



## Study of Genetic Parameters and Character Association of Different Agro-Morphological Characters in some Paddy Genotypes for Saline and Non-Saline Belts of West Bengal, India

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### Abstract

*The aim of this experiment was to estimate the phenotypic and genotypic coefficients of variation, broad sense heritability, genetic advance and correlations in some paddy genotypes for both saline and non-saline location. For this purpose field trial was conducted in two zones non-saline and saline with forty three paddy genotypes for three consecutive years. At maturity eight agro-morphological characters were studied. After that the following statistical analyses were carried out. The GCV (Genotypic coefficient of variation), PCV (Phenotypic coefficient of variation), heritability (H) in the broad sense, genetic advance (GA) and GA% of mean was calculated. Phenotypic and genotypic correlation coefficients were also estimated. High GCV, PCV, broad sense heritability and GA was obtained for two characters grains/ panicle and seed yield/plant for both the locations. For non-saline zone (genotypic) seed yield/ plant was significantly associated with plant height, panicles/ plant, grains/ panicle and days to maturity and for the saline zone it was plant height, tillers/ plant, panicles/ plant, grains/ panicle, panicle length, 1000 seed weight and days to maturity. Thus there was a change under the saline conditions. More number of characters influence seed yield under the saline stress as seed yield per plant was directly associated with all the other seven characters present. Both under phenotypic and genotypic level plant height, number of grains per panicle, panicles per plant and days to maturity continue to register significant correlation with seed yield per plant. Tillers per hill and panicles per plant as well as grains per panicle and days to maturity gave significant and consistent inter relationship. Therefore, the results suggest tillers/ hill can be considered to be an important yield contributing trait along with panicles/ plant, grains/ panicle, plant height and days to maturity. Selection based on these traits would be most effective even under saline conditions.*

**Keywords:** Coefficient of variation, heritability, genetic advance, correlation, seed yield, saline zone.

### Introduction

In a report published by United Nations the world population is going to cross the 8 billion mark by 2030 and 9.6 billion by the year 2050 when the demand for rice is also estimated to increase by 50%<sup>1</sup>. So, estimating the average annual population growth rate we have to grow 50% more rice with fewer natural resources. Hence, plant breeders are very much concerned for developing paddy cultivars with better yield and other desirable associated characters. Creation of genetic variation for agronomic traits is the main aspect of breeding program for increasing the gene pool of rice. This information regarding phenotypic and genotypic interaction of several valuable important traits is of immense importance to a rice breeder for the selection of various genotypes with improved yield aspects<sup>2</sup>. Plant breeders commonly select for yield components which indirectly increase yield. But rice is subjected to important biotic and abiotic stresses which dramatically reduce yield globally, with salinity being one of the major abiotic stresses. Abiotic stress is the major threat to crop production worldwide, reducing average yields of major crops by more than 50%. The total area under salinity is 953 million hectares which covers 8%

of the land surface<sup>3</sup>. The coastal areas are particularly vulnerable to salinity due to saline water intrusion and rise in the sea level as a consequence of global warming<sup>4</sup>. Therefore, the objective of this study was to estimate genetic parameters and character association among the rice genotypes for both saline and non-saline location.

### Material and Methods

The experimental material for the work comprises of forty three paddy genotypes which were procured from different parts of West Bengal and Orissa. The field trial was conducted in two zones namely saline and non-saline. The non-saline zone was the Calcutta University's Experimental farm at Baruipur, 24 Parganas (S) for three consecutive years of 2010, 2011 and 2012. While the trial for the saline zone was conducted for the same three consecutive years of 2010, 2011 and 2012. For the first two years the trial was conducted at Muriganga, Sagardeep, 24 Parganas (S) and the third trial was conducted at Hingalganj, 24 Parganas (N). The seeds were sown in Randomized Block Design (RBD) with three replications in the 1<sup>st</sup> week of July. At maturity plants were harvested taking five randomly selected

plants from each replication and their plant height, number of tillers per hill, number of panicles per plant, number of grains per panicle, panicle length, 1000 seed weight, seed yield per plant and days to maturity were recorded as per method of Standard Evaluation System for rice<sup>3</sup>. After that the following statistical analyses were carried out. The GCV (Genotypic coefficient of variation), PCV (Phenotypic coefficient of variation), heritability (H) in the broad sense, genetic advance (GA) and GA% of mean was calculated. Phenotypic and genotypic correlation coefficients were also estimated.

