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RESPONSES OF RICE GENOTYPES GROWN UNDER ACIDIC AND NEUTRAL SOILS OF NORTHERN HILLS OF CHHATTISGARH, INDIA

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Abstract

Rice grown in hills suffers serious yield loss due to soil acidity. A set of genotypes was selected for the evaluation of genotypes, which performs good in acidic and neutral soils. The present investigation was laid out under Randomized Block Design with three replication in two different experimental sites *i.e.*, Farmer's field at village Ajirma having low pH and RMD College of Agriculture and Research Station, Ajirma, Ambikapur (Chhattisgarh, India) having neutral pH. The results indicated that in acidic soils and neutral soils the highest yield was showed by Mahamaya which contributes due to yield components like filled grains panicle^{-1}, effective tillers hill^{-1} and test weight. In broad sense, yield is directly influenced by yield components and selection based on these traits would be very effective in rice grown under acid soil conditions.

Key words : Randomized block design, soil acidity, biotic and abiotic stress.

Introduction

Rice is one of the most important cereals and is a major source of food for large number of the people worldwide. It is the single largest source of food energy to more than half of the world population (Ammar *et al*., 2007). It is the dominant staple food of Asia, accounting for more than 70% of caloric intake. Rice production is affected by many biotic and abiotic stresses throughout the world, among which abiotic stress alone contributes to about 50% of the total yield losses. Number of plant traits has been found associated with sustained yield under stress conditions. In cereals and other crops where seed is of importance with respect to economic yield, proper and timely start of the reproductive stage and adequate period for grain filling ensures better yield. It is very important to select rice varieties that have a greater tolerance to acidity for growing in an area where acidity is a problem. The present study aimed to screen out the acidity tolerant rice varieties by evaluating grain yield performance of different rice varieties grown under acidic and normal condition, agronomic characterization of acid tolerant varieties and to study genotypic differences with respect to acidity tolerance in rice.

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Materials and Methods

The present investigation was carried out in the year 2014 *Kharif* in Randomized Block Design with three replication and twelve medium duration rice genotypes, which was tested with recommended doses of fertilizer *i.e.*, 100:60:40 in two different soil pH acidic (pH 4.5) and neutral (pH 6.6). Data collected from ten plants of each rice genotypes for each replication was made average and thus data were collected for each rice genotypes for 3 replications. Agronomic traits for which data were collected were number of effective tillers/hill, number of unfilled grains/panicle, number of filled grains/panicle, 1000 grain weight, grain yield, straw yield at harvest. Initial status of the soil in case of acidic soil available N P K recorded was 151.60, 9.63 and 148.06 kg ha^{-1} respectively and in case of neutral soil available N, P and K status in soil was 232.6, 14.89 and 318.50 respectively.

Results and Discussion

No. of effective tillers hill^{-1}

Number of effective tillers hill^{-1} was counted at harvest and data are presented in tables 1 and 2. Results showed that in acidic soil varieties Mahamaya showed significantly superior no. of effective tillers hill^{-1} (7.02), which was followed by MTU 1010, Indira Maheshwari

Table 1 : Performance of of different rice genotypes grown in acid soil.

Treatments	Grain yield (q ha^{-1})	No. of filled grains panicle^{-1}	No. of unfilled grains panicle^{-1}	No. of effective tillers hill^{-1}	Test weight (g)
V1- Indira Maheshwari	36.96	89.37	15.16	5.74	23.13
V2- R-1688-2150-5-2060-1	22.76	79.39	26.23	4.36	19.74
V3- Sampada	25.52	80.80	24.03	4.60	18.82
V4- Mahamaya	39.35	93.21	13.05	7.02	26.49
V5- Bamleshwari	38.23	96.80	21.10	5.80	23.91
V6- Vijeta (MTU 1001)	26.72	86.20	24.31	4.55	23.29
V7- Shyamla	16.81	71.03	32.26	4.09	18.13
V8- R 1661-605-84-1	28.27	80.40	23.23	4.64	18.87
V9- R 304-34	27.16	78.10	29.73	4.62	21.19
V10- IGKVR2 (Durgeshwari)	34.03	87.13	15.23	5.20	20.37
V11- Karma Mahsuri	33.04	83.93	20.36	5.54	18.27
V12- MTU 1010	37.83	91.97	18.07	6.42	26.11
SEm±	**0.95**	**0.43**	**1.16**	**0.12**	**0.31**
CD (P=0.05)	**2.78**	**1.26**	**3.40**	**0.37**	**0.93**

