Impact of Fungicides against False Smut Disease of Rice Caused by *Ustilaginoidea virens*

N Johnson Singh, L Somendro Singh, Ph. Chandramani Singh, N Soranganba, S Roma Devi, Bs Hmannihring Anal and Ramgopal Laha[1]

Krishi Vigyan Kendra, Churachandpur

ICAR Research Complex for NEH Region, Manipur Centre, Pearsonmun-795128 (Manipur)

ABSTRACT

An on farm trial (OFT) was conducted to evaluate the effectiveness of organic fungicides against false smut disease in rice. The trial was laid out in Randomised Block Design (RBD) with 3 treatments and replicated eight times. Three different treatments consist of T_1 COC 50% WP @ 0.3 %, T_2 Bordeaux mixture @1% and T_0 Farmer's practice. The sprays were given in three stages of rice growing period during booting, 50% panicle emergence and 100% panicle emergence. The rice variety RCM-13 was used. The results showed that three sprays of Copper oxychloride (COC) 50% WP (T_1) and Bordeaux mixture (BM) 1% (T_2) significantly reduced the percent infected grain and disease severity against the farmer's practice (T_0). T_1 and T_2 were significantly effective in percent reduction of disease severity over control resulting 86.57% and 77.78% respectively during *kharif* 2020. Similarly during *kharif* 2021 both the T_1 and T_2 treatments significantly reduced the percent disease severity over control (86.81% and 77.28%) respectively. Therefore, result obtained in the yield recorded 66.0 q/ha, 59.1 q/ha in T_1 and T_2 against the farmer's practice (T_0) 52.11 q/ha respectively. The highest percent increase over control was recorded in T_1 (21.97%) followed by T_2 (9.22%).

Key Words: Organic fungicides, Rice, False smut disease, Disease Severity, Yield.

INTRODUCTION

Rice false smut (RFS), also known as pseudo-smut, or green smut caused by *Ustilaginoidea virens* (*U. virens*), has become one of the most devastating diseases in rice-growing regions worldwide. Earlier it was regarded as a minor disease, occurring sporadically in certain regions, but now epidemics of the disease are also being reported in different parts of the world including in India (Rush *et al,* 2000; Singh and Pophaly, 2010; Anon., 2016). In old times the disease was considered as a symbol of good harvest. Recently in India, the disease has been observed in severe form since 2001 in major rice-growing states, *viz*., Andhra Pradesh, Bihar, Gujarat, Haryana, Jammu and Kashmir, Jharkhand, Karnataka, Maharashtra, Pondicherry, Punjab, Tamil Nadu, Uttar Pradesh and Uttaranchal (Dodan and Singh, 1996, Mandhane *et al,* 2008). It is an important devastating disease causing yield losses from 1.01 to 10.91 per cent (Atia, 2004). Disease incidence of 10-20 per cent and 5-85 per cent respectively has been reported from Punjab and Tamil Nadu on different rice cultivars (Ladhalakshmi *et al,* 2012). Now it's outbreak is anticipated due to high input cultivation, increased use of hybrid varieties and climate change (Lu *et al,* 2009).

Manipur is one of the North eastern states in India where 90% of gross cropped area (GCA) of the state is under paddy cultivation (Singha and Mishra, 2015). 80% of the total population in Manipur are engaged in agriculture and allied sectors (Roy

Corresponding Author's Email: johnson.singh1@gmail.com

[1]Head of Regional Centre, ICAR Manipur Centre, Lamphalpat, Imphal, Manipur-795004

et al, 2018). However, farmers are still facing various constraints during cultivation of rice crop in Manipur (Thangjam and Jha, 2020). Thus, rice research has to be geared up to develop strategies for alleviating losses due to pests and diseases. One such disease is the rice false smut (RFS) disease that threat to yield and grain quality. Reduction of constraints caused by pest and disease infestation in rice cultivation can achieve food security and socio-economic development. Therefore, an on farm trial was undertaken to identify the best management practices under organic condition at farmers' field of Manipur for sustainable rice cultivation.

