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# Evaluation of pesticide computability against stem borer, leaf folder and sheath blight of rice in irrigated ecosystem

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**Abstract**
Experiments were conducted to evaluate the compatibility of insecticide with fungicide against major insect pest (stem borer, leaf folder) and disease (sheath blight) of rice during ws 2017 and 2018. Insect pests and disease infestations are the primary constraints in rice (*Oryza sativa.* L) Production. The rice stem borer, leaf folder and sheath blight causing major loss of production. The experiment consisted of nine treatments combination viz.T1-Spinetoram 6% + methoxyfenozide 30% @ 0.75 g/l., T2- DPX-RAB 55 @ 0.48 g/l., T3- Contaf Plus 2.0 g/letter,4- Mantis 75@ 0.6 g/l., T5- Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) @ 0.75+2.0 g/l,T6- Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole)@ 0.75+0.6 g/l., T7- DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole)@ 0.48+2.0 g/l.,T8- DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole)@ 0.48+0.6 g/l. andT9- Untreated control. During both the years incidence of yellow stem borer and leaf folder at vegetative stage was below threshold level but at reproductive stage of crop growth incidence of yellow stem borer, leaf folder and sheath blight were observed significantly higher, due to congenial environment for insect pest and disease development and growth. Among treatments combination DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) was found most effective against yellow stem borerof rice resulted with lower dead heart% 4.2 (30 DAT), 4.7 (50 DAT) and white ear%. 0.8%. DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) was also found effective to control incidence of leaf folder% 1.1 (30 DAT), 0.5 (50 DAT) and sheath blight 18.2%. Maximum grain yield was also recorded with the treatment of DPX-RAB 55+Contaf Triflumezopyrim +Hexaconazole – 0.48+2.0 g/letter (3450 kg/ha) followed by DPX RAB 55+ Mantis.

**Keywords:** Yellow stem borers, infestation, Leaf folder

## Introduction

## Material and Methods

Rice (*Oryza sativa* L.) is one of the most important cultivated plants of tropics and subtropics. Next to wheat and maize, it occupies third place in global cereals production and is the most important staple food crop with more than half of the world's population relying on rice as the major daily source of calories and protein (Tiwari *et al*., 2014) [15]. Rice (*Oryza sativa* L.) is one of the most important crops of the world and provides food to more than 50% global population. More than 90% of the world's rice is grown and consumed in Asia, where 60% of the earth's people live. It was estimated that 35-60% of the calories consumed by 3 billion Asians comes from rice. Several insects feed on rice, but stem borers are considered the most important rice pests. particular *Scirpophaga incertulas* Walker and *S. innotata* Walker

(Lepidoptera: Pyralidae) (Sigsgaard, 2000) [13]. Among stem borers, the yellow stem borer *scirpophaga incertulas* Walker (Lepidoptera: Pyralidae) is the dominant species in India and rice plant are most prone to stem borer infestation at the tillering and flowering stage. Stem borer infestation at vegetative stage of crop produces dead heart symptoms while infestation at reproductive stage produces white ear. The larva of leaf folder rolls the leaf blade by fastening its edges and sometimes even fastening the leaf tip to the basal part of the leaf blade and feeds from inside by scraping. In a severely infested field the whole crop gives a sickly appearance with white patches. The infestation at boot leaf stage of the crop sometimes results in heavy loss of grain yield. Rice production and productivity is affected by many biotic and abiotic factor. Insect pest and disease are the major biotic factors limiting rice productivity. Rice is infested by many insect pest species at different crop growth stage. So far, more then 175 species of insect has been recorded as rice pest. The rice cultivation all over the world is more or less hindered by major insect pest, among them yellow stem borer (YSB) *scirpophaga incertulas* Walker (Lepidoptera: Pyralidae) and leaf folder Cnaphalocrocis medinalis Guen. (Pyraustidae: Lepidoptera) are now drawing attention to a greater extent. Stem borer is responsible for an annual loss of 10-15% of rice crop with local catastrophic outbreaks causing up to 60% damage (Daryaei, 2005) [2]. The larval stage of stem borers mostly remain concealed inside the stem and it is difficult to control. Rice leaf folder, Cnaphalocrocis medinalis (Pyraulidae; Lepidoptera) has attained the status of a major pest in rice growing areas of Eastern Uttar Pradesh. In certain cases it has been recorded to cause 63 to 80 percent yield losses in rice (Rajendaran *et al*., 1986) [10]. Various studies have been conducted by previous workers on the population dynamics and chemical control of leaf folder. Evaluation of different insecticides against rice stem borer and rice leaf folder. (Wakil *et al.* 2001) [16]. Application of Lorsban, Sumithion, Methyl Parathion, Denital and Thiodan gave more than 90% mortality of the insect larvae and were statistically at par in controlling the rice leaf-folder. Ramasubbaiah *et al*. (1980) [11]. Recent addition of the rice leaf folder, Cnaphalocrocis medinalis (Gn.) to the list also poses a threat to economic production of rice in the Punjab. Damage due to rice leaf folder may sometimes go as high as 60% (Kushwaha and Singh, 1984) [5]. For the control of the insect pests of rice, the insecticides like control ekalux, kilvil, lannate, padan recommended by Panda and Shi (1989) [8], Khan and Khaliq (1989) [4]. Mustafa and Razzaq (1991) [7] Biswas and Mandal (1992) [1], Prasad *et al*. (1995) [9], Sharma and Singh (1995) [12], Singh *et al*. (1995) [14] during the last two decades.

