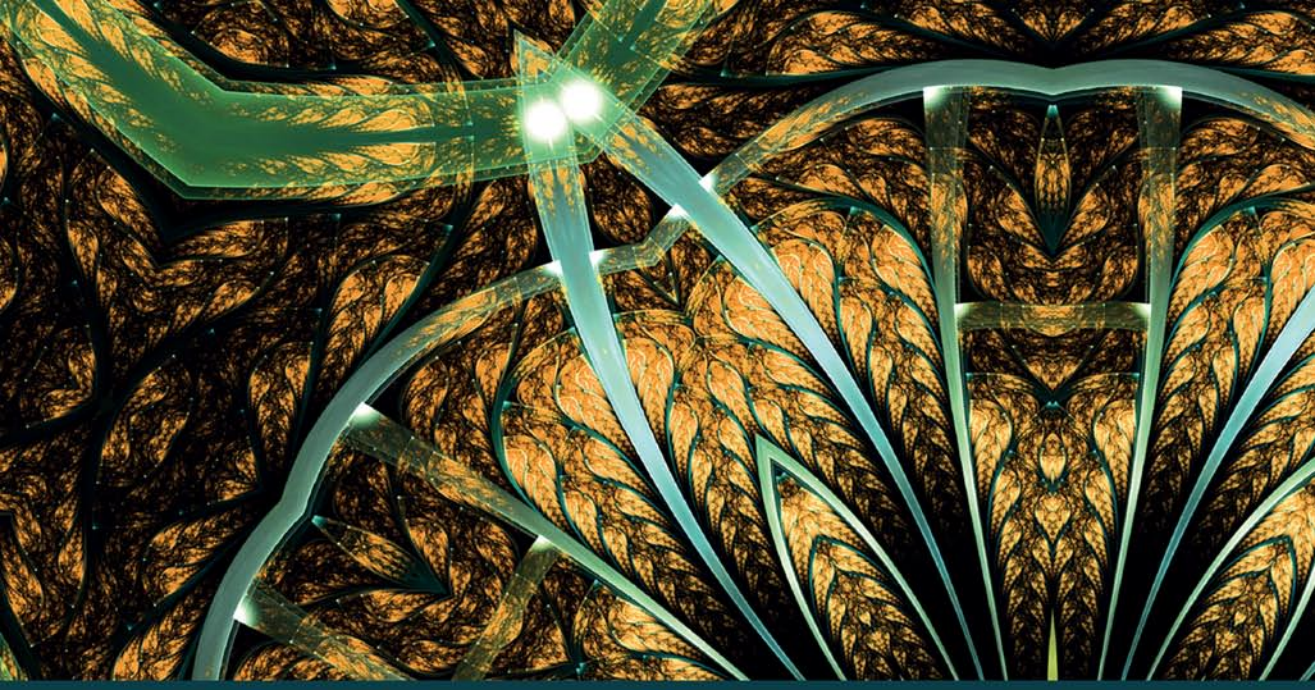
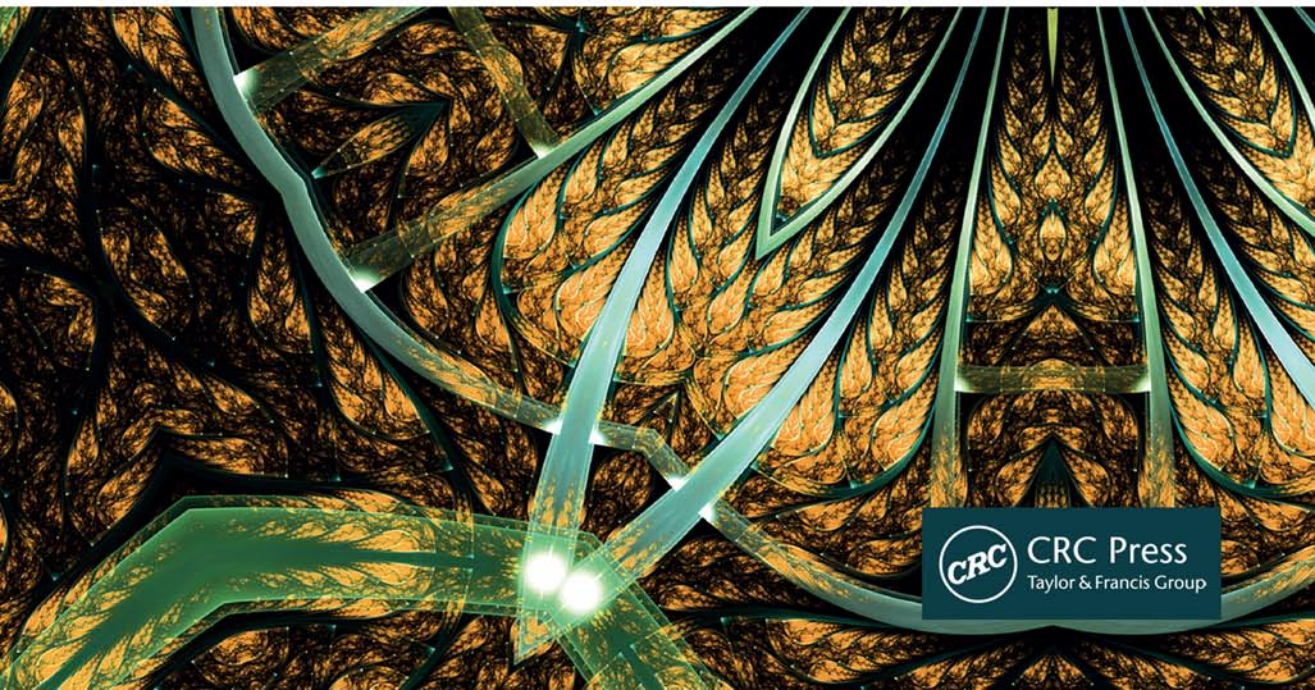


