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Comparative effect of bio pesticides and neem commercial products on rice yellow stem borer, *Scirpophaga incertulas* (Walker)

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Abstract
Management of Rice yellow stem borer *Scirpophaga incertulas* Walker using Bio-pesticides and neem commercial products in field conditions. The management of Rice yellow Stem borer *Scirpophaga incertulas* (Walker) was done using 8 different treatments and benefit cost ratios of all the treatments were calculated. Total two sprays were applied to protect the crop from *Scirpophaga incertula s*using randomized block design with three replications. The observations of *Scirpophaga incertulas* 24 hours before (Pre-treatment) and 3rd, 7th and 14th day after spraying (Post-treatment) were recorded for computing the per cent of pest reduction. The data were subjected to statistical analysis after appropriate transformation for interpretation. The treatment with recommended insecticide Spionosad 45%SC was of the most effective treatment followed with Imidacloprid 17.8%SL and Neem oil. The next best treatments were found to be Azadirachtin and *Beauveria bassiana*. *Bacillus thuringiensis* and lantana leaf extract were found to be least effective against *Scirpophaga incertulas* (Walker).

Keywords: Rice yellow stem borer, *Scirpophaga incertulas*, bio pesticides, spinosad 45% SC, neem commercial products

Introduction
Rice (*Oryza sativa* L.) is an annual plant which belongs to family gramineae. Rice (*Oryza sativa* L.) is one of the world's most important crops providing a staple food for nearly half of the global population (FAO, 2004) [5]. Rice shares one fifth of the world crop land that is employed for cereal production (Pathak and Khan., 1994) [11]. More than 90% of the world's rice is grown and consumed in Asia, where 60% of the earth's people live. This crop accounts for 35%-60% of the calories consumed by 3 billion Asians (Khush, 1997) [8]. 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) [9]. 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) [7]. Yellow stem borer, *Scirpophaga incertulas* (Walker) (Lepidopter: Pyralidae) is a monophagous rice pest. Larval infestation during reproductive growth stage of rice causes the damage of the growing panicle resulting in 'white head'' symptoms. After entering within the stem by successful boring/tunnelling, the larvae matures and subsequently pupates (Sarwar, M. 2012) [12].

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 2018. Trail was laid out in randomised block design consisting of eight treatments including control. Each treatment was replicated thrice and Sri Aman seeds were sown and transplanted at a spacing of 20 x 15cm. Standard agronomic practices were followed to ensure a good crop stand. Seven insecticides i.e; Spinosad 45% SC, Imidacloprid 17.8% SL, *Beauveria bassiana*, *Bacillus thuringiensis*, Neem oil, Azadirachtin, Lantana leaf extract were tested along with a control. The observations on count 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 were given with an interval of 15 days. In order to assess the 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 were recorded from each net plot and the population was worked out per plant.

Observations

Damage potential Rice yellow stem borer was observed in five hills, selected randomly in five different places in an given area and computed as per the formulae.

$$\text{Per cent of Dead hearts} = \frac{\text{Total number of dead hearts}}{\text{Total number of tillers}} \times 100$$

$$\text{Per cent of White ears} = \frac{\text{Total number of white ears}}{\text{Total number of tillers}} \times 100$$

Results and Discussion

The data on Per cent of dead hearts and white heads showed that all the insecticides were significantly superior over control in reducing the infestation per cent of stem borer which were the mean of 3, 7, and 14 DAS after insecticidal application. Pooled analysis (Table 1) and (Table 2) showed that among all the treatments, Spinosad were found significantly superior (05.29%) and (3.45%) these findings are supported by the Chatterjee *et al*. (2014) [1]. Followed by Imidacloprid (05.86%) and (3.95%), which is in line with the similar findings are also reported in Rice by Devi *et al.* (2016) [4]. Neem oil (06.43%) and(4.93%) was next best treatment these similar findings are with those of Choudhary *et al.* (2017) [3], the treatment Azadirachtin (06.84%) and (5.39%) was found next best treatment similar results are recorded by January *et al.* (2018) [6], Next best treatment proved to be the *Beauveria bassiana* (07.60%) and (5.9%) which is in line with findings of Shakir *et al*. (2015) [13] *Bacillus thuringiensis* (08.04%), (6.62%) and Lantana leaf extract (08.59%) and (7.50%) found to be least effective but comparatively superior over the control these results were in supportive with Chormule *et al*. (2014) [2] and Majlish *et al*. (2015) [10]. Among all the treatments lowest per cent of infestation was recorded in T1. The treatments were (T6 and T5), (T3, T4 and T7), (T3 and T6), (T2, T5 andT6) and also (T1 and T2) are par with each other.

Table 1: Effect of different Bio-pesticides and neem commercial product treatments on the incidence rice yellow stem borer (*Scirpophagaincertulas*) infestation after first spray.

