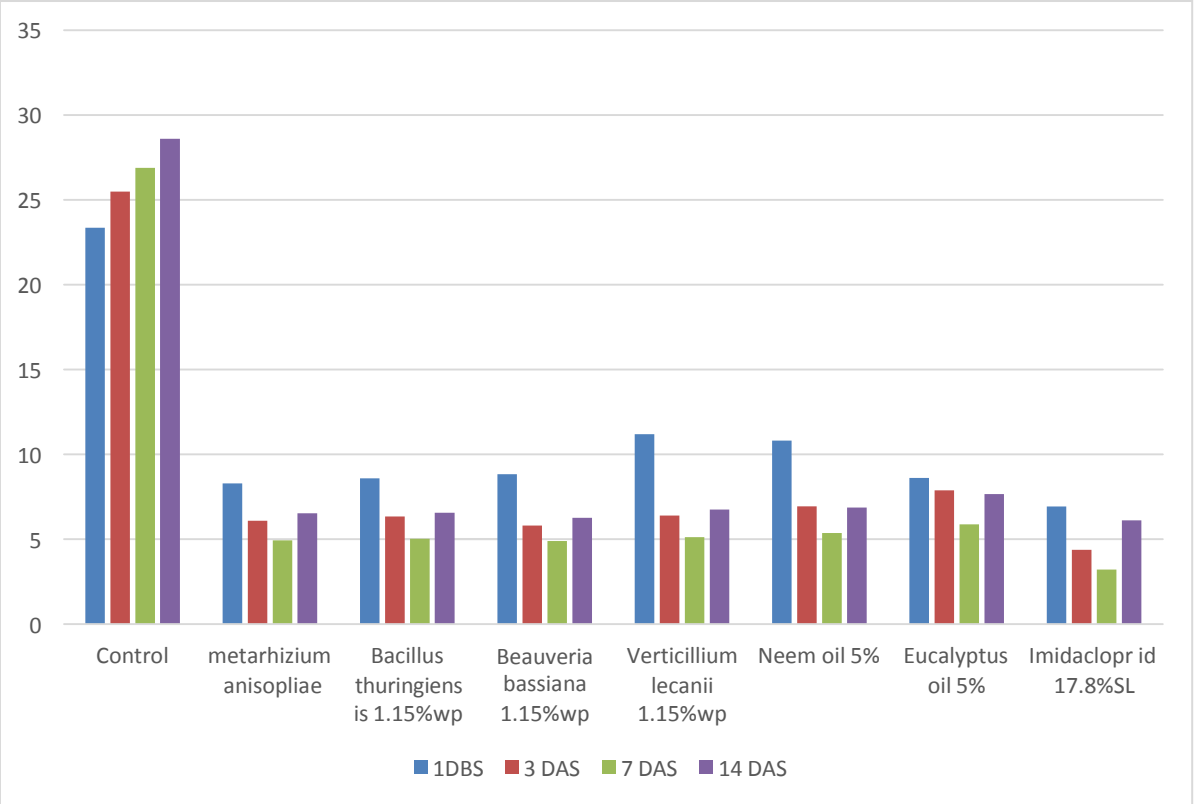

Fig 1. Effect of biopesticides for the management of rice yellow stem borer ((application of 1st spray)

Table 2. "Effect of biopesticides for the management of rice yellow stem borer [*scirpophaga incertulas* (walker)] at prayagraj" *infestation* after second spray

TREATMENTS		MEAN % DEAD HEARTS AND WHITE HEADS				
		1DBS	**3DAS**	**7DAS**	**14DAS**	**MEAN**
T0	**Control**	23.35	25.48	26.88	29.27	27.210
T1	*Metarhiziu anisopliae*	8.60	6.09	4.92	6.53	5.847
T2	*Bacillus thuringiens is* 1.15%wp	8.83	6.34	5.02	6.56	5.973
T3	*Beauveria bassiana* 1.15%wp	8.58	5.80	4.89	6.26	5.650
T4	*Verticillium lecanii 1.15%wp*	9.24	6.39	5.11	6.75	6.083
T5	Neem oil 5%	10.83	6.94	5.35	6.86	6.383
T6	Eucalyptus oil 5%	11.19	7.89	6.04	7.65	7.193
T7	Imidacloprid 17.8%SL	6.91	4.37	3.20	6.10	4.557
F-TEST		**NS**	**S**	**S**	**S**	**S**
CV		--	1.71	1.22	1.67	0.51
CD (5%)		--	2.31	1.94	2.26	1.25