Experiment were conducted during WS 2017 and 2018 at Crop Research Station, Masodha, which is situated at 26.47$^0$N (latitude), 82.12 $^0$E (longitude) and at 113 m (altitude). The soil is sandy loam low in organic carbon. It is rich in potassium, medium in phosphorus and possesses good water holding capacity. To evaluate the different insecticide to rice stem borer and leaf folder. Experimental material was comprised of 8 insecticidal formulations and 1 untreated check viz.T1-Spinetoram 6% + methoxyfenozide 30% @ 0.75 g/l., T2- DPX-RAB 55 @ 0.48 g/l., T3- Contaf Plus 2.0 g/letter, 4- Mantis 75@ 0.6 g/l., T5- Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) @ 0.75+2.0 g/l, T6- Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole) @ 0.75+0.6 g/l., T7- DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) @ 0.48+2.0 g/l., T8- DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) @ 0.48+0.6 g/l. and T9- Untreated control. The susceptible rice variety Pusa Basmati-1 was used as test variety. The nursery of Pusa Basmati 1 was sown in raised beds and 25 days old seedling were transplanted keeping 2-3 seedling/hill in the 1$^{st}$ week of July in the be both years of study. Transplanted of randomized block design with three replication in 20m$^2$ plot size, spacing 20x15 cm. Variety specific agronomic practices were adapted to raise the crop. No plant protection measures were used to create congenial environment for insect pest incidence. Observations were recorded after 30 days of transplanting, on 20-sample (hills) in each plot. Sample (hills) were chosen diagonally. Number of healthy and infested tillers. The data on stem borer and leaf folder infestation was recorded at vegetative stage as dead heart (DH%), damage of leaf/hill and total tillers and percent incidence was worked out. Similarly, white ear (WE%) and panicle bearing tillers were recorded near maturity of crop and percent white ear incidence was worked out. Disease severity of sheath blight was also recorded before and after application of treatment. The data on grain yield of each plot were recorded separately by threshing the harvested Pusa Basmati 1 on tarpaulin followed by proper sun drying and winnowing, grain yield measured in kilogram. The data so obtain were subjected to statistical analysis after necessary transformation for final statistical analysis (Gomez and Gomez, 1983) [3]

**Results and Discussion**

It is apparent from Table 1 to 4 that the results with various treatments were significantly different from the untreated check. That during the both years of study incidence of yellow stem borer, leaf folder and sheath blight at vegetative stage was below threshold level but at reproductive stage of crop growth incidence of yellow stem borer was observed significantly higher. Infestation of stem borer and leaf folder was higher in kharif 2018 then kharif 2017 due to congenial environment for insect pest development and growth. During kharif 2018 higher humidity was observed due to excess monsoon rainfall.