DISEASES OF FIELD CROPS AND THEIR MANAGEMENT

S. Parthasarathy, G. Thiribhuvanamala and K. Prabakar



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The book entitled “Diseases of field crops and their management” provides most recent information about major diseases of cultivation field crops, their symptoms, pathogen characters, epidemiology, and management. In order to make the book all in one, the importance of major diseases has also been dealt with in brief.

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Diseases Of Field Crops And Their Management

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Content

Preface

The book in hand entitled “Diseases of Field Crops and their Management” gives most recent information about major diseases of cultivation field crops, their symptoms, pathogen characters, epidemiology, and management. In order to make the book all in one, the importance of major diseases has also been dealt with in brief.

While preparing the book a number of books, research papers, manuals, IPM modules and online contents on the diseases of field crops are studied and drawn information from those and presented in this book. We wish to express my sincere thanks to my teachers, authors of various book and scientific works of literatures which is the foundation of this book.

The purpose of writing this book was mainly to present before plant pathologists a comprehensive text book of different type of diseases occurring on the plants in the nurseries, fields, controlled conditions, gardens, orchards, plantations etc. We request all the scientists, teachers, experts and students who read this book to comment and intimate me the rectifications and improvement for further validation. Our thanks are due to all those who inspired us in taking up this project.

We hope the book in the present form will fulfill the desired needs of the scientists, teachers and students alike.

Authors

Chapter - 1

Diseases of Rice - *Oryza sativa* L.

S. No.	Disease	Pathogen
1.	Blast	*Magnaporthe oryzae*
2.	Brown spot	*Cochliobolus miyabeanus*
3.	Sheath rot	*Sarocladium oryzae*
4.	Sheath blight	*Thanatephorus cucumeris*
5.	Stem rot	*Magnaporthe salvinii*
6.	False smut	*Ustilaginoidea virens*
7.	Udbatta	*Balansia oryzae-sativa*
8.	Stackburn	*Trichoconiella padwickii*
9.	Narrow brown leaf spot	*Cercospora janseana*
10.	Foot rot	*Gibberella fujikuroi*
11.	Grain discolouration	Fungal complex
12.	Bunt	*Tilletia barclayana*
13.	Leaf smut	*Entyloma oryzae*
14.	Leaf scald	*Microdochium oryzae*
15.	Bacterial blight	*Xanthomonas oryzae* pv. *oryzae*
16.	Bacterial leaf streak	*Xanthomonas oryzae* pv. *oryzicola*

17.	Rice tungro disease	*Rice tungro virus*
18.	Rice grassy stunt disease	*Rice grassy stunt virus*
19.	Rice ragged stunt disease	*Rice ragged stunt virus*
20.	Rice dwarf disease	*Rice dwarf virus*
21.	White leaf disease	*Rice hoja blanca virus*
22.	Rice yellow dwarf disease	*Candidatus* Phytoplasma oryzae
23.	Ufra disease	*Ditylenchus angustus*
24.	Khaira disease	Zinc deficiency

1. Blast

Other names: Grey leaf spot, Richman disease, Rice fever, Brusone

Significant History

» The rice blast disease was first reported in china by Soong ying-shin in 1637 in his book utilization of natural resources and it was first reported by Tsuchiya in Japan in 1704 from Italy in 1828 and from USA in 1876.

