

## Changing trends of rice diseases in West Bengal, India

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Changing scenario of rice diseases over the years in the State of West Bengal, India is critically reviewed and analysed. Current status of rice diseases in the State is also indicated ecosystem wise. Future research perspective of the subject is also given.

**Key words:** Rice disease, changing trends, current status, West Bengal

### INTRODUCTION

Importance of diseases as one of the major biotic stresses limiting rice production was realised for the first time 1942 - 43 in undivided Bengal when brown spot incited by *Helminthosporium oryzae* (= *Cochliobolus miyabeanus*) was found to play a major role in overall reduction of yield. The disease was observed to be present in a mild form over all the years. The disease was again reported to appear in a serious form in 1952 in Western drier districts of the State. Stem rot caused by *Sclerotium oryzae* (*Leptosphaeria salvinii* = *Magnaporthe salvinii*), though sporadic in appearance, was found in comparatively low lying and ill drained fields. Occurrence of blast (*Pyricularia oryzae* = *Magnaporthe grisea*) in the Himalayan Hills was also recorded on both leaf and neck. Thus, it is clear that in traditional rice cropping system prior to 1965 (pre HYV era) brown spot, stem rot and blast were considered to be diseases of major importance and production constraints.

A number of diseases of minor importance such as narrow brown leaf spot (*Cercospora oryzae* = *Sphaerulina oryzina*), stackburn (*Alternaria padwickii*), false smut (*Ustilaginoidea virens* = *Claviceps oryzae sativae*), glume blight (*Phyllosticta mirai*), sheath blight (*Corticium sasakii* = *Rhizoctonia solani* = *Thanatephorus cucumeris*), minute leaf spot (*Nigrospora oryzae*), back smut or

kernel bunt or smut (*Neovossia horrida* = *Tilletia barclayana*) and leaf spot (*Helminthosporium rostratum*) have been reported at that period.

With the introduction of N responsive high yielding rice cultivars such as IR 8, Jaya and others, increased inputs and intensive cropping altered the diseases scenario in West Bengal. Brown spot and stem rot became less important but bacterial blight (*Xanthomonas oryzae* pv. *oryzae*), tungro (causal agent : rice tungro bacilliform and spherical virus, vector : *Nephotettix virescens* etc.) and blast became diseases of major concern in intensive cropping areas. In 1966, bacterial blight appeared in a serious form in many fields of TN 1 which was then newly introduced and adopted for cultivation in a large scale; of late sheath blight was gaining importance. Serious epidemics of tungro occurred in the State in 1969, the most popular cultivar Jaya was severely affected at that time and the disease has occurred sporadically since then. In 1973, severe neck blast has been observed on widely grown cultivars Mahsuri, Saket 4 and China Boro in some pockets of some southern districts of West Bengal. Since early eighties intensive rice cropping system and high levels of N fertilizations along with cultivation of various types of high yielding cultivars led to serious sheath blight incidence in the State. Consequent of varietal shift during mid eighties particularly, blast and rice tungro disease reemerged in some pockets. In recent years sheath blight disease has become almost chronic in the Kharif (wet) season due to intensive cultivation



of the popular cultivar Swarna.

During this HYV era, minor diseases like sheath rot (*Acrocyldrium oryzae* = *Saroeladium oryzae*), bacterial leaf streak (*Xanthomonas translucence* f.sp. *oryzicola* = *X. oryzae* pv. *oryzicola*), leaf scald (*Rhynchosporium oryzae* = *Monographella albescens*), yellow dwarf (causal agent: Mycoplasma; vector : *Nephotettix virescens* etc.) rice ragged stunt (casual agent : rice ragged stunt virus; vector : *Nilaparvata lugens*), Ufra (casual agent : the stem nematode *Ditylenchus angustus*), crown sheath rot (*Gaeumannomyces graminis* var. *graminis*) and white leaf streak (*Mycovellosiella oryzae* = *Ramularia oryzae*) have been recorded from the State. In recent years, sheath rot is gaining importance more and more (Paul, 1966; Mukhopadhyay *et al.*, 1977; Sharma and Mukherjee, 1978; Sharma 1980) (Tables 1 and 2)