Percent dead heart and white ear were calculated using the following formula: $\text{Dead heart (\%)} = \frac{\text{No. of infested tillers x No. of infested hills}}{\text{No. of total tillers No. of hills in sample area}} \times 100$

The percentage of folded leaves was calculated by using the following formula: $\frac{\text{No. of infested leaves (hills) x No. of infested hills}}{\text{No. of total leaves No. of hills in sample area}} \times 100$

$$\text{Sheath Blight severity \%} = \frac{\text{Vertical spread of disease}}{\text{Total height of plant}} \times 100$$

The treatment with DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) @ 0.48+2.0 g/l. was observed as the most effective with minimum DH% 4.2 (30 DAT), 4.7 (50 DAT). White Ear incidence of 0.8% followed by DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) @ 0.48+0.6 g/l.DH% 9.0 (30 DAT), 8.0 (50 DAT)White Ear incidence 1.9%. Leaf folder% was observed minimum in DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) treated plot 1.1 (30 DAT) and 0.5 (50 DAT) followed by DPX-RAB

55+Mantis (Triflumezopyrim + Tricyclazole) 1.4 (30 DAT) and 1.5 (50 DAT). The untreated control Water spray DH% is 25.5 (30 DAT), 29.6 (50 DAT) and White Ear% 18.5. Leaf folder% 6.4 (30 DAT) and 6.4 (50 DAT). While minimum disease severity 18.2% was observed in the DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) @ 0.48+2.0 g/l treated plot were as 52.5% disease severity was recorded in untreated check.

The highest mean grain yield 3450 kg/ha was harvested from the plots treated with DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) @0.48+2.0 g/l. followed by DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) @ 0.48+0.6 g/l. in 3140 kg/ha. The untreated check grain yield was observed 1884 kg/ha.

The results of the present study showed that the DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) @ 0.48+2.0 g/l. was most effective to control incidence of yellow stem borer, leaf folder and sheath blight. In India, the yellow stem borer caused 1-19% yield loss in early-planted rice crop and 38-80% yield loss in late-planted rice. Rice leaf folder, Cnaphalocrocis medinalis (Pyraulidae; Lepidoptera) has attained the status of a major pest in rice growing areas of Eastern Uttar Pradesh. In certain cases it has been recorded to cause 63 to 80 percent yield losses in rice. The results of present investigation have reasonably led to conclusion that yellow stem borer, leaf folder and sheath blightcan be manage by the use of DPX-RAB 55+Contaf with out any phytotoxic effect.

**Table 1:** Effect of different treatment on Stem Borer incidence ws. 2017 and 2018

| Insecticide / Fungicide | Dose g/ml per litre of spray fluid | % DH_30DAT | | | % DH_50DAT | | | % WE_Pre-harvest | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2017 | 2018 | mean | 2017 | 2018 | mean | 2017 | 2018 | mean |
| T1-Spinetoram 6% + methoxyfenozide 30% | 0.75 | 9.8 | 10.2 | 10.0 | 5.2 | 6.4 | 5.8 | 2.1 | 2.79 | 2.4 |
| T2-DPX-RAB 55 | 0.48 | 8.2 | 8.6 | 8.4 | 4.6 | 5.7 | 5.2 | 1.7 | 2.09 | 1.9 |
| T-3Contaf Plus | 2.0 | 11.6 | 15.4 | 13.5 | 17.2 | 21.7 | 19.5 | 9.4 | 12.6 | 11.0 |
| T4-Mantis 75 WP | 0.6 | 13.2 | 15.0 | 14.1 | 16.4 | 19.2 | 17.8 | 11.2 | 13.7 | 12.5 |
| T5-Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) | 0.75+2.0 | 10.4 | 11.5 | 11.0 | 9.2 | 10.2 | 9.7 | 2.1 | 2.9 | 2.5 |
| T6-Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole) | 0.75+0.6 | 8.7 | 9.2 | 9.0 | 6.5 | 7.1 | 6.8 | 2.2 | 2.6 | 2.4 |
| T7-DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) | 0.48+2.0 | 6.1 | 7.0 | 6.6 | 4.2 | 5.2 | 4.7 | 0.6 | 1.0 | 0.8 |
| T8-DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) | 0.48+0.6 | 8.7 | 9.2 | 9.0 | 7.1 | 8.8 | 8.0 | 1.8 | 2.0 | 1.9 |
| T9-Untreated control | Water spray | 23.8 | 27.2 | 25.5 | 28.2 | 31.0 | 29.6 | 17.4 | 19.5 | 18.5 |