» The causal organism, *P. oryzae*, was named by Cavara in Italy (Cavara, 1891) and subsequently in Japan (Shirai, 1896).

» In India, blast was first recorded during 1913 (Mc Rae, 1922), the disease gained much significance when devastating epidemics observed in Tanjavur Delta region of Tamil Nadu state during 1919 (Padmanabhan, 1965).

» Later it was recorded in Maharastra in 1923 and subsequently in all rice growing states of the country. In severe cases grain losses of 70 to 80% were reported.

Occurrence

In Kharif season, the disease is prevalent throughout the rice-growing areas in India especially in Himachal Pradesh, Uttarakhand, Jharkhand, Madhya Pradesh, Chattisgarh, Assam, Tripura, West Bengal, Odisha, Maharashtra, Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Telangana.

In Rabi season, the disease is prevalent in Southern States like Andhra Pradesh, Tamil Nadu and Karnataka. The disease is also common on boro rice in the states of Assam, Tripura, Eastern Uttar Pradesh, Odisha and West Bengal.

Symptoms

- » The fungus attacks the crop at all stages of its growth.
- » Symptoms appear on leaves, nodes, rachis, and glumes.
- » The recent reports shows even roots can become infected.
- » All stages of the crop growth (seedling to maturity) were infected.
- » Depending on the site of symptom rice blast is referred as leaf blast, collar blast, node blast, and neck or panicle blast and grain infection. Amongst which, neck blast is the most destructive phase of the disease.

Types of blast – based on stage of infection

a. **Seedling blast (nursery) –** Predominant in tropical conditions
b. **Tillering blast (main field) –** Predominant in temperate conditions

Types of blast – based on part of infection

a. **Leaf blast:** The symptoms on the leaves may vary according to the stage of the crop, resistance level and environmental conditions. The lesions may appear as small water soaked grey-green spots with a darker green border and they expand rapidly under moist weather to form the characteristic diamond or spindle shaped spots with grey centre and dark brown margin on the leaf blades. The spots coalesce as the disease progresses and large areas of the leaves dry up and wither. Spots also appear on sheath rarely. Severely infected nursery and field appear as burnt.

b. **Nodal blast:** Besides infecting the leaves, during heading stage the pathogen also invades on nodes of the culms. Almost black color lesions appear on nodes and the tissue appears shrinkage. The affected nodes may break up and all the plant parts above the infected nodes may die.

c. **Collar blast:** Collar blast is seen at the base of the flag leaf. Brown necrotic lesion occurs at the junction of the leaf and the stem sheath. Collar blast will lead to kill the entire leaf.

d. **Neck blast or Rotten neck or Panicle blast:** During flower emergence, lesions can be found on the panicle branches, spikes, and spikelets. Necks are turned to brownish-black. In early neck infection, chaffiness occurs while in late infection,

partial grain filling occurs and may not attain normal size. Small brown to black spots may also be observed on glumes of the heavily infected panicles.

e. **Grain infection**: Seeds are fails to produce when pedicels become infected, a condition called blanking. The fungus can infect seeds by infecting the florets as they mature into seeds, and it is believed that this is the main way seed infection develops. The infected individual spikelet shows greyish discoloration on lemma and palea.

Fungus: Teleomorph: *Magnaporthe oryzae* (B.C. Couch)
Anamorph: *Pyricularia oryzae* (Cavara) (Early: *Pyricularia grisea* (Cooke) Saccardo)
(Early: *Trichothecium griseum* Cooke; *Dactylaria oryzae* Cav.)

Fungal characters

Anamorph:

» The mycelium is hyaline to olivaceous-brown and septate.

» Conidiophores emerge from the stomata or epidermal cells, singly or in clusters.

» Conidia are produced in clusters on apex of the long septate, olivaceous sympodial conidiophores. Conidia are attached at the broader base by a hilum. Conidia are haploid, pyriform (*Pyricularia*) to ellipsoid, hyaline to pale olive green. The conidia are usually three-celled (two septate), 14-40 µm in length and 6-15 µm in width. Conidia are produced after several hours of high humidity and are easily released or liberated near mid-day, especially under windy conditions.

» The fungus produces terpenoid phytotoxins called pyricularin.

Teleomorph:

» The perfect state of the fungal genus is *Magnaporthe* producing perithecia.

» The asci are unitunicate.

» The ascospores are hyaline, fusiform (spindle-shaped with tapering ends), four celled by producing three septa and slightly curved.