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Original Research Article

Assessment of Percent Grain Discoloration in Important Rice Varieties

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A b s t r a c t

The experiment was carried out at Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.) during spring season to assess the percent grain discoloration in important rice varieties. The experiments were conducted under Completely Randomized Design (CRD) with four replications *in-vitro*. Ten varieties of rice *viz.*, Mahamaya, MTU-1010, Sona Masuri, IR 36, Pant-4, IR-64, Indira-9, Kranti, Swarna and HMT were collected from different villages, Somani, Dhamtari, Durg, Aacholi, Tumdibode, Kalkasa and also IGKV Research Farm, Raipur. Each seed sample was mixed thoroughly and from this, a working sample of 100 g was made and used for the study. For pathogenecity test, variety Kranti was used. The seed lot comprised of different symptoms like dark brown discoloration, nectrotic spot and chaffy grains. Data revealed that the check variety Kranti recorded maximum discolored seeds (32.95%) followed by IR-36 (30.26%), Swarna (29.39%) and Mahamaya (29.46%). Chaffiness in all tested varieties varied from 4.75 to 19.82%. The highest chaffiness was (19.32%) in HMT followed by IR-36 (19.64%) and Pant-4 (19.43%). Data shows that seed weight loss varies from 7.63 to 24.90% in the varieties tested. The maximum weight loss in discolored seeds (24.90%) was observed in variety Indira-9 followed by Shyamla (19.14%) and IR-64 (15.50%). The fungi *Sarocladium oryzae*, *Drechslera oryzae*, *Fusarium moniliforme* and *Curvularia lunata* showed their pathogenic ability by infecting rice panicles, however rice grain without fungi could not initiate infection in rice panicles.

K e y w o r d s

Grain discoloration

Oryza sativa

Pathogenecity test

Rice varieties

Weight loss

Introduction

Discoloration in rice is minor disease presently gaining importance due to its severity in tropical rice growing areas. Grain discoloration is an early indication of poor quality seeds associated with microorganisms (Anonymous, 2009). The discoloration is mainly due to pathogenic microorganisms, *Helmithosporium*, *Cercospora*, *Gerlachia*, *Fusarium*, *Phoma*, *Curvularia*,

Trichoconiella and *Pseudomonas* (Ora et al., 2011; Hafiz et al., 2009). The discoloration may appear externally on the glumes or internally on the kernals or both (Ou, 1985). This leads to the decrease in seed quality and property. Studying discoloration of rice varieties used by local farming community may result in the causes and prevention of discoloration and associated pathogens. Hence in the present study, seeds of rice varieties in different villages and in IGKV, Raipur were tested for their discoloration pattern associated with weight loss and fungal pathogens.

Materials and methods

Grain discoloration

Ten varieties of rice *viz.*, Mahamaya, MTU-1010, Sona masuri, IR 36, Pant-4, IR-64, Indira-9, Kranti, Swarna and HMT were collected from different villages, Somani, Dhamtari, Durg, Aacholi, Tumdibode, Kalkasa and also IGKV Research Farm, Raipur. Each seed sample was mixed thoroughly and from this, a working sample of 100 g was made and used for the study of grain discoloration. The experiments were conducted under Completely Randomized Design (CRD) with four replications *in-vitro*. The seeds were brought into the laboratory and the healthy, discolored and chaffy seeds were separated on visual appearance basis. The per cent grain discoloration was calculated following general arithmetic rule i.e. The Chaffiness Percentage were calculated separately using same formula.

$$\text{Grain discoloration (\%)} = \frac{\text{Number of discolored grains in sample}}{\text{Total grains of sample}} \times 100$$

Loss in grain weight

The seed samples (100g each) of ten rice varieties were collected from field store of the Department of Plant Pathology. These samples brought into the laboratory and healthy and discolored seeds were separated on visual observations. The thousands seed weight of healthy and discolored seeds of each varieties were taken in highly sensitive anamide balance. The difference in seed weight and percent loss in weight were calculated as general formula.

