*Original Research Article*

# STUDY ON MAJOR DISEASE-INSECT INCIDENCE OF SCENTED GOBINDABHOG RICE IN NEW ALLUVIAL ZONE OF WEST BENGAL


*Abstract* :

A comprehensive study on "Improvement of production and storage system for Gobindabhog rice in West Bengal" comprising two field and one laboratory experiments was done at Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal, India during the period of 2010-2012. Plant height, tiller production and LAI were increased consistently with the advancement of crop growth upto panicle exertion, panicle initiation (*i.e.* 56 DAT) and flowering (*i.e.* 84 DAT) stage, respectively. The planting date had singnificant effect on incidence of blast disease in Gobindabhog rice during both 2010 and 2011, except at 28 DAT. Delay in planting generally provided the favorable environment for the causal organism (*Payricularia oryzae*) during vegetative and reproductive stages of Gobindabhog rice, thereby leading to greater incidence in delayed crops (25 July, 10 August and 25 August) than the earlier one (10 July). The susceptibility of Gobindabhog rice crop to brown spot disease caused by *Drechslera oryzae* increased progressively with the advancement of crop age from 28 DAT (*i.e.* active tillering stage) to 84 DAT (*i.e.* flowering stage). The population of gundhi bug (*Leptocorisa acuta*) increased steadily from 84 DAT (i.e., 50 % flowering) to 112 DAT (Maturity stage) irrespective of main and sub-plot treatments, as well as years of investigation.



*Keywords: Gobindabhog rice, planting date, spacing, disease, insect*




## 1. INTRODUCTION

Rice (*Oryza sativa*) is one of the world's prominent staple foods in Asia and Africa. Gobindabhog, short-grain scented rice, is a native cultivar of lower gangetic plains in Bengal, which is traditionally cultivated for about 400–500 years. The agro-morphological characterization of Gobindabhog rice is a traditional non-Basmati type aromatic rice of lower gangetic plains and *rahr* (red and laterite) region of West Bengal [1]. Major quality features of Gobindabhog are: golden-yellow coloured grain, kernel length 3.97 mm, L / B ratio 2.04, short

**Comment [WU1]:** The title should be corrected to (A STUDY ON THE MAJOR DISEASES AND INSECT PESTS INCIDENCE on SCENTED GOBINDABHOG RICE IN NEW ALLUVIAL ZONE OF WEST BENGAL)

**Comment [WU2]:** There are some grammar and language mistakes that should be corrected in the whole paper.

**Comment [WU3]:** The abstract should contain a concise introduction, the aim of the work, a concise method of work, brief results, and recommendations.

**Comment [WU4]:** Any abbreviation should be written in detail for the first time mentioned. That should be applied on the whole paper.

**Comment [WU5]:** Introduction should end with the aim of work.

**Comment [WU6]:** Any measuring unit should be written without space between it and the measuring number. That should be applied on the whole paper.

bold type kernel, amylose 17.9%, protein 7.2%, elongation ratio 1.77, alkali spreading value 3.7 and medium-strong aroma [2].

One of the major constraints in rice production is frequent occurrence of pests and diseases and one of them is rice blast which often causes yield loss varying from 10 to 30%. [3]. The incidence of insects and diseases in rice field varied depending on season, weather, variety, etc. A survey-based study in Rewa district in Madhya Pradesh revealed the incidence of 12 insect-pests, of which 8 were either regular or sporadic ones in the following order: Gundhi bug > White backed plant hopper > Grass hopper > Stem borer > Rice hispa > Army worm > Horned caterpillar > Rice case worm [4].The susceptibility of Gobindabhog rice to brown spot caused by *Drechslera oryzae* increased progressively with the advancement of growth or age including severe infestation at flowering and maturity stages [5]. The population of gundhi bug (*Leptocorisa acuta*) in Gobindabhog rice field was revealed as 6.52 and 3.35 hill-1 at 13 and 15 WAT, respectively. The minimum temperature (21.70C for 2008 and 22.50c for 2009) prevailing during the period from pre-flowering to soft dough stage had positive ($P < 0.05$) influence on gundhi bug population in West Bengal [5].