MATERIALS AND METHODS

On farm trial (OFT) on management of false smut disease on rice was conducted at 8 farmers' field of Yaiphakhol and Ngathal villages, Churachandpur district, Manipur during *kharif* 2020 and 2021. The trial was laid out in Randomised Block Design (RBD) with 3 treatments and eight replications. Three different treatments consisting of T_1 Copper oxychloride 50% WP @ 0.3 %, T_2 Bordeaux mixture @1% and T_0 Farmer's practice. The rice variety RCM-13 was used and the gross plot size was 40 sq.m. Three sprays were given during booting, 50% panicle emergence and 100% panicle emergence. All the agronomic practices were strictly followed except the application of chemical pesticides. Observations were recorded on infected grains / panicle and number of infected tillers/ total number of tillers per sq.m. were recorded. From that, percentage of infected grains,

percent disease severity was calculated. The yield data were recorded at the time of harvest. The data of the disease parameters and yield recorded for two years were statistically analyzed and BC: ratio was calculated. The benefit cost ratio was determined for each treatment.

RESULTS AND DISCUSSION

The results recorded from the field trial in two consecutive years of *kharif* 2020 and 2021 on different parameters of false smut disease of rice and yield (q/ha) have been presented in Table 1 and 2. All the treatment schedules were significantly superior over control throughout the entire period of study. A great deal of variation on the yield was also observed in different treatments.

Among the different treatments, three sprays of Copper oxychloride (COC) 50% WP (T_1) and Bordeaux mixture (BM) 1% (T_2) significantly reduced the percent infected grain and disease severity against the farmer's practice (T_0). The data (Table 1) revealed that use of T_1 and T_2 were significantly effective in percent reduction of disease severity over control resulting 86.57% and 77.78% respectively, during *kharif* 2020. Similarly, T_1 received highest yield (68.80 q/ha) followed by T_2 (60.40 q/ha) against T_0 (51.50 q/ha) with an increased yield of 24.19% and 12.45 % against the farmer's practice (T_0) respectively.

During *kharif,* 2021 significant difference among the treatments in false smut disease severity (%) infected grains (%) and yield. In terms of

Table 1. Disease incidence and Management of false smut of rice during *Kharif*- 2020

Treatment	Infected grains (%)	Disease Severity (%)	Reduction in disease severity over control (%)	Yield (q/ha)	Increase in yield over control (%)	B:C ratio
T_1 - COC 50% WP @ 0.3 %	1.11	4.35	86.57	68.80	24.19	2.08
T_2 - Bordeaux mixture @1%	1.85	7.20	77.78	60.40	12.45	1.83
T_0 - Farmer Practice	3.66	32.40	-	51.50	-	1.53
CD (0.05)	0.77	1.02	-	1.50	-	-
SeM (±)	0.25	0.33	-	0.49	-	-

Table 2. Disease incidence and Management of false smut of rice during *Kharif*- 2021

Treatment	Infected grains (%)	Disease Severity (%)	Reduction in disease severity over control (%)	Yield (q/ha)	Increase in yield over control (%)	B:C Ratio
T_1 - COC 50% WP @ 0.3 %	1.94	4.75	86.81	66.00	21.97	2.00
T_2 - Bordeaux mixture @1%	2.65	8.18	77.28	59.10	9.22	1.79
T_0 - Farmer Practice	4.70	36.00	-	52.11	-	1.58
CD (0.05)	0.49	1.25	-	1.34	-	-
SeM (±)	0.16	0.41	-	0.44	-	-

percent infected grains the treatment with Copper oxychloride (COC) 50% WP (T_1) recorded the lowest percentage of infected grains (1.94 %) which was followed by Bordeaux mixture (BM) 1% (T_2) (2.65%). The highest percent of infected grains (3.66%) was observed in the farmer's practice (T_0). Both the T_1 and T_2 treatments significantly reduced the percent disease severity over control (86.81% and 77.28%) respectively. On the other hand similar result was obtained in the yield recording 66.0 q/ha, 59.1 q/ha in T_1 and T_2 against the farmer's practice (T_0) 52.11 q/ha respectively. The highest percent increase over control was recorded in T_1 (21.97%) followed by T_2 (9.22%). Similar results were reported by Ahonsi and Adeoti, 2003 that copper fungicides viz., Bordeaux mixture and copper oxychloride were very effective in controlling the false smut of rice resulting in significant increase in grain yield over control. The results were in conformity with the findings of Pannu *et al* (2010).