Treatments		Mean % of dead hearts				
		1DBS	3DAS	7DAS	14DAS	MEAN
T0	Control	9.08	11.28^{a}	12.60^{a}	13.61 a	12.49^{a}
T1	Spinosad 45%SC	8.88	6.20^{f}	4.99^{h}	4.70^{g}	5.29^{e}
T2	Imidacloprid 17.8%SL	8.86	6.89^{e}	5.360^{g}	5.33^{f}	5.86^{de}
T3	*Beauveria bassiana*	9.33	8.25^{c}	6.75^{d}	7.82^{d}	7.60^{bc}
T4	*Bacillus thurungiensis*	9.14	8.40^{bc}	7.46^{c}	8.27^{c}	8.04^{b}
T5	Neemoil	8.87	7.06^{d}	5.57^{f}	6.11^{e}	6.43^{cde}
T6	Azadirachtin 0.03%	8.89	7.67^{d}	6.24^{e}	6.44^{e}	6.84^{cd}
T7	Lantana leaf extract	8.90	8.73^{b}	8.12^{b}	8.94^{b}	8.59^{b}
F-Test		NS	S	S	S	S
C.V		--	2.728	2.936	3.183	9.371
CD (5%)		--	0.536	0.518	0.592	1.740

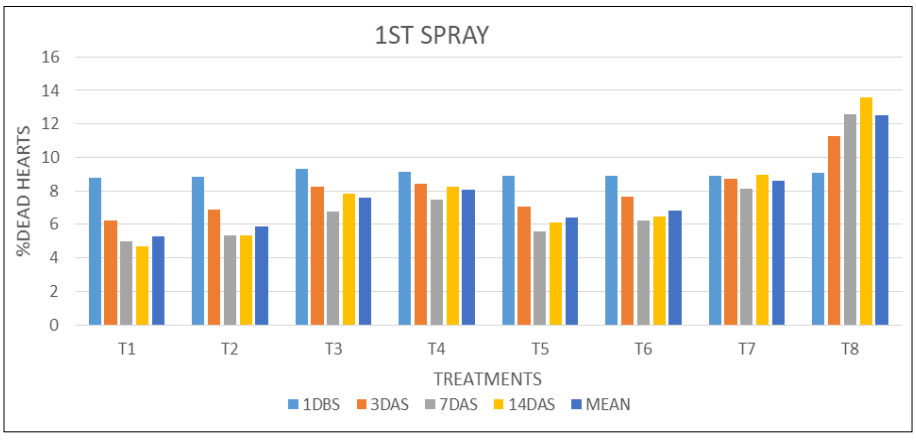

Fig 1: Graphical representation of effect of different bio pesticides and botanicals on rice yellow stem borer infestation in rice field

Table 2: Effect of different bio-pesticide and botanicals on the incidence rice yellow stem borer (*Scirpophagaincertulas)* infestation after second spray.

Treatments		Mean % Dead hearts and white heads				
		1DBS	3DAS	7DAS	14DAS	MEAN
T0	Control	13.59	15.40^{a}	17.15^{a}	18.07^{a}	16.87^{a}
T1	Spinosad 45% SC	04.64	04.25^{h}	03.45^{g}	02.65^{g}	03.45^{f}
T2	Imidacloprid 17.8%SL	04.89	04.62^{g}	03.92^{f}	03.33^{f}	03.95^{ef}

T3	*Beauveria bassiana*	07.02	06.67^{d}	05.70^{d}	05.33^{d}	05.9^{cd}
T4	*Bacillus thuringiensis*	07.62	07.26^{c}	06.31^{c}	06.30 ^{c}	06.62^{bc}
T5	Neem oil	05.86	05.73^{f}	04.56^{e}	04.52^{e}	04.93^{de}
T6	Azadirachtin 0.03%	06.24	06.06 ^{e}	05.40 ^{d}	04.73^{e}	05.39^{cd}
T7	Lantana leaf extract	08.06	07.93^{b}	06.73 ^{b}	07.86^{b}	07.50^{b}
F-TEST		NS	S	S	S	S
CV		--	2.463	3.420	3.403	11.11
CD (5%)		--	0.431	0.553	0.548	1.845

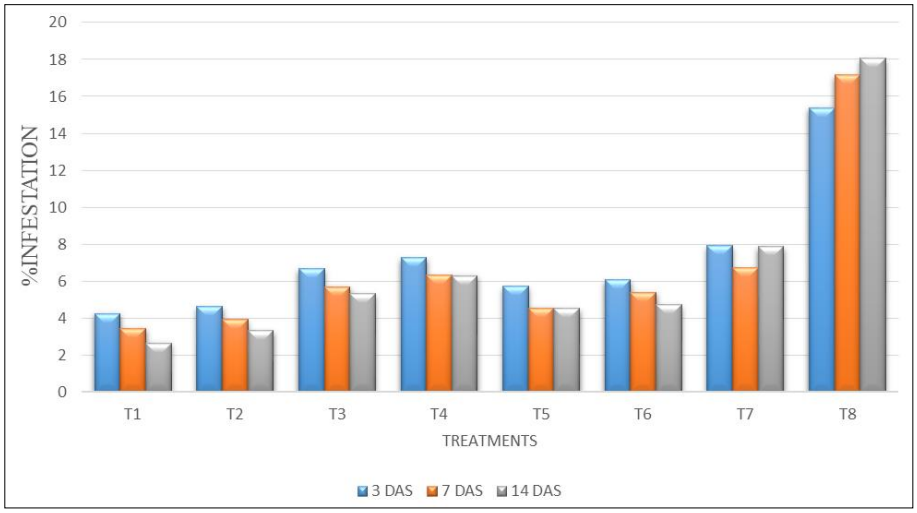

Fig 2: Representation of effect of different Bio pesticides and botanicals against yellow stem borer infestation in rice after second spray

Conclusion

Results showed that Spinosad 45%SC was the most effective insecticide followed by Imidacloprid 17.8% SL in controlling the rice yellow stem borer damage due to their mode of action compare to other insecticides. Neem insecticides like Azadirachtin, Neem oil were also very effective in reducing the stem borer damage.

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