J Krishi Vigyan 2020, 9 (1) : 298-301 DOI : 10.5958/2349-4433.2020.00182.8

Sustainable Strategy for Managing Blast and Sheath Blight in flood prone Rice

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ABSTRACT

Contingency measures were adopted based on the real time weather pattern of the growing season in the village Sirsuwada of Kotturmandal in Srikakulam district under rain fed farming system of paddy. Field study was conducted by Krishi Vigyan Kendra, Amadalavalasa as biotic stress management at farmers' fields during the two *khari f*seasons 2017-2018 and 2018-2019 in rice ecosystem in reducing the blast and sheath blight incidences by economizing the cost of plant protection chemicals, adopting prophylactic measures in the North Coastal Zone of Andhra Pradesh. The experiment carried out using different management practices as T1, seed treatment with carbendazim @ 2g/kg seed and as need based chemical spray using fungicides like tricyclazole @0.6g/l and hexaconazole @2ml/l and T2, was farmer's practice as fungicidal sprays after the occurrence of disease irrationally without proper prophylactic management practices. The results revealed that prophylactic measures were effective and were superior over the farmers' practice in reducing the incidence of blast and sheath blight in paddy with high B:C ratio of 2.07 and 1.93 along with increased net return of Rs.41600/- and Rs.34312/- ,respectively.

Key Words: Blast, Sheath blight, Rice, Real time contingency measures.

INTRODUCTION

In India over 16 mha of area is covered by rainfed lowland rice (Pradhan *et al,* 2019). Unpredictable weather conditions, poor socio-economic farmers' status, various nutrient disorders are the factors affecting agriculture productivity of rainfed agriculture. Climate change remains to be the biggest challenge faced by the whole world predominantly, affecting the highly populated countries like India where agriculture production is vital. Irregular rainfall with floods, intermittent and prolonged drought, occurrence of various pests and diseases due to change in temperature and relative humidity are the key elements reducing the crop yield. Such weather aberrations leads to crop vulnerability and risk by the evolution of disease incidence in the crop eco system. Blast is the deadliest disease that affects the rice crop destroying about 35 per cent of the crop(Kumar and Veerabhadraswami, 2014). It is an infectious disease decreasing the quality and seed production(Pasha *et al,* 2013). It is seen more predominantly in the vegetative stage than reproductive stages of the crop.In this the diseased stems and leaves do not allow the flow of nutrients to the panicle because of which immature grains remain resulting in total yield loss. In 1910 Japan first reported sheath blight after which it spread across the world (Singh P*et al,* 2019). Sheath blight is considered as the second most destructive disease of both temperate and tropical paddy which had the potential of causing 25 percent of yield losses(Reddy *et al,* 2009). In different countries like Japan, South Korea, Taiwan etc chemical control of blast and sheath blight diseases has been practiced and found successful in most of the cases.

MATERIALS AND METHODS

Field study was conducted by Krishi Vigyan Kendra, Amadalavalasa as biotic stress management

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Table 1. Blast and Sheath blight incidence and yield attributes in rice.

Particulars	*Kharif* 2017- 18		*Kharif* 2018-19	
	Demon.	Farmer's Practice	Demon	Farmer's Practice
Blast Incidence	11.6	16.8	11.98	17.28
Sheath blight incidence	15.2	22.4	16.52	22.94
Productive tillers per square meter	285	262	279	243
Grains per panicle	153	146	141	124

at the farmers' field of Sirsuwadavillage of Kotturumandal, Srikakulam district of Andhra Pradesh during the two *kharif* seasons 2017-2018 and 2018-2019. The experiment carried out using different management practices *i.e.,* T1, seed treatment with carbendazim @ 2g/kg seed and as need based chemical spray using fungicides like tricyclazole @ 0.6g/l and hexaconazole @ 2ml/l and T2 was farmer's practice as fungicidal sprays after the occurrence of disease irrationally without proper prophylactic management practices**.** Per cent disease incidence were calculated by the formula:

Per cent Disease Incidence (PDI) = No. of leaves infected X 100

Total No. of leaves examined

Modules	Particular
Demonstration	Prophylactic measures such as**:** Seed treatment with carbendazim@ 2g/kg seed. Need based chemical spray using fungicides like Tricyclazole @ 0.6g/ lt andHexaconazole @ 2ml/l
Farmer's Practice(FP)	Fungicidal sprays after the occurrence of disease irrationally without proper prophylactic management practices**.**

Seed treatment

Before sowing, seeds were treated with Carbendazim 50 WP@ 2g/kg of seed, soaked in water for about 8 to 10hr and the excess water was drained. Regular follow up of crops condition and record of data regarding number of productive tillers per square meter, number of plants damaged/ m^2, number of plants recovered/m^2 after treatment imposition, grains per panicle, yield obtained, gross income, B:C ratio etc was recorded.

