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Selection of most desirable genotypes for varietal development in rice (*Oryza sativa* L.)

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Abstract
Rice attains unique position in agriculture and economy of our country because of being first most important food crop. During last four decades, India has achieved tremendous increase in production, area and productivity of rice. The characters studied were days to 50% flowering, days to maturity, plant height, number of seeds per panicle, panicle length, harvest index, number of tillers per plant, biological yield, number of panicle bearing tillers per plant, 1000-seed weight, Germination percent, Seedling length, Vigour index and Seed yield per plant. The variance was found highly significant with all the treatments at 1 % probability level.

Keywords: Germination, unique, vigour index, productivity

Introduction
Rice (*Oryza sativa* L.) is the most important staple food crop of the world because of being the major source of calories of more than half of the total global population. The importance of rice is not only as a fundamental commodity and primary food source for more than half of the world's population, but also influences issues of global concern such as food security and development. More than 90 per cent of the world's rice is grown and consumed in Asia, known as rice bowl of the world, where 60 per cent of the earth's people and two third of world's poor live. Rice being the staple food for more than 70 per cent of our national population and source of livelihood for 120-150 million rural households is backbone to the Indian Agriculture.

Protein content of milled rice is 6-7 per cent, rice however, compares favorably with other cereals in amino acid content. The biological value of protein is high, the fat content of rice is low (2.0-2.5%) and much of the fat is lost during milling. Rice grain contains as much B group vitamin as wheat. Milled rice losses valuable proteins, vitamins and minerals in the milling process during which embryo and aleurone layer are removed and much of the loss of nutrients can avoided through parboiling process. The by-products of rice milling are used for a variety of purposes. Rice bran is used as cattle and poultry feed. Rice hull can be used in manufacture of insulation materials, cement and cardboard as well as a litter in poultry keeping. Rice straw can be used as cattle feed as well as litter during winter. Rice is grown almost throughout the year in hot and humid reasons of eastern and southern parts of India where two or three crops in a year is uncommon. Rice, being the staple food for more than 70 percent of our national population alongwith the source of livelihood for 120-150 million rural households.it is a backbone to the Indian agriculture. Rice production (according to USDA 2016/2017) is forecast higher at 105 MMT from 43.5 million hectare compared to 2015/16 production of 103.5 million tons in India (Grain report 2016).

Rice (*Oryza sativa* L.) is a semi-aquatic annual grass plant belongs to the genus *Oryza*, tribe Oryzeae and family Poaceae. It is the second largest principal food crop in the world after wheat and is one of the main staple food crop in India. Besides being the staple food crop, it has been the cornerstone of food and culture for our people. Among seven billion people on the earth, more than half of them depend on this crop for principal source of energy in their daily diet. Rice is distributed over a wider range of latitude from 50 ^{0} N to 40 ^{0} S and is being grown up to an altitude of 2500 meters. It evolved in humid tropics as a semi aquatic plant and it has got unique adaptive nature to hot humid environment, which is not seen in any other major cereal crop.

Rice yield in India fluctuate greatly in time and space on account of its cultivation under Diverse weather, ecological and socio-economic conditions. Out of the total 43.86 million ha. Under rice, 20 million ha. area is irrigated and the remaining 23.86 million ha. area is Cultivated in rainfed conditions. Rice can be grown under different agro-ecological environments.

Materials and Methods

The present study was designed to work out status of variability, among the thirty rice genotypes at field experiment under present investigation was conducted during *Kharif*, 2017-18 at Central Research Station (Mashodha) Faizabad and lab experiments were conducted in Seed Testing Laboratory Seed Technology Section, N.D. University of Agriculture and Technology, Narendra Nagar (Kumarganj) Faizabad (U.P.). The experimental materials of studies comprised of twenty seven rice varieties/lines/genotypes from Indian origin along with 3 check varieties *viz*., Baranideep, Shushk Samrat, NDR97. The experiment was laid out in Randomized Block Design comprising. The observations were recorded on Fourteen different yield components and seed quality parameters. Data analysis as per Standard statistical techniques such as analysis of variance genotypic and phenotypic coefficient of variation by Burton and de Vane (1953) [2] and Johnson (1955) [5].

Results and Discussion

In order to evaluate the germplasm collections, the mean performance of 27 rice genotypes and 3 check varieties for 14 characters is present in table 1. Very wide range of variation in mean performance of genotypes was observed for all the characters under study. The comparison of mean performance of 27 entries and 3 checks for 14 quantitative traits using least significant differences revealed existence of very high level of variability among the lines evaluated in the present investigation.

The entry, NDR-1119 produced highest seed yield per plant (36.80 g) and also showed high mean performance for panicle length and 1000-seed weight.