$$\text{Weight loss (\%)} = \frac{\text{Wt. of healthy grains} - \text{Wt. of discolored grains}}{\text{Wt. of healthy grains}} \times 100$$

Pathogenicity test

Fungi associated with discolored rice grain were isolated individually on PDA slant under aseptic condition. They were frequently sub-cultured and their pure culture was maintained for the pathogenicity test. The fungi in pure culture with respect to their conidia were critically examined under compound microscope and efforts were made for their identification up to species level referring to relevant literature. The micoflora isolated from the rice seeds were subcultured and tested for their pathogenicity, if any. At the time of 50% flowering the varieties were spray inoculated with the respective mycoflora isolated separately. For pathogenicity test, variety Kranti was used. The half cooked rice grains were first gently rubbed over the fungal growth (20-25 days) cultured in plates. This has helped the conidia and mycelium in adhering to the grain bits. Such coated rice grain bits were inserted gently into the boot. This procedure was followed in all the artificial inoculation tests, unless otherwise mentioned separately. At maturity, seeds were collected from every inoculated panicle and grain discoloration was assessed by counting the number of discolored seeds.

Results and discussion

Grain discoloration of rice varieties

The important rice varieties were screened to workout average per cent grain discoloration. The samples were sorted out in healthy and chaffy seeds. Observations on grain discoloration were recorded. Data from Table 1 reveals that check variety Kranti recorded maximum discolored seeds (32.95%) followed by IR-36 (30.26%), Swarna (29.39%) and Mahamaya (29.46%).

The least discoloration was observed (23.10%) in IR-64 variety. None of the variety was observed to exceed grain discoloration as compared to Kranti (check). Chaffiness is an impregnated part of rice panicle which was assessed from bulk sample tested.

Data reveals that chaffiness in all tested varieties varied from 4.75 to 19.82%. The highest chaffiness was (19.32%) in HMT followed by IR-36 (19.64%) and Pant-4 (19.43%). The least chaffiness was recorded in Indira-9 (4.75%). The incidence of rice

seed discoloration in TN-1 (6.6%), Manhar (52.8%), Jarga (58.7%), PR-106 (23%), IR-8 (19%), Narendra-80 (54.7%), Saket (45.3%) and Pant Dhan-16 (40%) were reported by Sharma and Valid (1997), Misra and Vir (1991) and Negi and Das (2003). These finding are very close to our results.

Table 1. Per cent grain discoloration of important paddy varieties.

Varieties	Grain discoloration (%)	Chaffiness (%)
IR-36	30.26	19.64
Pant-4	29.67	19.43
Mahamaya	29.46	9.27
Swarna	29.39	15.91
HMT	28.30	19.82
MTU-1010	27.37	17.05
Indira-9	25.43	4.75
Sona Masuri	23.81	15.06
IR-64	23.10	11.68
Kranti	32.95	6.09
SEm±	1.58	1.68
CD (5%)	4.56	4.85

Table 2. Grain discoloration percent in healthy seeds of rice varieties.

Rice varieties	Grain discoloration (%)
Indira-9	20.67
Mahamaya	20.18
Swarna	17.04
IR-64	11.59
IR-36	10.62
MTU-1010	10.30
Pant-4	10.20
Sona Masuri	8.99
HMT	8.48
Kranti	23.30
SEm±	1.27
CD (5%)	3.66

Grain discoloration in healthy rice seeds

The important rice varieties were screened to workout average per cent grain discoloration in healthy seeds. The samples were sorted out in chaffy and healthy seeds. Observations on grain discoloration were recorded. Data from the Table 2 reveals that in grain discoloration varies in healthy looking grains from 8.48 to 23.30%. The highest grain discoloration 23.30% was observed in check variety Kranti, whereas least discoloration was observed in variety HMT (8.48%) and Sona masuri (8.99%). None of the variety was observed to exceed grain discoloration as compared to Kranti (Check). The present investigations were very close to the observations of Singh et al. (1999). They have reported range of rice grain discoloration i.e., 1 to 94% and 58.7 to 66%, respectively.