## Results and Discussion

The present study is primarily concerned with the selection of suitable paddy genotypes which would be appropriate for the coastal zone of West Bengal during the *aman* season. For the purpose of selection, multi-location (saline and non-saline) evaluation was conducted over the years which is divided into two distinct parts a) Baruipur (non-saline) and b) Sagardeep and Hingalganj (saline).

Baruipur (non-saline): The GCV, PCV, heritability and GA was

estimated as per table-1. The PCV were slightly higher than those of GCV for all the traits studied. Both PCV and GCV were high for grains/panicle, 1000 seed weight, and seed yield/plant. For the pooled mean (non-saline) the GCV and PCV values were high for grains per panicle and seed yield per plant. The estimates of broad sense heritability varied from 23.6 to 99.6% (table-1). The present study, exhibited heritability as high as 80% in characters like plant height, grains/panicle, 1000 seed weight, seed yield/plant and days to maturity. For pooled mean high H% was observed for plant height, panicles/plant, grains/panicle, 1000 seed weight and seed yield/plant. GA was high for grains per panicle, seed yield/plant and 1000 seed weight recorded 40- 50% of gain and very low for panicle length. The GA% for pooled mean was high for grains per panicle and seed yield per plant ranging between 35- 50% of gain. High genetic variability for different quantitative traits in rice was also reported earlier<sup>6-7</sup>.

The genotypic correlation over three years and of their pooled mean at Baruipur was studied as shown in table-2 and table-3.

**Table- 1**  
**Variability parameters, heritability, genetic advance (GA) and GA % of mean under non-saline zone**

Parameters	Characters							
	Plant Height	Tillers/hill	Panicles/plant	Grains/panicle	Panicle length	1000 seed weight	Days to maturity (days)	Seed yield/plant
Baruipur 2010								
GCV	17.5	29.1	30.8	37.2	10.7	22.6	13.5	25.0
PCV	17.7	30.5	33.2	37.8	12.2	22.7	13.6	25.1
Heritability%	97.4	90.6	86.4	96.5	77.6	99.6	99.6	98.9
GA	35.1	6.2	5.4	110.3	4.4	10.7	39.7	12.7
GA % of mean	35.5	57.4	58.7	75.8	19.4	46.7	27.9	51.0
Baruipur 2011								
GCV	20.0	15.0	18.2	36.2	8.1	24.0	14.0	26.7
PCV	21.3	30.7	33.3	36.7	11.7	24.1	14.0	27.0
Heritability%	88.4	23.8	29.8	97.7	47.8	99.0	99.4	97.6
GA	51.0	2.0	2.4	105.1	2.7	12.0	40.9	13.3
GA % of mean	38.7	15.2	20.5	73.7	11.3	49.4	28.7	54.3
Baruipur 2012								
GCV	17.2	10.7	12.5	34.7	4.0	19.9	14.2	25.9
PCV	18.1	19.2	21.7	35.0	8.2	20.3	14.2	26.0
Heritability%	90.7	30.8	33.0	98.6	23.6	96.1	99.5	98.6
GA	42.8	2.1	2.3	109.6	1.0	9.4	41.1	13.8
GA % of mean	33.7	12.1	13.6	71.0	3.9	40.2	29.3	53.1
Non saline Pooled								
GCV	16.82	13.78	13.82	30.03	1.36	17.86	13.83	22.04
PCV	18.06	17.51	16.38	35.88	8.89	22.25	13.89	26.07
Heritability%	86.76	61.91	71.13	70.04	2.36	64.43	99.09	71.49
GA	38.2	3.1	2.9	76.3	0.1	6.9	40.2	9.7
GA % of mean	32.09	22.41	24.08	51.79	0.43	29.81	28.37	38.48

Note: GCV=Genetic Coefficient Of Variation, PCV=Phenotypic Coefficient Of Variation, H%=Heritability%, GA=Genetic Advance, GA% of Mean=Genetic Advance Percentage of Mean.