Table 1. Major and minor diseases of rice recorded before and after introduction of high yielding varieties in West Bengal, India

|                               | Major diseases      | Reference  | Minor diseases            | Reference                        |
|-------------------------------|---------------------|--|---------------------------|----------------------------------|
| Pre-high yielding variety era | 1. Brown spot       | Roy (1949)   | 1. Narrow brown leaf spot | Roy (1949)                       |
|                               | 2. Stem rot         | -ibid-   | 2. Stack burn             | -ibid-                           |
|                               | 3. Blast            | Chattopadhyay & Sengupta (1952)                                  | 3. False smut             | -ibid-                           |
|                               |                     |  | 4. Glume blight           | -ibid-                           |
|                               |                     |  | 5. Sheath blight          | -ibid-                           |
|                               |                     |  | 6. Minute Leaf spot       | Chattopadhyay & Sengupta (1952)  |
|                               |                     |  | 7. Black Smut             | -ibid-                           |
|                               |                     |  | 8. Leaf spot              | Chattopadhyay & Dasgupta (1959)  |
| High yielding variety era     | 1. Bacterial blight | Mukherjee <i>et al.</i> (1966)                                   | 1. Bacterial leaf streak  | Anonymous (1966 - 67)            |
|                               | 2. Tungro           | Anonymous (1969-70)  | 2. Leaf scald             | -ibid-                           |
|                               | 3. Sheath blight    | Mukhopadhyay <i>et al.</i> (1977) and Sharma and Mukherjee(1978) | 3. Yellow dwarf           | -ibid-                           |
|                               |                     |  | 4. Sheath rot             | Amin <i>et al.</i> (1974)        |
|                               |                     |  | 5. Rice ragged stunt      | Naik (1979)                      |
|                               |                     |  | 6. Ufra                   | Chakrabarti <i>et al.</i> (1985) |
|                               |                     |  | 7. Crown sheath rot       | Nayak and Chakrabarti (1978)     |
|                               |                     |  | 8. White leaf streak      | Nayak <i>et al.</i> (1987)       |

Adapted and modified after Sharma (1980)

Table 2. Changing scenario of major rice diseases over years in West Bengal, India

| Period  | Major diseases   |
|---|--|
| Prior to 1965 (Traditional rice cropping system)  | Brown spot, Stem rot, Blast  |
| 1965 - 80 (Introduction of N responsive HYV)  | Bacterial blight, Tungro   |
| 1980 - 90 (Intensive rice cropping system, high levels of N fertilization and many new high yielding varieties) | Sheath blight<br>Blast, Tungro (reemerged in some pockets)             |
| Current status  | Blast, Sheath blight, Sheath rot, Brown spot, Bacterial blight, Tungro |

**CURRENT DISEASE PROFILE**

Disease profile varies from region to region, as rice ecology, agroclimatic conditions and varietal composition directly affected the distribution and intensity. Across ecosystems, the major production constraints are blast, sheath blight, sheath rot, bacterial blight and rice tungro disease at present, though the overall economic importance of these diseases vary from region to region.

**Irrigated ecosystem :** In irrigated rice, sheath blight, sheath rot, bacterial blight and tungro are important diseases of *Kharif* (wet) season whereas during *Boro* (dry) season, blast is the major disease.

**Rainfed Upland ecosystem :** Blast, sheath rot and brown spot are of prime importance in the rainfed upland ecosystem being restricted particularly to the red and laterite tract of the State. Blast both on leaf and neck is a major problem during the *Kharif* (wet) season in the cooler regions simulating *Boro* (dry) season like the Himalayan Hills and the Sub-Himalayan (*Tarai*) area.

**Rainfed lowland (shallow and deepwater) ecosystem**

Bacterial blight, tungro and sheath rot are the major



diseases of the rainfed lowland ecosystem. The intensity and economic importance of these vary from season to season. In coastal saline areas of the State, sheath blight is the major problem, while in the riverine districts, rice crop often experiencing flood, confront bacterial blight and tungro diseases.

