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An Agriculture Monthly e-Magazine
Volume 01, Issue 02, 2023
Article ID: G-23-1102

RICE BLAST AND ITS MANAGEMENT

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INTRODUCTION

Rice is one of the most important staple food crops all over the world. Almost 98% of the world's rice production is alone from the Asian subcontinent. China ranks first in the production and productivity of the paddy crop while India occupies the next spot. According to IIRR (Indian Institute of Rice Research, Hyderabad) nearly 40% of the total yield losses in paddy is caused alone only due to Paddy blast. This disease was first reported in China in 1637. Later it was reported on 1706 in Italy and there this was called as 'Brusone' disease as the affected fields looks like burnt appearance. This disease is also called as rich man's disease and rice fever disease as it taking place in high temperature.

SYMPTOMS

Rice blast affects almost all stages of the crop. There are four different types of symptoms of paddy blast *viz*., leaf blast, nodal blast, neck blast and grain blast

A) Leaf blast

The leaf blast appears to be exact brusone appearance, Typical symptom of the leaf blast are eye or spindle shaped spots with greyish centre and with dark brown margin. According to IRRI (International Rice Research Institute, Phillipines) some of the cultivars exhibit diamond shaped spots with extended margin.

LEAF BLAST SYMPTOM

B) Nodal blast

Black coloured prominent spots appeared on the nodal region of the plants, The affected area gets rotted and this black coloured prominent spots extends up in both the direction.

Node blast symptom

C) Neck blast

The neck blast is the most serious infection of all the 4 types of blast. The symptoms appeared on the neck region during the boot leaf stage as a result the panicle initiation gets abruptly stopped and there is drastic yield loss. Once there is a neck blast the affected portion gets rotted and lodged and leads to the death of the entire plant.

Neck blast symptom

D) Grain blast

In the grain blast the symptoms appeared on the grains and ultimately leads to the rupture or breakage of the grains. The grains also appeared to be partially or fully bleached reduces the commercial potential of the marketable produce.

Grain blast symptom

TAXONOMIC POSITION

Kingdom:	Fungi
Division:	Ascomycota
Subdivision :	Pezizomycotina
Class:	Sordariomycetes
Subclass:	Sordariomycetidae
Order:	Magnaporthales
Family:	Magnaporthaceae
Genus:	*Pyricularia*
Species:	*oryzae*

Paddy blast is caused by *Pyricularia oryza*e (Cavara) anamorph and the teliomorphic stage is *Magnaporthe grisea* (Herbert Barr). The anamorphic stage of the fungi produces Pyriform shaped conidia which is Olive brown to green colour with 2 septations and three celled conidia have a protruded appendage called as hilum. The conidiophore is sympodially branched hyaline to light brown in colour and the septations are seen only near the stomata where the conidiophore gets ruptured.

Sympodially branched 2 septated 3 celled olive brown conidia

The teliomorphic stage *Magnaporthe grisea* produces the flask shaped sexual fruiting body perithecium from which the fungi produce hyaline 4 celled ascospore with 3 septations and is fusiform in shape

SPREAD AND SURVIVAL

The fungi hibernate in the seed material thus helps in survival during the off season the fungi adhered to the seed material as externally seed borne, the secondary spread is generally by the air borne conidia, in the tropical conditions the environmental conditions are conducive so air borne spread is taking place. The fungi also survive in the infected plant debris.

The fungi also survive in the alternate hosts such as *Digitaria marginata, Leersia hexandra, Panicum rapens* 25 to 30˚C of night temperature 14 hours of dark and 10 hours of light conditions are highly favourable for the conidial production. High RH and temperature between 24 and 28˚C are highly favourable for the conidial dispersal and proliferation. The conidial proliferation is more active in the night

time than the day time hence the conidia is also called as 'Night lover'.

RACES AND VARIABILITY

This Ascomycetan fungi has wide range of races and variability as of 2012 there were about 54 races of *Pyricularia oryzae* reported in India. This highly diverse variability is primarily due to heterokaryosis (condition of having two genetically different nuclei in the cytoplasm of the fungi) and parasexuality (recombination without the sexual reproduction) similarly the haploid nuclei of the ascospores consists of 2-12 chromosomes. This variation is primarily due to chromosomal aberrations. This fungi *Pyricularia oryzae* was completely gene sequenced in the year 2000 by Dean *et al*.

DISEASE FORECASTING MODEL

These are the computer-based models designed to predict the outbreak of the diseases in advance and taking the control measures accordingly. The first disease forecasting model for rice blast was developed by Japan called BLAST-L and later, Epi-Bla model was evolved in India

MANAGEMENT ASPECTS OF PADDY BLAST

- The paddy plant itself produces the phytoalexin (Sakura nectin) they are nothing but the low molecular anti-microbial compounds produced by the plants after the infection. This phytoalexin Sakura nectin detoxifies the toxins produced by the pathogen such as Pyricularin, Pyriculol and alpha picolenic acid which involves in the disease development.
- One of the cheapest methods of disease control is HPR (Host Plant Resistance) Cultivating the resistant varieties such as ADT-36, IR-20, Co-4, Co-25, etc.
- Judicious application of the ammoniacal nitrogeneous fertilizers. Heavy application of nitrogeneous fertilizers make the plants susceptible to the disease as it reduces the silicification process (accumulation of organic matter in a saturated form). In general, the plant epidermal cells have high silicon content which acts as a barrier for pathogenic entry. If the application of nitrogeneous fertilizers is higher silicification lowers and it is easy for the penetration of the pathogen.
- Treating the seeds with seed treatment chemicals such as Thiram, Captan @ 4g/kg of seeds as the fungi is externally seed borne in nature
- Foliar application of tricyclazole and metaminostrobin considerably controls the disease as they affect the MBI (Melanin Biosynthesis Inhibition) and affects the mitochondrial respiration of the fungal cell by affecting the Cyt bc1 complex of electron transport chain respectively.
- Application of the bio-control agents like *Pseudomonas fluorescens* PF-1 not only controls the disease incidence but also improves the yield
- Application of the antibiotics such as Blasticidin 3% (SL) soluble liquid and kasugamycin they are the potent inhibitor of translational activity and cuts the protein synthesis
- The fungi also survive in the infected plant debris so maintaining clean cropping environment and field sanitation reduces disease incidence
- Destruction of the collateral plants such as *Echinochloa colonum, Panicum rapens, Digitaria marginata, Leersia hexandra,* etc. as it serves as a host for the pathogen during off season.