**Table-2**  
Genotypic correlations for three consecutive years for non-saline zone

Characters	Plant Height (cm)			No. of tillers/hill			No. of panicles/plant			No. of grains/panicle			Length of panicle (cm)			1000 seed weight(g)			Days to maturity (days)			Seed yield/plant (g)		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Plant Height (cm)	1	1	1	0.06	-0.07	0.12	0.09	0.16	0.12	0.25	0.79**	0.61**	-0.17	0.51**	0.21	0.46**	0.37*	0.30*	0.44**	0.60**	0.58**	0.26	0.81**	0.59**
No. of tillers/hill				1	1	1	0.91**	0.80**	0.93**	0.21	-0.09	0.48**	-0.01	-0.23	-0.08	-0.22	0.12	0.29	0.21	0.06	0.02	0.22	0.03	0.49**
No. of panicles/Plant							1	1	1	0.32*	0.08	0.44**	0.05	-0.19	-0.19	-0.19	0.17	0.15	0.15	0.27	-0.01	0.30*	0.13	0.47**
No. of grains/Panicle										1	1	1	-0.14	0.62**	0.27	-0.03	0.33*	0.16	0.42**	0.53**	0.56**	0.99**	0.99**	0.98**
Length of panicle (cm)													1	1	1	0.14	0.38**	0.63**	-0.41	0.60**	0.25	0.11	0.63**	0.18
1000seed weight(g)																1	1	1	0.13	0.27	0.22	0.004	0.28	0.13
Days to maturity (days)																			1	1	1	0.42**	0.56**	0.57**
Seed yield/plant (g)																						1	1	1

Note: I-2010, II- 2011, III-2012, \* and \*\* - 5% and 1% level of significance respectively

**Table 3**  
**Genotypic correlations of pooled mean for non-saline zone**

Characters	Plant Height (cm)	No. of Tillers / hill	No. of panicles/plant	No. of grains/panicle	Length of panicle (cm)	1000 seed weight(g)	Days to Maturity (days)	Seed yield/plant (g)
Plant Height (cm)	1.00	0.0448	0.1371	0.6729**	-0.0001	0.5315**	0.5896**	0.6672**
No. of tillers/hill		1.00	1.0148**	0.2225	-0.0001	0.0067	0.1860	0.2536
No. of panicles/plant			1.00	0.2868	-0.0001	0.1112	0.2161	0.3279*
No. of grains/panicle				1.00	-0.0001	0.2383	0.5973**	1.0029**
Length of panicle (cm)					1.00	-0.0001	-0.0001	-0.0001
1000seed weight(g)						1.00	0.2521	0.2205
Days to maturity (days)							1.00	0.6094**
Seed yield/plant(g)								1.00

Significant association with seed yield/plant was observed for the characters grains/panicle and days to maturity for three consecutive years, panicles per plant and plant height for two consecutive years. While for the pooled seed yield/ plant was positively associated with plant height, number of panicles/ plant, grains /panicle and days to maturity. For phenotypic correlation table-4 and table-5 seed yield per plant revealed similar results as in for genotypic correlation except number of panicles per plant was found to be significantly correlated with seed yield only for one year and for pooled mean seed yield/ plant was significantly correlated with plant height, grains/ panicle and days to maturity table-5. Out of these characters grains/panicle recorded exceptionally consistent correlation for all the years and even for the pooled mean which are in accordance with some of the previous findings<sup>8-10</sup>.