The ten genotypes possessing higher seed yield per plant along with the higher yielder NDR-1119, Nagina, NDR-1176, NDR-118, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1. These ten genotypes also showed high mean performance for some other characters besides having higher yield.

Among them NDR-1177 which ranked second (215.00) was present in highest mean performance group for seeds per panicle.

In addition to the genotypes mentioned above, some other genotypes showed very high mean performance for other characters can be used as donors for improving those characters in a component breeding approach even if they have medium or low seed yield. In this context, the most desirable genotypes were NDR-1132-2, NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1 for early flowering; NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118 for early maturity; NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1177, NDR-1140 and NDR-118 for dwarf plant height; NDR-1119, Baranideep, NDR-97, Shusk Samrat and NDR-1140 for number of tiller per plant; NDR1119, NDR1140, NDR-1177, Baranideep and NDR-97 forpanicle bearing tiller per plant; NDR1119, NDR1140, NDR-1177, NDR-97 and NDR-1130-1 for panicle length; NDR1119, NDR1140, NDR-1177, NDR-97 and NDR-1130-1 for seeds per panicle; NDR-1132-2, NDR-1132-5, NDR-1130-1, NDR-1140, NDR-1161-1-1 and NDR-1023-2 for 1000-seed weight; NDR-1177, NDR-1119, NDR-97, Shushk samrat and NDR-1140 for biological yield per plant; NDR-1119, NDR-97, Baranideep, NDR-1140 and NDR-1159 for harvest index; NDR-1127, NDR-1132-2, NDR-1018-1-1-2, NDR-97 and baranideep for seed germination; NDR-1169-1-1, NDR-1119, Baranideep, NDR-97 and NDR-1132-6 for seedling length; NDR-1169-1-1, NDR-1119, NDR-97, Baranideep, NDR-1023-2 for vigour index; NDR-1119, NDR-97, NDR-1140, NDR-1130-1 and NDR-1177 for seed yield per plant.

The genotypes sowing very high mean performance in desirable direction as for various characters listed in Table 2 can serve as suitable donors for improving the characters for which they had high mean performance.

Table 1: Analysis of variance for 14 characters in rice germplasm

Characters	Source of variation		
	Replications	**Treatments**	**Error**
Degree of freedom	**2**	**29**	**58**
Days to 50% Flowering	0.278	31.985**	0.588
Days to Maturity	0.278	44.223**	0.588
Plant Height cm	52.341	674.237**	19.778
Tillers/ Plant	0.286	2.060**	0.207
Panicle Bearing Tillers/ Plant	0.126	1.647**	0.055
Panicle Length cm	0.410	9.938**	0.697
Seeds/ Panicle	13.878	613.180**	36.395
Test Weight	0.012	9.507**	0.004
Biological Yield/Plant	0.409	22.259**	2.625
Harvest Index	0.001	5.665**	0.006
Germination %	2.233	19.738**	1.440
Seedling Length	0.262	10.748**	0.648
Vigour Index	3735.595	124929.060**	5560.861
Yield/ Plant	0.850	10.478**	1.137

Table 2: Most desirable rice genotypes identified for 14 characters

S. No	Characters	Promising lines
1.	Days to 50% Flowering	NDR-1132-2, NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1
2.	Days to Maturity	NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118
3.	Plant Height cm	NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1177, NDR-1140 and NDR-118
4.	Tillers/ Plant	NDR-1023-3,NDR-1176,NDR1161-1-1,NDR-1018-1-1-2,NDR1169-1-1,NDR1164-1-5,NDR-80, NDR-1055-6, IR-87707-446-B-B-B-M-2
5.	Panicle Bearing Tillers/ Plant	NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118
6.	Panicle Length cm	NDR-1132-2, NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1
7.	Seeds/ Panicle	NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118
8.	Test Weight	NDR-1023-3,NDR-1176,NDR1161-1-1,NDR-1018-1-1-2,NDR1169-1-1,NDR1164-1-5,NDR-80, NDR-1055-6, IR-87707-446-B-B-B-M-2
9.	Biological Yield/Plant	NDR-1119, Nagina, NDR-1176, NDR-118, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1
10.	Harvest Index	NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118
11.	Germination %	NDR-1023-3,NDR-1176,NDR1161-1-1,NDR-1018-1-1-2,NDR1169-1-1,NDR1164-1-5,NDR-80, NDR-1055-6, IR-87707-446-B-B-B-M-2
12.	Seedling Length	NDR-1132-2, NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1
13.	Vigour Index	NDR1127, NDR-97, Baranideep, Shushk samrat, NDR-1159, NDR-1018-1-1-2, NDR1119, Nagina, NDR-1176, NDR-118
14.	Seed yield per plant	NDR-1119, Nagina, NDR-1176, NDR-118, Shushk samrat, NDR-1159, NDR-80, NDR-11140, NDR-1132-5 and NDR-1161-1-1

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