Brown spot and sheath rot occur in severe form when drought pursue particularly in the red and laterite tract. (Table 3)

Table 3. Current status of major rice diseases in different ecosystems of West Bengal, India

| Ecosystems                                 | Diseases*   |            |
|--|---|------------|
|  | Khariif (wet)   | Boro (dry) |
| Irrigated                                  | Sheath blight, Sheath rot<br>Bacterial blight, Tungro | Blast      |
| Rainfed upland                             |   |            |
| i) Himalayan Hill and Sub-Himalayan region | Blast   | ....       |
| ii) Red and Laterite tract                 | Blast, Sheath rot, Brown spot                         | ....       |
| Rainfed lowland                            |   |            |
| i) Shallow and Deepwater                   | Bacterial blight, Tungro,<br>Sheath rot               | ....       |
| ii) Coastal Saline                         | Sheath blight   | ....       |
| During post - flood situation              | Bacterial blight,<br>Tungro                           | ....       |
| During Drought                             | Brown spot,<br>Sheath rot                             | ....       |
| Adapted and modified after Reddy (1993)    | *arranged according to importance                     |            |

#### FUTURE RESEARCH PERSPECTIVE

West Bengal is one of the potential areas for HYV rice cultivation. Compared with traditional varieties, HYV's are more responsive to fertilizers, more vigorous in growth with high tillering capacity. These attributes are closely associated with outbreaks of diseases like blast, sheath blight, sheath rot and bacterial blight. Research on host plant resistance by using resistant donors, both from traditional and introduced sources must be given major emphasis in resistant

breeding programmes for the major rice diseases as rice has both constitutive and inducible resistance mechanisms. More studies on the epidemiology of disease and of rice disease pathogens, whether major or minor must be carried out. Moreover, research on disease management by recently developed ecofriendly chemicals and exploitation of natural plant products and biological control measures must also be given due importance.

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#### REFERENCES

- Amin, K.S., Sharma B.D. and Das C.R. (1974). Occurrence in India of sheath rot of rice caused by *Acrocyndrium*. *Pl. Dis. Repr.* **58**: 358-360.
- Anonymous (1966-67), *Annual report of Mycology Section*, Directorate of Agriculture, Govt. of West Bengal.
- Anonymous (1969-70). *Annual report of Mycology Section*, Department of Agriculture, Govt. of West Bengal.
- Chakraborti, H.S., Nayak D. K. and Pal. A. (1985). Ufra incidence in summer rice in West Bengal. *IRRN* **10**(1) : 15 - 16
- Chattopadhyay, S. B. and Dasgupta C. (1959). *Helminthosporium rostratum* Drechs on rice in India. *Pl. Dis. Repr* **43** : 1241 - 1244.
- Chattopadhyay, S. B. and Sengupta S. K. (1952). Additions of Fungi of West Bengal. *Bull. Bot. Soc. Bengal.* **6** : 57-61
- Mukherjee. S. K., Das, C.R. and Sharma, B. D. (1966). The bacterial blight disease of paddy in West Bengal *Ind. Farming* **15** : 11-12.
- Mukhopadhyay, S., Ghosh, A. B., Tarafder, P and Chakravarty, S., (1977). The appearance of Tungro symptoms in boro paddy in W. Bengal, India *IRRN* **2**(5) : 15.
- Naik, R., (1979). Occurrence of rice ragged stunt disease in West Bengal, India *IRRN* **4**(2) : 12.
- Nayak, D. K. and Chakrabarti, H.S. (1987). Crown sheath rot incidence in West Bengal. *IRRN* **12**(3) : 26-27.
- Nayak, D. K., Chakrabarti, H.S. and Pal, A., (1987). White leaf streak disease on rice in West Bengal *IRRN* **12**(6) : 23.
- Paul, A.K., (1993). West Bengal, Closing the rice gap.....Disease. *Ind. Farming* **16** : 147.
- Reddy, A.P.K., (1993). Appendix 2. Current status of rice diseases in India and their management. In *Report of an INGER disease resistance monitoring visit to Indonesia and Philippines* (20-27 February, 1993), Los Banos, IRRI. pp 13-22.

- Roy, T.C., (1949). Fungi of Bengal *Bull. Bot. Soc. Bengal* **3**:135 - 175
- Sharma, B. D. and Mukherjee S. K., (1978). Natural occurrence of *Corticium sasakii* on four hosts. *Sci & Cult.* **44** : 43 - 44
- Sharma, B.D., (1980). Retrospect and prospect of pathological

research on rice at Rice Research Station, Chinsurah. In *Rice in West Bengal*, Vol II, Dept. of Agri., Govt. of West Bengal. pp 101-107.

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