

Variability and Genetic Parameters for Yield and Yield Components in Rice (*Oryza sativa*)

Key words : Genetic Advance, Genetic Parameters, Heritability, Rice, Variability.

Yield is a complex trait and is polygenic in nature. This needs a deeper insight into the nature of variability present in the germplasm. The magnitude of heritable variation in breeding, more particularly its genetic component has immense value in the fixation of particular trait. Heritability coupled with genetic advance would be more useful tool in predicting the resultant effect from selection of best genotypes for various important yield attributes and yield. The present study was done to evaluate released cultivars of different states and local land races, compare their relative performance and study variability and genetic parameters for yield and yield contributing traits.

A diverse set of twenty rice genotypes from different states of India were evaluated in Allahabad agroecological conditions to assess their comparative performance. Thirty days old seedlings were used for transplanting in randomized block design with three replications. Spacing between plant/plant and row/row was 15 and 20 cm respectively and normal recommended agronomical practices were followed to raise a good crop. Data were collected in each genotype in three replications for plant height, total tillers, panicle length, flag leaf length, flag leaf width, productive tillers, maturity duration, spikelets panicle⁻¹, biological yield plant⁻¹, test weight, harvest index and yield plant⁻¹. The data were analyzed for analysis of variance, coefficient of variation according to Burton and De Vane (1953). Heritability (H) in broad sense was calculated according to Hanson *et al* (1956) and genetic advance (GA) as per Johnson *et al* (1949).

The analysis of variance exhibited significant differences for all the characters studied except flag leaf width indicating presence of wide variability among the genotypes studied. The considerable range of variation expressed indicated good scope for genetic improvement. Less variation for flag leaf width has also been earlier reported by Devi *et al* (2006). Tata Mahsuri recorded highest yield/plant (43.5 gms) followed by Nati Mahsuri, Ratna, Mahsuri and Pant Dhan 12. Among the released cultivars Samba Mahsuri, MTU 1010, MTU 2067 from Andhra Pradesh along with Pant Dhan 12, Pant Dhan 4,

Sarjoo 52, Mahsuri and Narendra 359 performed better providing farmers choice to select varieties from different states also.

Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were highest for spikelet number (35.1%, 36.8%), followed by yield/plant (29.4%, 30.0%), harvest index (27.7%, 28.4%), plant height (27.7%, 28.2%), biological yield (22.6%, 24.2%), test weight (23.5%, 23.8%) and number of total (19.6%, 23.5%) and productive (19.9%, 23.2%) tillers (Table). The high values of GCV for these traits suggested the possibility of yield improvement through selection of these traits. The above findings are in conformity with Singh *et al* (2005) and Devi *et al* (2006). PCV values were higher than GCV values for all the traits studied indicating interaction of all the characters with the environment but the difference was low indicating meagre influence of environment on these traits. Such results have also been noted by Singh and Chakraborty (1996), Krishna Veni *et al* (2002) and Devi *et al* (2006). Lowest GCV and PCV were observed for maturity duration (8.5%, 9.0%) followed by flag leaf width (10.2%, 13.8%) and panicle length (13.0%, 15.1%). Low GCV and PCV values for these traits have also been reported by Shivani and Reddy (2000) and Devi *et al* (2006).

Heritability (in broad sense) ranged from 97.2% (test weight) to 54.3% (flag leaf width) while genetic advance (% of mean) ranged from 69.1% (spikelet number) to 15.4% (flag leaf width). High heritability coupled with high genetic advance was observed for test weight (97.2%, 47.7%), yield/plant (96.5%, 59.6%), plant height (96.3%, 55.9%), harvest index (96.1%, 54.8%) and spikelet number (91.3%, 69.1%) while biological yield (87.6%, 43.7%) and flag leaf length (84.7%, 40.9%) have exhibited high heritability and moderate genetic advance. High heritability and genetic advance for above traits were also reported by Shivani and Reddy (2000), Krishna Veni *et al* (2002) and Devi *et al* (2006).

Low variability, heritability and genetic advance was recorded for flag leaf length and harvest index indicating the influence of additive gene action in controlling the expression of these traits. Hence, simple phenotypic selection for these traits may not

Table 1. Genetic parameters for different traits in rice genotypes

Trait	Mean	PCV	GCV	GA (%mean)	H (%)	Best genotypes for this trait
Plant height (cm)	87	28.2	27.7	55.9	96.3	RGL 1880, MTU 7029, MTU 2067, BPT 5204
Productive tillers	15.6	23.2	19.9	35.1	73.7	Pant Dhan 4, MTU 1010, Ratna, BPT 5204, MTU 2067
Panicle length (cm)	23.5	15.1	13.0	23.2	74.7	Savithri, Pant Dhan 12, Nati Mahsuri, Pusa 44, MTU 1010
Total tillers	16.1	23.5	19.6	33.6	69.5	Pant Dhan 4, MTU 1010, BPT 5204, Ratna, MTU2067
Spikelets panicle ⁻¹	201.4	36.8	35.1	69.1	91.3	Tata Mahsuri, Pant Dhan 4, Pusa 44, Ratna
Flag leaf length (cm)	26.1	23.5	21.6	40.9	84.7	Ratna, Savithri, Saryu 52, Pant Dhan 12, Tata Mahsuri
Flag leaf width (cm)	1.4	13.8	10.2	15.4	54.3	Tata Masuri, Nati Mahsuri, Mahsuri Tall, Pant Dhan 4, Pant Dhan 12
Maturity Duration(Days)	133.7	9.0	8.5	16.4	89.8	Pant Dhan 4, BPT 5204, More Pankhi, RGL 1880, MTU 1010
Biological yield plant ⁻¹ (g)	87.7	24.2	22.6	43.7	87.6	BPT 5204, Tata Mahsuri, Mahsuri Tall, Pant Dhan 4, More Pankhi
Test weight (g)	23.2	23.8	23.5	47.7	97.2	Saryu 52, Mahsuri Tall, Pusa 44, Narendra 359, Ratna
Harvest Index	31.0	28.4	27.7	54.8	96.1	Narendra 359, Nati Mahsuri, Ratna, Proagro 4, Pant Dhan 12
Yield Plant ⁻¹ (g)	27.3	30.0	29.4	59.6	96.5	Tata Mahsuri, Nati Mahsuri, Ratna, Mahsuri (Tall), Pant Dhan 12

PCV = Phenotypic Coefficient of Variation

GCV = Genotypic Coefficient of Variation

GA = Genetic Advance

H = Heritability (broad sense)

be fruitful as these characters are highly influenced by the environment. Hence, it may be concluded that spikelet number, plant height, harvest index, yield/plant, test weight and productive tillers showed moderate to high genetic parameter values and hence these traits may be selected for improvement of grain yield in rice.

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