Sagardeep and Hingaljanj (saline): The results as per table-6 revealed that the estimates of PCV were higher than those of GCV for all the traits studied similar to that of non-saline zone. Number of tillers/ hill, panicles/plant, grains /panicle, 1000 seed weight and seed yield /plant exhibited high range of GCV and PCV values while for the pooled both PCV and GCV were high for grains/panicle and seed yield/plant. The present study, exhibited heritability as high as 80% and above in characters like plant height, grains/panicle, 1000 seed weight, days to maturity and seed yield/plant. High to moderate heritability was reported for different quantitative traits studied in rice<sup>11-13</sup>. While it was grains/panicle, days to maturity and seed yield/plant for the three years pooled mean. High estimate of GA% was recorded for seed yield per plant, grains per panicle, and thousand grain weights. Genetic advance for pooled mean at saline zone as per table-3 was high for grains/ panicle and seed yield /plant with 40- 50% of gain.

Seed yield/plant for three consecutive years at genotypic level (table-7) was found significantly associated with grains/panicle and days to maturity for three consecutive years, panicle length and 1000 seed weight for two consecutive years. Phenotypic correlation over the years (table-9) also revealed similar correlations with seed yield as in genotypic correlation and the pooled mean exhibited significant correlation with plant height, grains per panicle 1000 seed weight and days to maturity at

phenotypic level (table-10). Grain yield was found to be positively associated with grains/panicle both at genotypic (table-8) and phenotypic levels (table-10) indicating the importance of these traits for yield improvement of rice in coastal saline belts of West Bengal<sup>14</sup>.

## Conclusion

In this study considering all the locations and all the years of study and pooled mean of both locations relatively high GCV, PCV, broad sense heritability and GA obtained for grains/panicle and seed yield/ plant. Such a trend will indicate a largely additive genetic control for the characters.<sup>15</sup> Considering the correlation coefficient with respect to yield in both saline and non-saline zones over the span of three years has led to the conclusion that normal (non- saline) correlation profile has changed in saline correlation profile. When the correlations of the two zones were studied separately, some interesting results featured. For non-saline zone (genotypic) seed yield was significantly correlated with plant height, panicles numbers, grains/panicle and days to maturity. While that for saline zone it was plant height, tillers per plant, panicles per plant, number of grains per panicle, panicle length, 1000 seed weight and days to maturity. Thus there was a change under the saline conditions. More number of characters influence seed yield under the saline stress as seed yield per plant was directly associated with all the other seven characters present. Consistent character association at genotypic level was only of four (plant height, panicles per plant, grains per panicle and days to maturity) attributes and they prove to be major yield attributing traits. Phenotypic and genotypic correlations reveal that plant height, grains/panicle, panicles numbers and days to maturity continue to register significant correlation with seed yield/plant for both saline and non-saline locations. Tillers per hill and panicles per plant as well as grains per panicle and days to maturity gave significant and consistent inter relationship. This indicates that more, the number of tillers more will be the panicle number. Therefore, the results suggest tillers per hill can be considered to be an important yield contributing trait along with panicles per plant, grains per panicle, plant height and days to maturity selection based on these traits would be most effective even under saline conditions.

**Table 4**  
Phenotypic correlations for three consecutive years for non-saline zone

Character	Plant Height (cm)			No. of tillers/hill			No. of panicles/plant			No. of grains/panicle			Length of panicle (cm)			1000 seed weight(g)			Days to maturity (days)			Seed yield/plant (g)		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Plant Height (cm)	1	1	1	0.05	0.07	0.12	0.08	0.18	0.10	0.25	0.74**	0.57**	-0.15	0.30*	0.13	0.46**	0.33*	0.29	0.44**	0.57**	0.55**	0.26	0.76**	0.56**
No. of tillers/hill				1	1	1	0.91**	0.89**	0.94**	0.20	-0.03	0.25	-0.02	-0.12	0.11	-0.21	0.05	0.17	0.20	0.03	0.02	0.21	0.01	0.26
No. of panicles/plant							1	1	1	0.30*	0.06	0.26	0.05	-0.13	0.09	-0.18	0.08	0.1	0.14	0.15	-0.01	0.28	0.80**	0.26
No. of grains/panicle										1	1	1	-0.12	0.4**	0.12	-0.03	0.32*	0.15	0.41**	0.5**	0.55**	0.98**	0.98**	0.97**
Length of panicle (cm)													1	1	1	0.12	0.26	0.32*	-0.37	0.42**	0.13	-0.09	0.41**	0.08
1000seed weight(g)																1	1	1	0.14	0.26	0.22	-0.01	0.28	0.13
Days to maturity(days)																			1	1	1	0.42**	0.54**	0.56**
Seed yield/plant(g)																						1	1	1.0