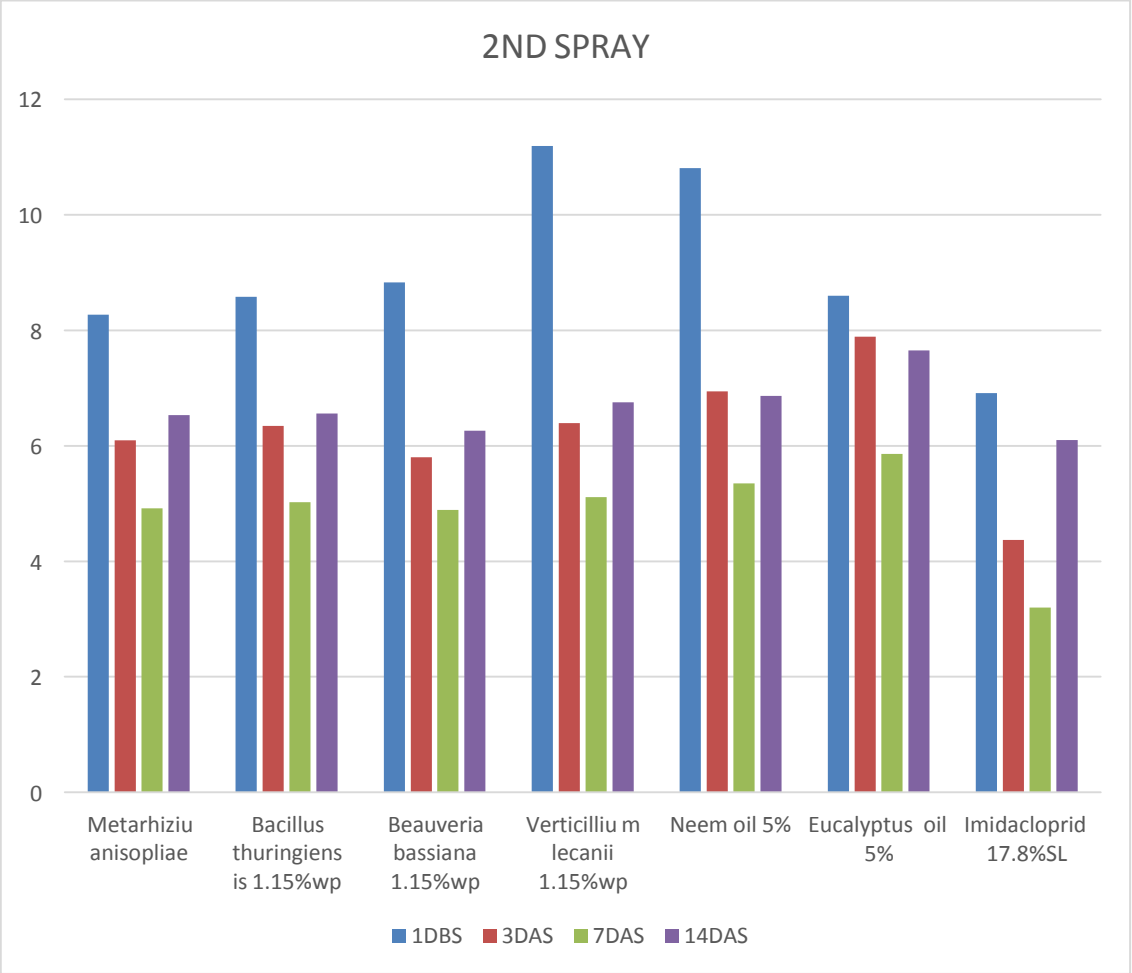

Fig 2. Effect of biopesticides for the management of rice yellow stem borer (application of 2nd spray)

CONCLUSION

Applications of the treatments for the management of rice yellow Stem Borer were initiated when the infestation crossed ETL (5 %) in the field. Subsequently applications were undertaken at an interval of 20 days. In all two applications were made during the experimental period. The observations on stem were recorded after 3, 7 and 14 days of application.

Among all the treatments, most effective Number of dead heart percentage infestation of yellow stem borer, was recorded in imidacloprid 17.8%SL (4.92), followed by *Beauveria basiana 1.15%w*p (6.37), *Metarhizium anisopliae* (6.59), *Bacillus thuringiensis 1.15%wp*

(6.80), *Verticillium lecanii* 1.15%wp (7.00), Neem oil 5% (7.80), Eucaylptus oil 5%(8.43),were significantly superior over untreated control (23.51).

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