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Genetical analysis in rice (*Oryza sativa* L.) Under saline environment

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ABSTRACT

Genetic parameters of variability and heritability of different characters were studied in 60 genotypes of rice. The maximum genotypic coefficient of variability and phenotypic coefficient of variability were observed for straw yield per plant, grain yield per plant, total biological yield per plant, number of filled geains per panicle. The heritability estimates were highest for 100-gain weight. The genetic advance as percentage of mean were higher for total biological yield per plant and gain yield per plant will be useful for further breeding programme.

Keywords: rice (*Oryza sativa* L), variability, heritability, genotypes

Introduction

Rice (*Oryza sativa* L. 2n:2x: 24) belonging to the genus *Oryza* includes 24 species, out of which 22 species are wild and only two species *viz.*, *O. sativa* and *O. glaberrima* are cultivated. The genus *Oryza* belongs to the tribe *Oryzeae* in the family Poaceae. Rice is the most important cereal crop cultivated widely in many parts of the world. Rice is the world's most important food crop and primary source of food for more than half of the world's population. India has the second largest area under rice crop and ranks second in production next to china.

Variation is the basis of plant breeding. The success of any crop improvement programme will largely be depend on the magnitude and range of variability on the available genetic stock. A critical estimate of genetic variability is a prerequisite for initiating appropriate breeding procedures in crop improvement programmes. The heritable variation is masked by non-heritable variation, which creates difficulty in exercising selection. Hence, it becomes necessary to spilt over-all variability in to its heritable and non-heritable components with the help of certain genetic parameters, which may enable the breeders to plan out proper breeding programme. Since many characters of economic importance are highly influenced by environmental conditions. Therefore, the progress of a population mainly depends upon the amount and magnitude to genotypic variability present in the population.

Materials and Methods

The experimental material used in the present study is included 60 genotypes of rice. The study was conducted at the plant breeding farm Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nager. The experimental field is under saline Condition with pH of 7.7 and EC of 4.4 dSm^{-1}. These genotypes were grown with all the recommended cultural practices. The experiment was laid out in Randomized Block Design, consisting of three replications. The crop was spaced row-to-row 20 cm and plant-to-plant 15 cm. Observations were obtained on five competitive plants for plant height, number of productive tillers per plant, length of panicle, length of boot leaf, number of branches per panicle, number of grains per panicle, 100-gain weight, straw yield per plant, total biological yield per plant, harvest index % and grain yield per plant. The coefficient of variation was estimated as suggested by Burton (1952) [3], heritability according the formula suggested by Hanson *et al*., (1956) [5, 6]. Expected genetic advance was estimated as suggested by Allard (1960) [1].

Table 1: Estimates of different genetic parameters in Rice

Characters	No. of effective tillers / plant	Height of plant	Length of boot leaf	Length of panicle	No. of branches / panicle	No. of ertile florets /plant	1000 grain weight	Straw yield / plant	Total biological yield/ plant	Harvest index %	Grain yield plant
Genotypic coefficient of variability (G.C.V.)%	8.73	14.30	8.10	7.58	16.04	22.12	10.31	27.77	23.62	11.90	24.83
Phenotypic coefficient of variability (P.C.V.)%	18.05	15.00	10.36	9.00	16.01	25.28	11.07	32.17	27.45	13.04	29.21
Heritability (H)%	23.09	87.26	79.90	79.78	93.05	88.75	97.55	74.88	74.08	82.46	73.07
Genetic advance (G.S.)%	1.09	24.90	4.29	3.58	3.06	58.54	4.46	11.25	18.35	11.48	8.94
Genetic advance % of mean	8.57	27.62	15.77	13.10	32.03	45.23	21.16	49.36	42.00	23.06	43.04
Grand mean	11.28	89.94	26.36	25.21	10.50	129.02	22.22	22.19	43.19	50.09	21.00
Coefficient of variation (C.V.)%	16.29	5.24	4.94	4.42	4.00	8.00	2.00	19.00	14.10	5.50	15.14
Critical difference (C.D.) at 5%	3.209	8.902	1.503	1.501	0.201	2.309	1.006	5.688	9.687	4.409	5.187

Results and Discussion

Analysis of variance showed highly significant differences due to treatments for all the characters. In general estimates of phenotypic coefficient of variability (PCV) were higher than those due to genotypic coefficient of variability for all characters (Table-1). This view has also been reported by (Das *et al.,* 2001) [4].

The genotypic coefficient of variability was found maximum for straw yield per plant followed by grain yield per plant, total biological yield per plant, number of filled grains per panicle, number of branches per panicle and minimum length of panicle followed by length of boot leaf (Karthikeyan (2003) [8]

. High variability has been reported in rice for grain yield per plant and number of fertile florets per panicle (Das *et al.,* 2001; Sundram *et al.,* 1988) [4] and minimum length of panicle by Das *et al.,* (2001) [4]. The heritability was found highest in all the characters except number of productive tillers per plant. Maximum heritability were observed for 100-grain weight, number of filled grains per panicle, plant height, harvest index, panicle length, length of boot leaf and minimum heritability number of productive tillers per plant. This trend was also observed in the rice for 100-grain weight and plant height by Ali *et al.,* (2000) [2]; Sun (1979) [12] and Maurya (1976) [9]. Number of filled grains per panicles was similar to the findings of Ali *et al.,* 2000 [2] and Maurya, 1976. Burton (1952) [3] suggested the genetic coefficient of variation along with heritability give clear picture of the amount of advance to be accepted from selection. The character, which exhibited high heritability, indicates the presence of additive gene action and such character could be fixed by resorting to selection (Panse, 1957) [10]. In the present studies, the character *viz*. 100-grain weight, panicle length, straw yield per plant had grain yield per plant and high heritability values however, exhibited low genetic advance. Similar result for length of panicle and 100-grain weight was reported earlier (Das *et al.,* 2001) [4]. Thus indicated the presence of non-heritable variability. High heritability coupled with genetic advance can be more useful in selection types with such characters. A relative comparison of heritable estimates and expected genetic advance expressed as percentage of mean will give an idea about a nature of gene action governing a particular character. A comparison of heritability and genetic advance as percentage of mean revealed that straw yield per plant, number of grains per plant, total biological yield per plant and grain yield per plant had high heritability coupled with high-expected genetic advance a percentage of mean. This showed the substantial contribution of additive genetic variance in the expression of these characters. These findings were in confirmation with earlier report of Johnson *et al.,* (1995) [7] while, number of fertile florets per panicle and grain yield per plant were found similar to the observations of (Shivani and Sree Rama Reddy, 2000) [11].

On the basis of heritability estimates and expected genetic advance as percentage of mean for different characters studied in the present studies selection, criteria based on straw yield per plant, number of filled grains per plant, total biological yield per plant and grain yield per plant will be useful further improvement of rice.

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