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Comparative efficacy of different botanicals against yellow stem borer (*Scirpophaga incertulas* walker) of rice

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Abstract
An experiment was carried out in the field laboratory, Krishi Vigyan Kendra, Basuli Mahrajganj (U.P.) to evaluate the comparative efficacy of different botanicals against yellow stem borer (*Scirpophaga incertulas* Walker) during kharif 2018. The treatments included four botanical insecticides i.e. NSKE 5% @25 kg/ha, Neemazal 1.0% Aza. @ 3lit/ha, Nimbolin 0.15% Aza. @ 3 lit/ha and Neembaan 0.15% Aza. @ 3 lit/ha and one chemical control Coragen 20% SC @ 150 ml/ha. The efficacies of treatments were evaluated based on the percent dead heart and white head resulted by rice stem borer infestation at vegetative and reproductive stages, respectively. The efficacies of treatments were varied significantly against the rice stem borers. Among the tested botanical/insecticidal treatments Coragen 20% SC @ 150 ml/ha was found most effective with minimum Dead Heart incidence of 3.55% at 50 DAT percent and 5.45 WE% as against 16.25% dead heart at 50 DAT and 21.50 WE% in untreated control plots The second most effective treatments was Neemazal 1.0% Azadirachtin @ 3.0 lit/ha (4.75% DH) followed by Nimbolin 0.15% Azadirachtin @ 3.0 lit/ha (6.65% DH). Maximum grain yield was also recorded for the treatment Coragen 20% SC @ 150 ml/ha (3350 kg/ha) followed by Neemazal 1.0% Azadirachtin @ 3.0 lit/ha (2850 kg/ha).

Keywords: Botanicals, stem borer, *scirpophaga incertulas* (walker), Neemazal, Neembaan

Introduction
Rice (*Oryza sativa* L.) is the major cereal crop of the world since it's domestication about 8000 years ago. It is the staple food of more than half of the world population and also the major source of nutritional energy for the rice eating people of south and south East Asia. India is the second largest producer and consumer of rice in the world just after china. India produced about 104.3 million ton of rice during in 2011-12 which accounts for 22.81% of total global rice production. Uttar Pradesh is the 2nd largest rice producing state of the country with an area of 5.9 million ha. The average rice productivity of the state is 2.80 t/ha. Insect pests are one of the major biotic factor limiting the rice productivity. Annually 20-30% production losses were estimated due to insect pest infestation. More than 300 species of insect pests were reported infesting different growth stages of paddy crop. Among them 20 species of insect pests were considered of economic importance (Arora and Dhaliwal, 1996) [2]. Yellow stem borer (YSB), *Scirpophaga incertulas* Walker is considered as the most nuisance of rainfall, low land and flood prone rice ecosystem (Deka. 2010) [6]. In India YSB is regarded as the most dominating destructive pest species. 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 greatly depend upon insecticide applications to control stem borer, even though a lot of insecticide applications are not effectual. Indiscriminate use of insecticides have resulted in a number of undesirable side effects such as the emergence of resistant species of insects, undesirable effects on non-target organisms including the natural enemies of the target pests. Excessive and indiscriminate use of insecticides not only affects the pest but also becomes a major source of human health hazard, environmental pollution, fish toxicity and deleterious on predators, parasitoids, pathogens and pollinators.

In view of the above observations, the present study was carried out to evaluate the efficacy of different botanicals and chemical insecticides against the infestation caused by rice stem borer and find out the effect of different botanicals and chemical insecticides on the rice yield

Materials and methods

The experiment was conducted at Krishi Vigyan Kendra, Basuli, Mahrajganj during kharif 2018 in well managed irrigated condition. The soil of the experimental field was silty loam in texture having pH 7.3. The Organic carbon content in the soil was medium (0.65%). The experiment was laid out in randomized block design with three replication. The plot size of the experimental plot was 20 m^2. The susceptible rice variety Pusa Basmati-1 was used as test variety. The nursery 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 between row to row and hill to hill. Recommended agronomic practices were adapted to raise the crop. The N, P2O5 and K2O were applied in the form of Urea, Single Super Phosphate and Muriate of Potash @ 120:60:600 kg per hectare, respectively. Half of the recommended dose of Urea, and full dose of Single Super Phosphate and Muriate of Potash were applied as basal dose at the time of final puddling and incorporated properly with the soil. The remaining half dose of Urea was applied as top-dressing in two equal splits at active tillering and panicle initiation stages of crop growth. Experimental material was comprised of four botanical insecticides i.e. NSKE 5% @25 kg/ha, Neemazal 1.0% Aza. @ 3lit/ha, Nimbolin 0.15% Aza. @ 3 lit/ha and Neembaan 0.15% Aza. @ 3 lit/ha and one chemical control Coragen 20% SC @ 150 ml/ha were tested along with untreated control in rice. Each plots were 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 Percent dead hearts and white ears were calculated and transformed into arc sine transformation for statistical analysis and presentation in table.

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

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

Table 1: Efficacy of botanicals against stem borer of rice in agroclimatic condition of eastern Uttar Pradesh during kharif 2018

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)
1	NSKE	5%	25 kg	9.10	12.25	2230
2	Neemazal	1.0% Aza.	3lit	4.75	6.70	2850
3	Nimbolin	0.15% Aza.	750 g	6.65	9.50	2625
4	Neembaan	0.15% Aza.	800 ml	7.25	10.10	2550
5	Coragen	20% SC	150 ml	3.55	5.45	3350
8	Control	-	-	16.25	21.50	1635
	CD (P=0.05)			8.15	9.25	6.55

Results and discussion

Among the botanical/insecticidal treatments evaluated against yellow stem borer of rice Coragen 20% SC @ 150 ml/ha was found most effective with minimum Dead Heart incidence of 3.55% at 50 DAT percent and 5.45 WE% as against 16.25% dead heart at 50 DAT and 21.50 WE% in untreated control plots The second most effective treatments was Neemazal 1.0% Azadirachtin @ 3.0 lit/ha (4.75% DH) followed by Nimbolin 0.15% Azadirachtin @ 3.0 lit/ha (6.65% DH).All the insecticidal treatments recorded significantly lower DH and WEH incidence than untreated control. The moderate effectiveness of neem based botanicals viz. Neemazal, Nimbolin and Neembaan against stem borer obtained here is supported by the results of Chanu and Ray (2015) who reported that application of Pestoneem (a neem based biopesticides) @ 0.15g a.i/ha. & 0.3g a.i /ha proved no White Ear Heads infestation at 21DAT. Maximum grain was also obtained in the treatment Coragen 20% SC @ 150 ml/ha (3350 kg/ha) followed Neemazal 1.0% Aza. @ 3.0 lit/ha (2850 kg/ha).

Conclusion

On the basis of result obtained it was concluded that neem based botanicals viz. Neemazal, Nimbolin and Neembaan can be used as an effective major to control yellow stem borer of rice. These botanicals also possess broad-spectrum insecticidal properties can be incorporated in integrated pest management modules which can greatly decrease the use of conventional pesticides or can be used in rotation or in combination with other insecticides for mitigating complications produced in conventional chemical insecticides application.

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