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Evaluation of Seed Quality Parameter in Rice (*Oryza sativa* L.)

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Abstract The laboratory was carried out in the seed testing laboratory. The objective of the present study was to assess physical, viability, seedling and vigor parameters of 10 rice genotypes. Analysis of variances revealed that presence of considerable variation among the genotypes for all the characters viz. test weight (g) 1000 seeds, seed length (mm), seed width (mm), seed length/width ratio, seed density (g/cm^3), germination (%), vigor index length, speed of germination (day^{-1}), root length (cm), seedling length (cm), shoot length (cm), dry weight (g), dry root weight of seeds, dry shoot weight, and seed metabolic efficiency (SME). On the basis of mean performance for physical parameters best genotypes was observed by NDR-3112 has been identified as the best genotype for the seed quality parameters viz., test weight, seed length, seed width, seed length/width ratio germination (%), root length (cm) and shoot length (cm), seedling length (cm) and seed metabolic efficiency. Whereas genotype Pusa Basmati-1509 has found superior for seed density, seedling length and dry root weight of seeds.

Keywords Rice, Seed, Vigor, Germination, Quality.

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Introduction

Rice (*Oryza sativa* L.) is the most important staple food crop among the cereals consumed by more than half of the worlds population. India has the largest area under rice in the world and ranks second in production. Rice is one of the significant cereal commodities. The genetic classification of rice plant belongs to genus *Oryza* family Gramineae (Poaceae). The genus *Oryza* includes 24 species of which 22 are wild and 2 viz., *Oryza sativa* and *Oryza glaberrima* are cultivated. *Oryza sativa* is grown in all rice growing areas, but *Oryza glaberrima* is confined to the West Africa only (Singh 1998). In India during 2014-15 the production of rice was 104.7 million tons from 43.61 million ha and it stands second in position in the world production after China. In Uttar Pradesh area, production and productivity is 5.19 million ha, 10.80 million tons and 20.8 q/ha respectively (CRRI Annual Report 2014-15).

Germination levels also affected the yield components like effective tillers per plant, panicle length, sterility and final yield. Decline in germination level

resulting in reduction in vigor, yield components and yield has been reported in maize, sunflower, rice and sorghum. Roberts (1972) observed that direct association between the decline in germination and reduction in yield in barley, broad bean and lettuce.Reduction in yield of the low germination seed lots was due to loss of vigor and its persistence to reduction in dry matter production, number of effective tillers, panicle length and increased sterility percentage. Quality of seed is a multiple concept comprising, several aspects such as genetically and physical purity, high levels of germination and vigor and free from disease, insects. Seed vigor is not equipment of seed germinability. Vigor is defined by the ISTA as the sum total of those properties of seed which determine the potential level of activity and performance of a non-dormant seed (Perry 1972). Thus germination tests which are conducted under optimum condition in the laboratory can only indicate the ability of a seed lot established seedling under favorable field condition. The vigor tests are commonly evaluated according to their ability to predict some aspect of potential seed performance, particularly seedling growth rate, seedling emergence in field, plant uniformity, crop yield and storability with an array of possible vigor tests available appropriate procedure for chosen the single or multiple predictors of seed performance is a very difficult job but a necessity. Generally seed viability and vigor are at their maximum potential at physiological maturity. Once seed attains physiological maturity deterioration of seed starts. The seed deterioration proceeds at very rates depending on the kinds of seeds, pre-harvest, post-harvest, post-maturation, environmental and pathological factors, seed moisture content, temperature, relative humidity, threshing, drying, storage conditions and inheritance to deterioration during storage (Copeland 1976).

There is a great demand for high quality products that could be maintained only when the seed quality will be better means the physical seed quality parameters like test weight, seed length, seed width, seed density could match standard value. Seed must be viable, purity percentage these parameters must be standard. To meet out the needs of majority we have to grow seed in maximum of the fields. The present investigation was undertaken to study to evaluate seed vigor of rice and seed quality parameters in rice.

Materials and Methods

In order to determine the seed quality parameter in rice (*Oryza sativa* L.), an experiment was conducted in the seed testing laboratory, Department of Genetics and Plant Breeding, SHIATS, Allahabad in CRD (complete randomized design) having 4 replications. The experiment comprising of 10 diverse genotypes received from Directorate of Rice Research, Hyderabad and Directorate of Seed and Farm SHUATS. The observation on the characters viz., test weight (g), seed length (mm), seed length/width ratio, seed width (mm), seed density (g/cm^3), germination percentage (%), speed of germination (days^{-1}), seed vigor index, seed metabolic efficiency (SME), root length (cm), shoot length (cm), seedling length, dry root weight (g), dry shoot weight (g) and seedling dry weight (g).

Results and Discussion

Analysis of variance revealed presence of considerable variability among the genotypes for all the characters indicating a scope for further improvement and selection. The maximum test weight was observed in the genotype Pusa Basmati-1509 (30 g). Whereas the minimum test weight was observed in the genotypes SHIATS DHAN-1 (15 g). The maximum seed length was observed in the genotype Pusa Basmati-1509 (12.02 mm), whereas the minimum seed length was observed in the genotype SHIATS DHAN-1 (8 mm). The maximum seed width was observed in the NDR-3112 (3.02 mm) Whereas the minimum seed width was observed in the genotype Pusa-2511 (2.0 mm). The maximum seed length/width ratio was observed in the genotype Pusa Basmati-1509 (6.01), whereas the minimum seed length/width ratio was observed in the variety NDR-359 (2.6) as shown in Table 1.

