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Evaluation of different modules for the management of false smut of rice under field conditions

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Abstract

The present study was undertaken to evaluate the different modules for management of False Smut of rice caused by *Ustilaginoidea virens* (Cooke) in field condition. The On Farm Trials (OFT) was conducted during Kharif, 2018-19 to evaluate various chemicals & biopesticides (Module) for management of disease. The soil drenching of *Trichoderma* @ 5.0Kg/ha with 100kg FYM (Before transplanting), Seed treatment with Vitavax @ 2.5gm/kg (During nursery sowing) & two spray of tebuconazole 25EC @ 1.0ml/lit (During vegetative phase & before panicle initiation) was found most effective module for management of False Smut of rice and resulted in minimum 8% disease severity with 33.14% increase in yield over the check followed by module no. 02 where disease severity was 11% and 25.14% increase in yield.

Keywords: Evaluation, management, rice, conditions

Introduction

Rice (*Oryza sativa*) is one of the most important staple food crop in the world. China & India are the lead producing countries in the world. Major rice growing states of India are West Bengal, Uttar Pradesh, Punjab, Bihar, Tamil Nadu, Madhya Pradesh and Chattisgarh. Rice is known to suffer from many biotic like fungal, bacterial and viral diseases & abiotic stresses. Several fungal diseases reported on rice i.e. Blast, Sheath blight, Sheath rot, False Smut, Bakane and Brown spot are the most important for the various states and cause considerable economic yield loss. False smut has one of the most emerging fungal grain disease. False smut has become one of the emerging fungal grain diseases of rice. False smut pathogen, *Ustilaginoidea virens* (Cooke) Takahashi (teleomorph *Villosiclava virens* (Tanaka) on rice was first reported and described by Cooke in 1878^[12] from Thirunelveli district of Tamil Nadu in India (Cooke, 1878)^[12]. The disease causes reduction in the quality and quantity of rice grains and also affects the germination vigour of the infected seedlings (Sanghera *et al.*, 2012). Pathogen on infected grains produces antimetabolic cyclic peptides, ustiloxin from its chlamydospores, poisonous to both humans and animals (Nakamura *et al.*, 1994; Koiso *et al.*, 1994)^[20]. The symptom appears only after flowering, by then the fungus infects the individual grains of the panicle (Atia., 2004)^[4]. The pathogen over winters in soil by means of sclerotia and chlamydospores. Sclerotia produce ascospores, which are primary source of infection to rice plants, whereas secondary infection may come from air-borne chlamydospores (Ashizawa *et al.*, 2010)^[2]. The most economical and effective strategy to manage false smut is breeding of durable resistance varieties (Cartwright *et al.*, 2000; Wang *et al.*, 2010)^[10, 17]. Rice cultivars exhibit significant differences in quantitative resistance still no variety is yet to have complete resistance to *U. virens* (Biswas., 2001; Li *et al.*, 2008; Huang *et al.*, 2015)^[6, 17]. Management of false smut has been achieved through cultural, biological and chemical control. The efficacy of several fungicides to manage false smut has also been reported by various workers (Pannu *et al.*, 2010; Mohiddin *et al.*, 2012)^[19].

Rice False Smut Disease is also known as Green smut and considered as Lakshmi disease, because it was always found associated with bumper harvest. The false smut pathogen, *Ustilaginoidea virens*, infects rice at the time of panicle development and affects the young ovary of the individual spikelet transforming it into large, yellow to velvety green balls (smut balls) and the symptoms produced are visible from milky stage onwards. Initially, the smut balls are small in size and remain confined between glumes. They gradually enlarge and enclose the floral parts. The individual grain get converted into yellowish smut ball then changes to yellowish orange to green, olive green and greenish black on maturity. Powdery dark green spores are released when smut balls burst open (Biswas, 2001; Atia., 2004)^[6, 4].