## 2. MATERIAL AND METHODS

### 2.1 Description of Experimental Site:

The experiment was conducted during wet (*kharif*) seasons of 2010 and 2011 at 'C' Block Farm (22°58' N latitude, 88°26' E longitude and 15.9 m altitude) of Bidhan Chandra Krishi Viswavidyalaya (BCKV), Kalyani, Nadia, West Bengal. Monthly maximum and minimum temperature throughout the crop season varied between 12.2 and 34.3°C and 13.4 and 33.2°C in 2010 and 2011 and the rainfall received for the seasons were 826.4 mm and 1720.3 mm, respectively. The bright sunshine ranged between 5.1 (June) and 7.5 hours (November) in 2010, and between 3.3 (August) and 8.2 hours (October) in 2011. It was lower in high rainfall months mainly due to cloud-cast days.

### 2.2 Treatment details and crop husbandry

The experiment was laid out in a split-plot design replicated thrice comprising four planting dates [10 July, 25 July, 10 August and 25 August] in main plots and three spacings [20 cm × 10 cm, 15 cm × 15 cm, and 20 cm × 15 cm] in sub plots. Gobindabhog paddy seeds were collected from RKVY Project on 'Bengal Aromatic Rice' of BCKV and sown @ 18-20 kg/ha in wet nursery at three different times of 15 days interval. 24- 25 days old seedlings @ 2-3/hill was transplanted as per planting time and spacing schedule at a shallow depth (3-4 cm) in puddled field. A uniform fertilizer dose consisting of 2t FYM, 40kg N, 20kg $P_2O_5$ and 20kg $K_2O$/ha was given to all experimental plots in the study. Manual weeding was done at 3 and 6 weeks after transplanting (WAT), and other crop management practices were adopted as per standard recommendations.

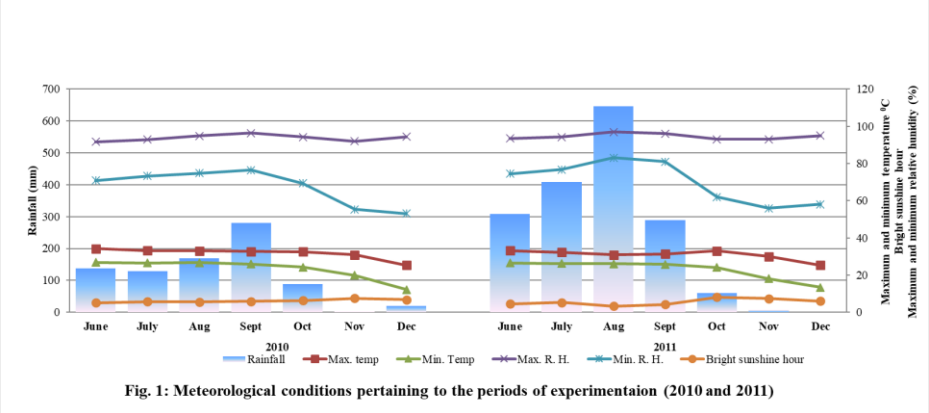


Fig. 1: Meteorological conditions pertaining to the periods of experimentaion (2010 and 2011)

**Fig 1: Meteorological conditions pertaining to the periods of experimentation (2010 and 2011)**
[Source: Department of Agricultural Meteorology and Physics, Faculty of Agriculture, BCKV, Mohanpur, W.B., India]

### 2.3 Methods of scoring pest-disease incidence

Five randomly selected hills were tagged in each plot for recording incidence of insect and disease at respective infestation stages during cropping season.

#### 2.3.1 Disease incidence

**Brown spot (*Drechslera oryzae*) and Blast (*Pyricularia Oryzae*)**

The infestation of brown spot and blast was estimated by the percentage of leaf area affected or disease symptoms (small, oval or circular and dark brown spots with light yellow halo around the outer edge for brown spot; while diamond-shaped with a grey or white center in blast) at 28, 56 and 84 DAT. Then, the leaf area affected values (%) were compared with the disease severity scale (IRRI, 1996) (Table 1).