The maximum seed density was observed in the genotype Pusa Basmati-1509 (4.02 g/cm^3). Whereas the minimum seed density was observed in the genotype BPT-5204 (2.0 g/cm^3). The maximum germination percentage was observed in the genotype NDR-3112 (91.05%). Whereas the minimum germination percentage was observed in the genotype Pusa Basmati-1509 (80.75%). The maximum viability was observed in the genotype NDR-3112 (8916.7). Whereas the minimum viability was observed in the

Table 1. Mean performance of rice of 10 different varieties for 14 observations.

Genotypes	Test weight (g) 1000 seeds	Seed length (mm)	Seed width (mm)	Seed length/ width ratio	Seed density (g/cm^3)	Germi-nation (%)	Vigor index length	Speed of germi-nation (day^{-1})	Root length (cm)	Seedling length (cm)	Shoot length (cm)	Fresh weight (g)	Dry weight (g)	Seed metabolic efficiency (SME)
Pusa-2511	24	12	2	6	60	87	7338.6	7.90	9.75	21.5	11.40	0.77	0.3	0.147
Pusa Basmati-1509	30	12.02	2	6.01	75	80.75	5851	5.16	8.87	25.97	12.62	1.07	0.27	0.1015
BPT-5204	15.50	8	2	4	77.5	86.25	6818.8	7.49	11.95	21.1	7.37	0.42	0.2	0.153
HUR-105	23	10.02	2	5.01	57.5	80.75	7173.1	6.60	13.25	19.82	13.05	0.75	0.35	0.1515
Sourna Sab-1	18.25	8	2	4	90	84	6990.7	7.59	11.62	23.00	9	0.82	0.27	0.1812
NDR-3112	18.75	10	3.02	3.2	95	91.5	8916.7	8.15	14.1	21.4	11.87	0.92	0.35	0.2265
SHIATS DHAN-1	15	8	2	4	62.2	84.25	7204.6	7.90	11.87	19.62	9.85	0.65	0.25	0.216
MTU-7029	19	8	2	4	95	82.75	6495.1	7.62	10.17	21.8	9.27	0.57	0.25	0.152
Sarju-52	26	11	3	3.67	86.67	87.5	7627.9	7.81	12.92	22.35	9.12	1.25	0.3	0.13
NDR-359	27	8	3	2.67	67.5	87.75	7810.7	6.95	10.67	25.72	11.05	0.7	0.3	0.125
Grand mean	21.52	9.50	2.30	4.26	76.65	85.25	1805.6	7.32	11.62	22.23	10.46	0.79	0.28	0.1578
SE	0.193	0.15	0.11	0.001	0.011	1.91	128.78	0.18	1.48	1.60	0.81	0.092	0.035	0.232
CD 5%	0.395	0.32	0.22	0.002	0.0322	3.91	254.83	0.36	3.02	3.27	1.67	0.254	0.072	0.475
CV	1.27	0.235	0.68	0.037	0.029	3.18	9.77	3.49	18.19	10.19	11.06	16.48	17.54	20.85
Range														
Max	30	12.02	3.025	6	95	91.50	8916.7	8.15	14.1	25.97	13.05	1.25	0.35	0.2265
Min	15	8	2	2.67	57.5	80.75	5851	5.16	8.87	21.1	7.37	0.42	0.2	0.13

genotype Pusa Basmati-1509 (5851). The maximum speed of germination was observed in the genotype NDR-3112 (8.15). Whereas the minimum speed of germination was observed in the genotype Pusa Basmati-1509 (5.16). The maximum root length was observed in the genotype NDR-3112 (14.01 cm). Whereas the minimum root length was observed in the genotype Pusa Basmati-1509 (8.87 cm). The maximum shoot length was observed in the genotype HUR-105 (13.05 cm).

Whereas the minimum shoot length was observed in the genotype BPT-5204 (7.37 cm). The maximum seedling length was observed in the genotype Pusa Basmati-1509 (25.97 cm). Whereas the minimum seedling length was observed in the genotype SHIATS DHAN-1 (19.62 cm). The maximum seedling fresh weight was observed in the genotype Sarju-52 (1.25 g). Whereas the minimum seedling fresh weight was observed in the genotype BPT-5204 (0.42 g). The maximum seedling dry weight was observed in the genotype NDR-3112 (0.35 g). Whereas the minimum seedling dry weight was observed in the genotype BPT-5204 (0.2 g). The maximum seed metabolic efficiency was observed in the genotype NDR-3112 (0.2265). Whereas the minimum seed metabolic efficiency was observed in the genotype Sarju-52 (0.13). The data for present study was similar to the findings of different researches like variations in test weight are closely related with findings of Kanchana et al. (2012), Babu et al. (2013). The overall above characters are similar with the findings of are Singh et al. (2005), Babu et al. (2013), Srivastava and Jaiswal (2013), Thomas et al. (2013), Sarkar et al. (1994).

Conclusion

It was concluded that the genotype NDR-3112 has been identified as the best genotype for the seed quality parameters viz, seed width, seed density germination (%), speed of germination, root length (cm), dry root weight, shoot length (cm), seedling length (cm) and seed metabolic efficiency. Whereas genotype Pusa Basmati-1509 has found superior for, test weight, seed length, seedling length and seed length/width ratio of seeds.

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