Table 2 : Performance of different rice genotypes grown in neutral soil.

Treatments	Grain yield (q ha^{-1})	No. of filled grains panicle^{-1}	No. of unfilled grains panicle^{-1}	No. of effective tillers hill^{-1}	Test weight (g)
V1- Indira Maheshwari	53.78	108.79	23.62	6.80	25.54
V2- R-1688-2150-5-2060-1	38.58	87.18	25.22	4.47	22.74
V3- Sampada	39.20	90.81	29.31	6.33	20.45
V4- Mahamaya	59.64	118.28	20.73	7.93	29.53
V5- Bamleshwari	55.79	112.85	22.47	7.70	26.08
V6- Vijeta (MTU 1001)	44.81	91.27	26.30	6.40	25.68
V7- Shyamla	32.17	85.97	31.28	5.32	19.92
V8- R 1661-605-84-1	42.85	82.87	29.48	7.30	20.33
V9- R 304-34	57.28	113.25	21.93	6.91	23.96
V10- IGKVR2 (Durgeshwari)	43.98	90.40	27.28	5.45	21.71
V11- Karma Mahsuri	38.12	87.27	27.89	7.77	19.64
V12- MTU 1010	47.07	96.20	24.27	6.75	28.90
SEm±	**3.00**	**0.37**	**0.43**	**0.13**	**0.38**
CD (P=0.05)	**8.82**	**1.10**	**1.27**	**0.39**	**1.12**

and Karma Mahsuri and the lowest no. of effective tillers was recorded by Shyamla (4.09), whereas in neutral soil Mahamaya (7.93), which is significantly superior and at par with Karma Mahsuri and Bamleshwari and followed by (R 304-34), Indira Maheshwari and MTU 1010 while the lowest no. of effective tillers hill^{-1} was recorded by R-1688-2150-5-2060-1 (4.47).

No. of filled grains panicle^{-1}

The data presented in tables 1 and 2 showed that number of filled grains panicle^{-1} in acidic soils were found significantly superior in Bamleshwari (96.80) followed by Mahamaya and MTU 1010 and the lowest no. of filled grains panicle^{-1} was observed in Shyamla (71.03), whereas in neutral soils Mahamaya (118.28) are independently significantly superior among all the treatment, which was further followed by R 304-34, Bamleshwari and Indira Maheshwari and the lowest no. filled grains panicle^{-1} was showed by R 1661-605-84-1 (82.87).

Test weight

The data presented in tables 1 and 2 and stated that in acidic soil the highest test weight was found in Mahamaya (29.49 g), which was found significantly superior and at par with MTU 1010 and followed by Bamleshwari, Vijeta and Indira Maheshwari and

comparatively lowest test weight was found in genotype Shyamla (18.13 g).

In neutral soil, highest test weight was found in Mahamaya (29.53g), which was found significantly superior among all other genotypes followed by MTU 1010, Bamleshwari, Vijeta and Indira Maheshwari and the lowest test weight was found in Karma Mahsuri (19.64 g).

Grovois and McNew (1993) reported that genotypes produced higher number of effective tiller and grain per panicle also resulted in higher grain yield of rice. The yield attributing traits are genetically controlled which vary with genotypes and also influenced by environmental factors. The results of the study were similar as reported in rice by Counce *et al*. (1996) and in dry bean by Wallace *et al*. (1972), Fageria *et al*. (2007) and Sharma and Dadhich (2003).

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