Note: I-2010, II- 2011, III-2012, \* and \*\* - 5% and 1% level of significance respectively

**Table 5**  
**Phenotypic correlations of pooled mean for non-saline zone**

Characters	Plant Height (cm)	No. of Tillers / hill	No. of panicles/plant	No. of grains/panicle	Length of panicle (cm)	1000 seed weight(g)	Days to Maturity (days)	Seed yield/plant (g)
Plant Height (cm)	1.00	0.0388	0.1021	0.5240**	0.0898	0.3939**	0.5481**	0.5135**
No. of tillers/hill		1.00	0.7869**	0.0962	-0.0297	0.0152	0.1293	0.1344
No. of panicles/plant			1.00	0.2177	-0.0697	0.0638	0.1713	0.2444
No. of grains/panicle				1.00	0.1639	0.1598	0.4969**	0.9811**
Length of panicle (cm)					1.00	0.2749	0.0677	0.1719
1000seed weight(g)						1.00	0.2073	0.1440
Days to maturity (days)							1.00	0.5137**
Seed yield/plant(g)								1.00

**Table 6**  
**Variability parameters, heritability, genetic advance (GA) and GA % of mean in saline zone**

Parameters	Characters							
	Plant Height	Tillers/hill	Panicles/plant	Grains/panicle	Panicle length	1000 seed weight	Days to maturity (days)	Seed yield/plant
Sagardeep 2010								
GCV	16.05	21.68	21.76	44.50	6.35	26.20	14.20	29.42
PCV	16.6	24.32	24.71	45.04	9.28	26.40	14.22	29.51
Heritability%	93.6	79.5	77.5	97.6	46.7	98.5	99.4	99.3
GA	29.5	7.9	6.9	114.1	2.2	13.2	40.9	13.6
GA % of mean	32.0	39.9	39.2	90.0	8.9	53.2	28.7	60.4
Sagardeep 2011								
GCV	10.5	12.86	15.17	46.94	11.62	23.80	13.95	29.26
PCV	10.7	15.27	17.54	47.09	13.71	24.16	14.00	29.40
Heritability%	95.9	71.0	74.8	99.4	71.8	97.1	99.4	99.1
GA	20.5	3.4	3.5	107.2	4.4	9.5	40.9	12.3
GA % of mean	21.1	22.2	26.7	96.4	20.1	47.5	28.7	59.7
Hingaljanj 2012								
GCV	19.54	17.52	15.69	45.04	15.17	22.26	13.57	32.58
PCV	20.15	24.69	25.23	45.24	16.39	22.65	13.60	32.74
Heritability%	94.1	50.4	38.7	99.1	85.6	96.6	99.6	99.0
GA	48.9	2.9	1.9	116.7	6.4	10.1	39.7	15.1
GA % of mean	39.0	25.9	20.2	104.7	28.8	45.3	28.3	66.5
Saline Pooled								
GCV	11.04	3.65	7.10	42.14	3.22	18.92	13.83	20.60
PCV	16.89	20.56	21.17	45.71	11.78	24.16	13.89	28.08
Heritability%	42.72	3.15	11.26	84.97	7.46	61.33	99.11	84.20
GA	15.6	0.2	0.7	97.2	0.4	6.8	40.2	11.6
GA % of mean	14.86	1.34	4.90	83.43	1.81	30.36	28.36	53.09