**Table 1. Disease severity scale for brown spot and blast**

| Scale | Severity (leaf area affected) |
|---|---|
| 0 | No incidence |
| 1 | Affected leaf area less than 1% |
| 2 | 1-3% of the leaf area affected |
| 3 | 4-5% of the leaf area affected |

| | |
|---|---|
| 4 | 6-10% of the leaf area affected |
| 5 | 11-15% of the leaf area affected |
| 6 | 16-25% of the leaf area affected |
| 7 | 26-50% of the leaf area affected |
| 8 | 51-75% of the leaf area affected |
| 9 | Affected leaf area above 76% |

In the context, it was also noted that there were some blast lesions (*Pyricularia oryzae*) intermingled with brown spot ones on rice leaves, which could not separately be identified or considered in the study.

#### 2.3.2 Insect incidence

**Gundhi bug (*Leptocorisa acuta*)**

The incidence of gundhi bug, i.e., the number of gundhi bug hill-1 was recorded at 84 and 112 DAT.

### 2.4 Statistical analysis:

The data recorded in the study were analysed using Fisher's 'Analysis of Variance' technique as per the procedures described by Gomez and Gomez [6], and the mean differences were compared at 5% level of significance.

## 3. RESULTS AND DISCUSSION

### 3.1 Disease incidence

**Brown spot disease incidence**

The variation in disease incidence (% of leaf area affected) at different growth stages noted in the study could generally be classified under scale 4 (6–10%) at 28 DAT, scale 5 (11–15%) at 56 DAT and scale 6 (16–25%) at 84 DAT in the investigation (Table 2). The incidence of brown spot disease increased rapidly with delay in planting from July 10 to August 25 during both 2010 and 2011.

The variation in brown spot disease incidence on Gobindabhog rice due to spacing was found non-significant at 56 and 84 DAT during both the years of experiment, except at 28 DAT during 2010 only. According to Wang *et al*, the greatest disease incidence in rice was observed in the earliest sown plants and substantial control could be achieved by delay in planting from late May to mid-June. In an experiment where different proportions of infected plants were established (by

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inoculation or varying the sowing date), average yield losses were 0.8% for every 1% increase in disease incidence [7]. According to Rautaray planting geometry of skipping one row after every three rows with 15 cm × 15 cm spacing resulted in highest grain yield. Grain yields were similar with the next best planting geometry of 20 cm × 15 cm. Incidence of sheath rot disease (34.4%) and also its severity in terms of chaff number per panicle (41.4) were less under the skip row arrangement [8].

**Table 2. Effect of planting date and spacing on brown spot disease incidence of Gobindabhog rice during *kharif* season**

| Treatment | Brown spot disease incidence (%) | | |
|---|---|---|---|
| | 28 DAT | 56 DAT | 84 DAT |
| *Planting time* | | | |
| 10 July | 7.46 (15.8) | 12.0 (20.2) | 18.7 (25.6) |
| 25 July | 7.46 (15.8) | 13.8 (21.7) | 20.6 (26.9) |
| 10 August | 8.82 (17.3) | 13.2 (21.2) | 22.3 (28.0) |
| 25 August | 8.82 (17.2) | 13.9 (21.9) | 23.3 (28.8) |
| SEm± | 0.26 | 0.30 | 0.57 |
| CD (P=0.05) | 0.79 | 0.94 | 1.75 |
| *Spacing* | | | |
| 20 cm × 10 cm | 8.42 (16.8) | 12.9 (21.0) | 21.3 (27.4) |
| 15 cm × 15 cm | 8.09 (16.5) | 13.4 (21.4) | 21.3 (27.4) |
| 20 cm × 15 cm | 7.91 (16.3) | 13.4 (21.4) | 21.1 (27.3) |
| SEm± | 0.21 | 0.27 | 0.31 |
| CD (P=0.05) | NS | NS | NS |

Figures in parentheses are angular transformed values; DAT = Days after transplanting; NS = Not significant

**Blast disease incidence**

Rice blast development is intimately related to meteorological factors that include air temperature, accumulated rainfall, and amount of sunshine kang [9–12]. The blast lesions as observed on Gobindabhog rice plants were found to increase from 28 DAT to 84 DAT during both the years of investigation (Table 3). Based on the percentage of leaf area affected, the incidence could be grouped under scale 2 (1–3%) and 3 (4–5%) at 28 DAT, scale 4 (6–10%) and 5 (11–15%) at 56 DAT, and scale 5 (11–15%) and 6 (16–25%) at 84 DAT.