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If the infection occurs before fertilization most of the glumes remain sterile without any visible sign of infection. Typical large, velvety, green smut balls develop when infection occurs after fertilization. The fructifications replacing the grains represent the conidial, pseudosclerotial and sclerotial stages of the pathogen. The pseudosclerotia (green smut balls) consists of mycelial tissue and spore masses, remnants of anthers and portions of palea and lemma. In general only few grains are affected in a panicle but the number may rise up to 100 in case of severe disease incidence (Ladhalakshmi *et al.* 2012)

Materials and Methods

Evaluation of modules under field condition

On Farm Trials were conducted out (Kharif 2018-19) on the farmers field at district Muzaffarnagar, UP. The field size of 4000 meter sq (1.0 Acre). Susceptible rice cultivar Pusa Basmati-1 was used. General agronomical practices were followed for cultivation of trial field. There were four treatments ie Propeconazole 25EC, Tebuconazole 25EC, Vitavax, Biological control agent *Trichoderma viride* alongwith FYM and including untreated (control) for each replication. The following combination as modules used for management of sheath blight

1. T1- *Trichoderma* @5.0Kg/ha with 100Kg of FYM (Before transplanting)+ Seed treatment with Vitavax@ 2.5gm/Kg (During nursery sowing)
2. T2- T1+Propeconazole 25EC @1.0ml/lit- 02 spray at vegetative stage & before panicle initiation.
3. T3- T1+Tebuconazole 25EC @1.0ml/lit- 02 spray at vegetative stage & before panicle initiation.
4. T4- No treatment (Control)

Percent Disease Index

Disease severity of False Smut was recorded 10 days after the the second spray. Ten sampling units of 1 meter square area were marked in each field for each replication at random. The disease score was recorded on 20 plants per sampling units by counting the number of infected tillers and degree of severity on each tiller 0-5 scale (0=0%, 1= less than 5%, 2= 6-10%, 3= 11-25%, 4= 26-50%, 5= more than 50%)

The percentage of disease index was calculated by following formula

Suppose

SDR= Sum of all disease rating

TR= Total no. of rating

MDG= Maximum disease grade

$$PDI = \frac{SDR}{TR} \times 100 / MDG$$

Results and Discussion

The result indicated that the module T3- The soil drenching of *Trichoderma* @5.0Kg/ha with 100Kg of FYM (Before transplanting), Seed treatment with Vitavax @2.5 gm/kg seed (During nursery sowing) and two spray of Tebuconazole 25 EC @ 1.0ml/lit water (During vegetative stage & before panicle initiation) found most effective in reducing the disease severity 7% and recorded 55.56% decrease of False Smut of rice & yield increase 33.14% over control. The module treatment T2- The soil drenching of *Trichoderma* @5.0Kg/ha with 100Kg of FYM (Before transplanting), Seed treatment with Vitavax @2.5 gm/kg seed (During nursery sowing) and two spray of Propeconazole 25 EC @ 1.0ml/lit water (During vegetative stage & before panicle initiation) was found better than T1 and reducing disease severity 11% and recorded 38.88% decrease of False Smut of rice & yield increased 25.14% over control. In module T1- The soil drenching of *Trichoderma* @5.0Kg/ha with 100Kg of FYM (Before transplanting), Seed treatment with Vitavax @2.5 gm/kg seed (During nursery sowing) disease severity was found 14% and recorded 22.22% decrease of False Smut of rice & yield increased 18.57% over the control. The findings under the field condition in the study clearly revealed that all fungicides significantly reduced the disease severity over control and increased yield of rice. These findings one in line with the observation of on the basis of Borthakur and Addy (1989), Das & Mishra (1990), Dutta & Kalha (2011), Deepmala Kindo & P.K. Tiwari (2015), Akansha Singh, Ram Chandra & Nitish Rattan Bhardwaj (2015) and V. Bhuvanewari & Krishnan Raju (2012).

Table 1: Disease Severity Scale Percent Disease Index

Treatments (Modules)	Disease Severity Scale	Percent Disease Index	Yield(q/ha)	%Increase in Yield	BC Ratio
T1- <i>Trichoderma</i> @5.0Kg/ha with 100Kg of FYM (Before transplanting) + Seed treatment with Vitavax@ 2.5gm/Kg (During nurseery sowing)	3	13	41.5	18.57	3.54:1
T2- T1+Propeconazole 25EC @1.0ml/lit- 02 spray at vegetative stage & before panicle initiation.	3	10	43.8	25.14	3.66:1
T3- T1+Tebuconazole 25EC @1.0ml/lit- 02 spray at vegetative stage & before panicle initiation.	2	7	46.6	33.14	3.88:1
T4- No treatment (Control)	3	16	35.0	-	3.06:1

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