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Efficacy of commercially available insecticides and botanicals against yellow stem borer (*Scirpophaga incertulas*, Walker) of rice

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ABSTRACT
A field experiment was conducted at Krishi Vigyan Kendra, St. Kabir Nagar to evaluate efficacy of commercially available insecticides and botanicals against yellow stem borer of rice during kharif 2014 and 2015. The experiment was consists of 7 treatments viz. Acephate 95% SG @ 526 ml/ha, Dinotefuron 20% @ 200 ml/ha, Triazophos 40% @ 750 g/ha, Applaud (Buprofezin) 25% @ 800 ml/ha, Coragen 20% @ 150 ml/ha, Neem Seed Kernel Extract @ 5% and Neem Oil @ 5% including two neem based botanicals. Incidence of yellow stem borer at vegetative stage was below threshold level but at reproductive stage of crop growth relatively higher pest population of stem borer was recorded. Among treatments Coragen 20% SC was found most effective against yellow stem borer (YSB) of rice resulted with lower Dead Heart % and White Ear%. Maximum grain yield was also recorded with the treatment of Coragen 20% SC @ 150 ml/ha (3250 kg/ha, 2014 and 3515 kg/ha, 2015).
Key Words: *Yellow Stem Borer, Dead Heart, White Ear, Scirpophaga incertulas, NSKE*

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INTRODUCTION

Rice is the staple food of more than half of the world population and it also the major source of livelihood of rice growing farmers of south and south east asia. India is the 2nd largest producer and consumer of rice just after China with annual rice production of 104.30 million tons which accounts for 22.81% of total global rice production. Uttar Pradesh is the 2ndlargest rice producing state of the country with an rice growing area of 5.9 million ha. The average rice productivity of the state is 2.80 t/ha. Insect pests are the major biotic factor limiting the rice productivity of the state due to changing agroclimatic situations. i.e. erratic rainfall coupled with frequent drought and submergence. Annually 20-30% yield losses were estimated due to insect pest infestation. More than 300 species of rice insect pests were identified which infested rice crop at various crop various growth stages. Among the major insects of rice, yellow stem borer (YSB), *Scirpophaga incertulas* Walker is considered as the most nuisance of rainfall, low land and flood prone rice ecosystem (Deka. 2010). In India YSB is regarded as the most dominating destructive pest species. (Mahar *et al* 1985). *Scirophaga incertulas* causes 1% to 19% of yield loss in early transplanted rice crop while 38% to 80% yield loss was observed in late transplanted rice crops. Yellow stem borer, *Scirpophaga incertulas* (Walker) (Lepidopter: Pyralidae) is a monophagous rice pest and infested the rice crop at every crop growth stages. The larvae of yellow stem borer bore or successfully tunneled into stem and feed on the inner tissue of the stem. The damage symptoms depends on the crop growth stage at which larvae infested the crop. Stem borer infestation at vegetative stage of crop produces dead heart symptoms while infestation at reproductive stage produces white ear. Infestation of *Scirpophaga incertulas* at reproductive stage causes severe yield loss and full potential of the variety cannot be achieved. Farmers were using pesticides to control the stem borer. Use of indiscriminate use of pesticide results development of new biotype resistant to pesticides and also contamination environment. Chemical control of stem borer is still considered as the best option. Several insecticides have been recommended /reported for the effective control of stem borer. In the present study, efficacies of commercially available insecticidal molecules and some eco-friendly botanicals were evaluated against yellow stem borer of rice in irrigated ecosystem.

METHODOLOGY

The experiment was conducted at Krishi Vigyan Kendra, St. Kabir Nagar (U.P.) during kharif 2014 & 2015 in well managed irrigated condition. The soil of the experimental field was silty loam in texture and slightly alkaline in nature (pH 7.4). The Organic carbon content of soil was estimated and found very low (0.38%). The experiment was laid out in randomized block design with three replications. The plot size of the experimental plot was 20 m^2. The yellow stem borer susceptible rice variety Pusa Basmati -1 was used as test variety. The nursery of Pusa Basmati was sown in raised beds and 30 days old seedlings were transplanted keeping two seedlings/hill in the 1st week of July in both the years of study. Spacing of 20 x 15 cm was maintained between row to row and hill to hill. Recommended agronomic practices were adapted to raise the crop. No plant protection measures were used to create congenial environment for insect/pest incidence. Experimental material was comprised of 7 insecticidal formulations viz. Acephate 95% SG @ 526 ml/ha, Dinotefuron 20% @ 200 ml/ha, Triazophos 40% @ 750 g/ha, Applaud (Buprofezin) 25% @ 800 ml/ha, Coragen 20% @ 150 ml/ha, Neem Seed Kernel Extract @ 5% and Neem Oil @ 5%. Each plot was separated by bunds and channels to regulate water flow. Treatments were applied at 45 and 75 days after transplanting. Observations on the incidence of dead hearts (DH) were taken on 20 randomly selected hills per plot from each replication at 55 days after transplanting. The white ear head (WEH) was counted on 20 randomly selected clumps from each plot just before harvest. The percent dead hearts and white ears were calculated and transformed into arc sine transformation for statistical analysis and presentation in table.