The Benefit Cost Ratio during the study period of both the years ranged between 1.79 to 2.08 in T_1 and T_2 and 1.53 to 1.58 in T_0 (Farmer's practice), respectively. The findings were similar to the reports given by Kumar *et al* (2021).

CONCLUSION

The findings revealed that the copper based fungicides namely Copper oxychloride and Bordeaux mixture were highly effective to control the false smut disease caused by *Ustilaginoidea virens* if application of the fungicides were given in a appropriate stages of rice growing season. 86.81 % disease severity can be reduced with an increased yield of 21.97% using the technology over farmer's practice. Therefore large scale horizontal spread can be demonstrated using the technology to manage the false smut disease of rice so that the excessive use of chemical fungicides can be minimized. Prediction or forecasting Proper management strategies with non- chemical means are needed to be framed to control the disease.

REFERENCES

Ahonsi M O and Adeoti A Y A (2003). Evaluation of fungicides for the control of false smut of rice caused by *Ustilaginoidea virens* (Cooke). *Tak Moor J Agric Sci* 4(1): 118-122.

Anonymous (2016). Production Oriented Survey. DRR, Hyderabad, India.

Atia M M M (2004). Rice false smut (*Ustilaginoidea virens*) in Egypt. *J Plant Dis and Prot* 111: 71-82.

Dodan D S and Singh R (1996). Effect of planting time on the incidence of blast and false smut of rice in Haryana. *Indian Phytopath* 47: 185-187.

Kumar S, Nath S, Singh S and Singh A K (2021). Integrated approach to manage false smut in paddu (Oryza sativa L.). *J Krishi Vigyan* 10 (1): 138-141.

Ladhalakshmi D, Laha G S, Singh R, Karthikeyan A, Mangrauthia S K amd Sundaram R M, (2012). Isolation and characterization of *Ustilaginoidea virens* and survey of false smut disease of rice in India. *Phytoparasitica* 40:171-176.

Lu D H, Yang X Q, Mao J H, Ye H L (2009). Characterising the pathogenicity diversity of *Ustilaginoidea virens* inhybrid rice in China. *J Plant Pathol* **91**:443-451.

Mandhane V K, Gawade, S P, Game B C and Padule D N (2008). Prevalence and incidence of bunt and false smut in paddy (*Oriza sativa* L.) seeds in Maharastra. *Agrl Sci Dig* **28**: 292-294.

Pannu P P S, Thind T S, Goswami S (2010). Standardization of technique for artificial creation of false smut of rice and its management. *Indian Phytopath* **63**: 234-35.

Roy S S, Ansari S K, Sharme S K, Saili B, Basudha D C and Singh I M (2018). Climate resilient agriculture in Manipur: status and strategies for sustainable development. *J Cur Sci* **115**(7):1342-1350.

Rush M C, Shahjahan A K M, Jones J P, Groth D E (2000). Outbreak of false smut of rice in Louisiana *Plant Dis* **84**(1): 100.

Singh A K, Pophaly DJ (2010). An unusual rice false smut epidemic reported in Raigarh District, Chhattisgarh. *Int Rice Res Notes* **35**:1-3.

Singha K and Mishra S (2015). Sustainability of Rice Cultivation: A Study of Manipur. *Rice Research: Open Access* **4**(1): 2375-4338.

Thangjam B and Jha K K (2020). Sustainable rice production in Manipur: Analysis of constraints faced by farmers. *Pharmacognosy and Phytochem* **6**: 57-63.