The significant variation in blast infestation on Gobindabhog rice due to spacing was usually found at 84 DAT (i.e. flowering stage), along with a few cases at 28 and 56 DAT in the investigation. Close spacing (20 cm × 10 cm) resulted in greater blast incidence than other two wider spacings (15 cm × 15 cm and 20 cm × 15 cm) (Table 3).

**Table 3. Effect of planting date and spacing on blast disease incidence of Gobindabhog rice during *kharif* season**

| Treatment | Brown spot disease incidence (%) | | |
|---|---|---|---|
| | 28 DAT | 56 DAT | 84 DAT |
| *Planting time* | | | |
| 10 July | 3.21 (10.1) | 8.02 (16.3) | 13.2 (21.2) |
| 25 July | 3.64 (10.7) | 10.11 (18.4) | 14.6 (22.4) |
| 10 August | 4.32 (11.8) | 13.32 (21.3) | 15.7 (23.3) |

| | | | |
|---|---|---|---|
| 25 August | 5.00 (12.7) | 14.06 (22.0) | 19.4 (25.9) |
| SEm± | 0.56 | 0.37 | 0.54 |
| CD (P=0.05) | 1.73 | 1.14 | 1.66 |
| *Spacing* | | | |
| 20 cm × 10 cm | 4.30 (11.7) | 12.16 (20.2) | 17.9 (24.8) |
| 15 cm × 15 cm | 3.38 (10.3) | 11.15 (19.3) | 15.2 (22.9) |
| 20 cm × 15 cm | 4.44 (11.9) | 10.82 (19.0) | 14.1 (21.9) |
| SEm± | 0.48 | 0.39 | 0.42 |
| CD (P=0.05) | 1.38 | NS | 1.22 |

Figures in parentheses are angular transformed values; DAT = Days after transplanting; NS = Not significant

### 3.2 Insect incidence

**Gundhi bug incidence**

The population of gundhi bug per hill of gobindavhog paddy was increased from early (10 July) to mid planting (25 July) in July and there after decline gradually due to delayed planting upto August 25 in the experiment (Table 4), but the difference were mostly non-significant, excluding at 112 DAT for pooled over two years, mean number of gundhi bug hill$^{-1}$ of four planting dates pooled over two years was 3.10 and 4.96 during 2010 and 2011 respectively; which indicated greater incidence of gundhi bug in second year than first year. Plant density could not show any definite effect or trend on incidence of gunghi bug during both grain development and ripening stage of Gobindabhog rice in 2010 and 2011 (Table 4).



**Table 4. Effect of planting date and spacing on gundhibug incidence of Gobindabhog rice during *kharif* season**

| Treatment | Number of gundhibug hill$^{-1}$ | |
|---|---|---|
| | 84 DAT | 112 DAT |
| *Planting time* | | |
| 10 July | 2.78 (1.64) | 4.67 (2.12) |
| 25 July | 3.39 (1.79) | 5.56 (2.34) |
| 10 August | 3.28 (1.77) | 5.17 (2.25) |
| 25 August | 2.94 (1.67) | 4.44 (2.08) |
| SEm± | 0.19 | 0.21 |
| CD (P=0.05) | NS | 0.65 |

| | | |
|---|---|---|
| *Spacing* | | |
| 20 cm × 10 cm | 3.08 (1.72) | 5.29 (2.29) |
| 15 cm × 15 cm | 3.04 (1.70) | 4.79 (2.15) |
| 20 cm × 15 cm | 3.17 (1.74) | 4.79 (2.15) |
| SEm± | 0.23 | 0.32 |
| CD (P=0.05) | NS | NS |

Figures in parentheses are square root transformed values; DAT = Days after transplanting; NS = Not significant

## 4. CONCLUSION

This research work was conducted to find out the major diseases and insect of indigenous Gobindabhog rice in new alluvial zone of West Bengal. Based on the findings of the present study the highest brown spot disease intensity was 23.3% recorded with delay planting time (25 August), whereas the lowest was 7.4% observed with earlier planting time (10 July). The blast intensity was also recorded highest 19.4% with delay in planting time and lowest 3.2% with earlier planting time. In case of gundhi bug population highest number 5.56 / hill were counted with 25 July planting time and also with closer spacing (20 cm x 10 cm) 5.29 / hill.

### ETHICAL APPROVAL (WHERE EVER APPLICABLE)

This article does not contain any studies with human participants or animals performed by any of the authors.



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