Determination of loss in grain weight of discolored seeds in rice varieties

Seed discoloration badly affects seed development and may cause loss in weight. Data (Table 3) shows that seed weight loss varies from 7.63 to 24.90% in the varieties tested. The maximum loss in discolored seed weight (24.90%) was observed in variety Indira-9 followed by Shyamla (19.14%) and IR-64 (15.50%). The loss in seed weight were observed in varieties like MTU-1010 (10.97%), Swarna (10.59%), Pant-4 (9.08%), HMT (8.80%), Mahamaya (7.83%) and (7.63%) Kranti. The least loss in seed weight of discolored seeds was observed in variety Chapti (5.70%).The present findings corroborates with the findings of Misra and Vir (1991) where they observed loss in grain weight upto 31.2% and 50.2% in grains classified as having less than 50% and more than 50% area of seed discoloration, respectively compared with the seeds classified as healthy and with no discoloration.

Table 3. Loss in grain weight due to grain discoloration.

Varieties	Healthy grain (g)	Discolored grain (g)	Weight difference (g)	Weight loss (%)
MTU-1010	26.23	23.35	2.88	10.97
Pant-4	31.71	28.83	2.88	9.08
Indira-9	25.13	18.85	6.28	24.90
IR-64	27.03	22.84	4.19	15.50
Shaymla	28.36	22.93	5.43	19.14
HMT	18.40	16.78	1.62	8.80
Swarna	29.08	26.00	3.08	10.59
Kranti	13.63	12.59	1.04	7.63
Mahamaya	32.16	29.64	2.52	7.83
Chapti	29.47	27.79	1.68	5.70

Pathogenicity of the associated mycoflora

The half cooked rice grains impregnated with test fungi were inserted in panicles at boot stage to find out their pathogenic potential. *Sarocladium oryzae*, *Drechslera oryzae*, *Fusarium moniliforme* and *Curvularia lunata* showed their pathogenic ability by infecting rice panicles expressed as (+) plus however rice grain without fungi could not initiate infection in rice panicles and expressed as (-) minus. Sharma and Valid (1997), Negi and Das (2003) and Hafiz et al. (2009) and also proved pathogenicity by inoculating rice plants of various stages with different fungal isolates and proved their pathogenic potential to initiate grain discoloration.

Table 4. Pathogenicity of fungal isolates in causing infection in panicle.

Pathogen	Infection in panicle
Sarocladium oryzae	+
Drechslera oryzae	+
Fusarium moniliforme	+
Curvularia lunata	+
Control (without pathogen)	-

References

Anonymous, 2009. Rice Production (online). In: www.fao.org. Available at http://faostat.fao.org, Rome, Italy: Food and Agriculture Organization (FAO).

Hafiz, M., Khan, J.A., Naz, S., Khan, S.N., Akram, M., 2009. Grain discoloration disease complex: a new threat for rice crop and its management**.** Pak. J. Phytopathol. 21(1), 31-36.

Misra, A.K., Vir, D., 1991. Assessment of losses due to discoloration of paddy seeds. Loss in seed weight in different rice cultivars due to seed discoloration. Int. J. Trop. Plant Dis. 9(2), 245-249.

Negi, H., Das, B., 2003. Germinability, viability and seedling vigour of discoloured rice seeds. Plant Dis. Res. 18(2), 165-167.

Ora, N., Faruq, A.N., Islam, M.T., Akhtar, N., Rahman, M.M., 2011. Detection and identification of seed borne pathogens from some cultivated hybrid rice varieties in Bangladesh. Middle-East J. Sci. Res. 10(4), 482-488.

Ou, S.H., 1985. Rice disease. 2nd Edn. Commonwealth Mycology Institute, Surrey, England. 380p.

Sharma, O.P., Valid, A., 1997. Mycoflora of discolored rice grains and its pathogenic potential in Himachal Pradesh. Himalyan Microbial Diversity, Part I. pp.273-281.

Singh, K.D., Bhattacharya, H.C., Pathak, A.K., 1996. Nature of perpetuation of sheath rot (*Sarocladium oryzae*) in rice seeds and its control. J. Agric. Sci. Soc. North East India 9, 76-78.