**Table 2:** Effect of different treatment on Leaf Folder incidence ws. 2017 and 2018

| Insecticide / Fungicide | Dose g/ml per litre of spray fluid | % leaf folder_30DAT | | | % Leaf folder_50DAT | | |
|---|---|---|---|---|---|---|---|
| | | 2017 | 2018 | mean | 2017 | 2018 | mean |
| T1-Spinetoram 6% + methoxyfenozide 30% | 0.75 | 2.1 | 2.3 | 2.2 | 2.0 | 2.2 | 2.1 |
| T2-DPX-RAB 55 | 0.48 | 1.2 | 1.5 | 1.4 | 1.4 | 1.8 | 1.6 |
| T-3Contaf Plus | 2.0 | 3.2 | 3.7 | 3.5 | 3.2 | 3.9 | 3.6 |
| T4-Mantis 75 WP | 0.6 | 4.2 | 4.7 | 4.5 | 4.2 | 4.7 | 4.5 |
| T5-Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) | 0.75+2.0 | 2.0 | 2.3 | 2.2 | 1.6 | 1.9 | 1.8 |
| T6-Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole) | 0.75+0.6 | 2.2 | 2.4 | 2.3 | 1.7 | 2.0 | 1.9 |
| T7-DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) | 0.48+2.0 | 1.0 | 1.2 | 1.1 | 0.4 | 0.6 | 0.5 |
| T8-DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) | 0.48+0.6 | 1.3 | 1.5 | 1.4 | 1.2 | 1.7 | 1.5 |
| T9-Untreated control | Water spray | 5.4 | 7.3 | 6.4 | 5.9 | 6.9 | 6.4 |

**Table 3:** Effect of different treatment on sheath blight severity ws. 2017 and 2018

| Insecticide / Fungicide | Dose g/ml per litre of spray fluid | % sheath blight_50DAT | | |
|---|---|---|---|---|
| | | 2017 | 2018 | mean |
| T1-Spinetoram 6% + methoxyfenozide 30% | 0.75 | 45.2 | 52.0 | 48.6 |
| T2-DPX-RAB 55 | 0.48 | 41.3 | 49.5 | 45.4 |
| T-3Contaf Plus | 2.0 | 19.9 | 26.1 | 23.0 |
| T4-Mantis 75 WP | 0.6 | 28.3 | 33.3 | 30.8 |
| T5-Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) | 0.75+2.0 | 22.5 | 25.5 | 24.0 |
| T6-Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole) | 0.75+0.6 | 23.2 | 27.6 | 25.4 |
| T7-DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) | 0.48+2.0 | 17.6 | 18.8 | 18.2 |
| T8-DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) | 0.48+0.6 | 20.5 | 24.7 | 22.6 |
| T9-Untreated control | Water spray | 48.8 | 56.2 | 52.5 |

**Table 4:** Effect of different treatment on grain yield of rice ws. 2017 and 2018

| Insecticide / Fungicide | Yield kg/ha | | |
|---|---|---|---|
| | 2017 | 2018 | mean |
| T1-Spinetoram 6% + methoxyfenozide 30% | 2830 | 2540 | 2685 |
| T2-DPX-RAB 55 | 3140 | 2759 | 2950 |
| T-3Contaf Plus | 2689 | 2487 | 2588 |
| T4-Mantis 75 WP | 2459 | 2260 | 2360 |
| T5-Spinetoram 6% + methoxyfenozide 30%+Contaf (Spinetoram 6% + methoxyfenozide 30%+ Hexaconazole) | 3099 | 2945 | 3022 |
| T6-Spinetoram 6% + methoxyfenozide 30%+ Mantis (Spinetoram 6% + methoxyfenozide 30%+ Tricyclazole) | 2910 | 2759 | 2835 |
| T7-DPX-RAB 55+Contaf (Triflumezopyrim +Hexaconazole) | 3650 | 3250 | 3450 |
| T8-DPX-RAB 55+Mantis (Triflumezopyrim + Tricyclazole) | 3240 | 3039 | 3140 |
| T9-Untreated control | 2100 | 1667 | 1884 |

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