RESULTS AND DISCUSSION

Real time contingency measures were taken as part of the NICRA project to reduce the damage caused by blast and sheath blight diseases of paddy. Observations on the incidence of disease and various other important parameters (Table 2) revealed that blast disease occurred during the vegetative stages and damage caused in the farmers practice was 16.8 per cent in *kharif* 2017 and 17.3 per cent in *kharif* 2018. Lower incidence of blast was found in the demonstration practice recording 11.6 per cent and 11.9 per cent in *kharif* seasons of 2017 and 2018 , respectively. In this demonstration practice optimum doses of nitrogen fertilizer and protective measures were applied. This was in line with Prasanna *et al* (2014) who found tricyclazole to be very effective in controlling the blast disease. This is because, prophylactic spray of systemic natured tricyclazole safeguards plants from infection by preventing the entry of the fungus into the epidermis. Tricyclozole has proved to exhibit excellent protective activity by protecting the crop from fungal infection by preventing the fungal penetration into the crop's epidermis.

Sheath blight incidence has started in the late tillering stage of the crop. This disease is caused by the causal organism called as *Rhizoctonia solani.* This also leads to lodging of the crop leading to grain yield and quality reduction. In 2017 and 2018 incidence of sheath blight in farmer's practice was 22.4 and 22.9, respectively whereas

Table 2. Economics of contingency measures against blast and sheath blight of rice.

Treatment	*Kharif* 2017-2018					*Kharif* 2018-2019				
	Grain yield (kg/ha	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C ratio	Grain yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ ha)	B:C ratio
Farmer's practice	5450	36700	76,300	39600	1:2.07	4252	36700	68032	31332	1:1.85
Improved method / IPM	5650	37500	79,100	41600	1:2.10	4507	37800	72112	34312	1:1.93

there was significant reduction of the incidence in demonstrated practice where hexaconozole @2ml/l was used. It is protectively used, that resulted in15.2 and 16.52 per cent of disease incidence. This was with Kindo and Tiwari (2015) who reported that seed treatment with carbendazim 50 WP followed by hexaconozole 5SC treatment was found highly efficacious in controlling sheath blight. This efficacy of hexaconazole 5 EC @ 2.0 ml/l against sheath blight of rice is also advocated by Krishnam Raju et al (2008). Seed treatment with carbendazim reduces the seed borne infection of pathogen and improves seed germination, root and shoot growth, seed viability and seedling vigour(Kumar *et al,* 2013).

Yield attributes

The average number of effective tillers per square meter in demonstration practice were 285 and 279 as compared to the farmers practice plot tillers which were 262 and 242 in 2017 and 2018 *kharif* seasons, respectively. Less number of tillers in farmers practice was due to use of chemicals after the disease has attacked the crop. The average number of grains per panicle in farmers practice (146 and 124) in 2017 and 2018 were considerably low when compared with those of demo practice which recorded 153 and 141 in 2017 and 2018, respectively.

Difference in the disease incidence of blast and sheath blight has been finally reflected in the grain yield improvement. Significant increase in the grain yield was observed in 2017 giving 56.5q/ ha in demonstrated plots as compared over farmers practice which gave 54.5q/ha. The same trend is followed in the consecutive year of 2018 where in demonstration plots yielded 45.07 q/ha and only 42.52 q/ha in the area where farmers practice is followed and 45.07 q/ha.Yield loss was positively correlated with the incidence of blast and sheath blight diseases. Similar results were demonstrated by Katsube *et al* (1970) who advocated that there was 6 per cent yield reduction for every 10 per cent blast incidence and 5 pe rcent increase in chalky kernals, which lowered the rice quality. The B:C ratio was also found highest in demo plots giving 1:2.1 and 1: 1.93 in the demo plots in the years of 2017 and 2018, respectively. This was in accordance with Naik *et al* (2017) who reported that maximum yield and benefit cost ratio was recorded in plots sprayed with hexaconazole prophylactically.

CONCLUSION

Under the present study, real time contingency practices suggesting the prophylactic measures gave good control on prominent disease incidence of paddy and increased the yields.This study showed that quality and quantity reduction inyield was highly correlated with disease incidence, indicating that real time protective measures should be directed to limit the yield loss and disease dissemination particularly paddy grown in flood prone areas. Hence there is every need in managing the diseases at the right time.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, ATARI for the funding provided and Dr. Chinnam Naidu, Programme Coordinator for guiding us throughout the study. We also thank all the staff members of our KVK, who helped us in successful completion of this trail.

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Received on 14/09/2020 *Accepted on 02/11/2020*