$$\%\ Dead\ Hearts = \frac{Total\ no.\ of\ Dead\ Hearts}{Total\ no.of\ tillers}\ X\ 100$$

$$\%\ White\ Ears = \frac{Total\ no.\ of\ White\ ears}{Total\ no.of\ ear\ bearing\ tillers}\ X\ 100$$

RESULTS

Pooled data presented in table-1 revealed that during both of the years of study incidence of yellow stem borer at vegetative stage was below threshold level but at reproductive stage of crop growth incidence of yellow stem borer was observed significantly higher. Incidence of stem borer of was higher in kharif 2014 than kharif 2015; it may be attributed to more congenial environment for insect growth i.e. higher humidity coupled with high temperature in kharif 2014. Dead Heart % (DH %) was recorded 16.25 (2014) and 15.05% DH (2015) in Untreated control plots. Among different insecticidal treatments Coragen 20% SC @ 150 ml/ha was found most effective to control the incidence of yellow stem borer on susceptible rice variety Pusa Basmati – 1 and resulted with minimum DH % of 4.65 (2014) and 4.15 (2015). The effectiveness of Dinotefuran 20% SG @ 200 ml/ha was slightly lower than Coragen 20% SC with DH% of 6.70 (2014) and 6.35 (2015). In all other insecticidal treatments including botanicals significantly higher DH % was recorded than Coragen 20% SC and Dinotefuran 20% SG. Among botanicals lower dead heart count was observed with the spray of Neem Seed Kernel extract (NSKE) @ 5% than the spray Neem oil @ 5% during both the year of study.

The treatment with Coragen 20% SC @ 150 ml/ha was observed as the most effective with minimum White Ear incidence of 6.25 % (2014) and 5.70 % (2015) followed by Dinotefuran 20% SG @ 200 ml/ha 8.50 % (2014) and 6.85 % (2015). The highest mean grain yield 3250 kg/ha (2014) and 3515 kg/ha (2015) was harvested from the plots treated with Coragen 20% SC followed by Dinotefuran 20% SG (2875 kg/ha, 2014 and 3005 kg/ha 2015) and Acephate 95% SG (2670 kg/ha, 2014 and 2755 kg/ha 2015). Significantly higher grain was recorded with the plots treated with neem based botanicals than untreated control. The neem seed kernel extract (NSKE) is known to suppress the feeding, growth and reproduction of insects due to its bio-chemicals. Neem products can be recommended for many programmes on integrated pest management. No phytotoxicity symptoms was observed in all the treatments.

DISCUSSION

The result of the present study showed that the Coragen 20% SC was most effective to control incidence of yellow stem borer on rice. The present findings are in agreement with the result of *Sarao et.al.* (2014) who reported that chlorantraniliprole (active ingredient of Coragen) was found effective against yellow stem borer. However, all the insecticidal treatments recorded significantly lower white ear head incidence than untreated control. In order to efficacy of each of treatments along with the test of

significance is as follows:- Coragen 20% SC > Dinotefuran 20% WG > Acephate 95% SG > Triazophos 40% EC > Applaud 25% SC > NSKE @ 5% > Neem Seed Oil @ 5% > > Untreated control.

Table: 1- Efficacy of commercially available insecticides and botanicals against stem borer of rice during kharif 2013 and 2014

S. No.	Trade Name	% a.i. in form	Rate g or ml of form/ha	% Dead Heart (DH) at 50 DAT		% WE at Pre Harvest		Grain Yield (kg/ha)	
				2014	2015	2014	2015	2014	2015
1	Acephate	95% SG	526 ml	7.12	6.85	10.14	9.65	2670	2755
2	Dinotefuron	20% SG	200 ml	6.70	6.35	8.50	6.85	2875	3005
3	Triazophos	40% EC	750 g	7.45	7.05	11.70	10.55	2445	2550
4	Applaud	25% SC	800 ml	8.35	8.02	12.50	11.95	2375	2425
5	Coragen	20% SC	150 ml	4.65	4.15	6.25	5.70	3250	3515
6	Neem Seed Kernel extract	5%		9.80	9.30	16.50	13.75	2205	2270
7	Neem Oil	5%		11.15	10.50	19.80	17.45	2060	2180
8	Control	-	-	16.25	15.05	28.65	25.30	1595	1725
	CD (P=0.05)			**6.75**	**5.25**	**7.35**	**6.15**	**5.65**	**4.85**

CONCLUSION

The results of present study led to conclusion that yellow stem borer (*S. incertulas)* is one the major pest of rice under agro climatic condition of eastern Uttar Pradesh and under prevalence of favourable conditions, flaring of this pest to epidemic proportion cannot be ruled out. Further, it may also be concluded from the present study that Coragen 20% SC and Dinotefuran 20% SG afforded more effective control of YSB. Moreover, these new insecticide molecules are comparatively safer to non-targeted organism in comparison with other conventional insecticides.

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