Note: Genetic Coefficient Of Variation, PCV=Phenotypic Coefficient Of Variation, H%=Heritability%, GA=Genetic Advance, GA% of Mean=Genetic Advance Percentage of Mean



Table 7  
Genotypic correlations for three consecutive years for saline zone

Characters	Plant Height (cm)			No. of tillers/hill			No. of panicles/plant			No. of grains/panicle			Length of panicle (cm)			1000 seed weight (g)			Days to maturity (days)			Seed yield/plant (g)		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Plant Height (cm)	1	1	1	-0.15	0.45**	-0.16	0.02	0.35*	-0.39	0.23	0.24	0.50**	-0.09	0.51**	0.33*	0.34*	0.43**	0.66**	0.40**	0.35*	0.52**	0.25	0.24	0.52**
No. of tillers/hill			1	1	1	1	0.84**	0.91**	0.79**	0.17	0.41**	-0.06	-0.50	0.40**	-0.001	-0.12	0.28	-0.32	0.42**	0.23	-0.43	0.18	0.42**	-0.03
No. of panicles/plant							1	1	1	0.15	0.36*	-0.22	-0.45	0.33*	-0.08	-0.01	0.25	-0.41	0.68**	0.15	-0.36	0.15	0.37*	-0.18
No. of grains/panicle										1	1	1	-0.26	0.44**	0.33*	0.23	0.49**	0.42**	0.45**	0.48**	0.51**	0.99**	0.99**	0.98**
Length of panicle (cm)													1	1	1	0.31*	0.60**	0.35*	-0.24	0.81**	0.28	0.26	0.52**	0.33*
1000 seed weight (g)																1	1	1	0.28	0.28	0.52**	0.22	0.51**	0.41**
Days to maturity (days)																			1	1	1	0.47**	0.54**	0.51**
Seed yield/plant (g)																						1	1	1

Note: I-2010, II- 2011, III-2012, \* and \*\* - 5% and 1% level of significance respectively

**Table 8**  
**Genotypic correlations of pooled mean for saline zone**

Characters	Plant Height (cm)	No. of Tillers / hill	No. of panicles/plant	No. of grains/panicle	Length of panicle (cm)	1000 seed weight(g)	Days to Maturity (days)	Seed yield/plant (g)
Plant Height (cm)	1.00	1.0874**	0.7417**	0.4067**	0.3817**	0.7093**	0.6553**	0.4330**
No. of tillers/hill		1.00	0.9761**	1.0599**	2.8983**	0.2224	0.8351**	1.1594**
No. of panicles/plant			1.00	0.4428**	1.9176**	0.0929	0.8467**	0.5496**
No. of grains/panicle				1.00	0.5724**	0.4430**	0.5151**	0.9993**
Length of panicle (cm)					1.00	0.8892	1.2736**	0.6484**
1000seed weight(g)						1.00	0.4553**	0.4629**
Days to maturity (days)							1.00	0.5491**
Seed yield/plant(g)								1.00

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Table 9  
Phenotypic correlations for three consecutive years for saline zone

Characters	Plant Height (cm)			No. of tillers/hill			No. of panicles/plant			No. of grains/panicle			Length of panicle (cm)			1000 seed weight(g)			Days to maturity (days)			Seed yield/plant (g)		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Plant Height (cm)	1	1	1	-0.13	0.37*	-0.09	0.02	0.29	-0.22	0.22	0.24	0.48**	-0.05	0.42**	0.30*	0.33*	0.41**	0.64**	0.38**	0.34*	0.50**	0.24	0.24	0.50**
No. of tillers/hill				1	1	1	0.71**	0.87**	0.76**	0.16	0.34*	-0.04	-0.30	0.24	-0.04	-0.07	0.24	-0.21	0.60**	0.19	-0.31	0.16	0.36*	-0.02
No. of panicles/plant							1	1	1	0.12	0.31*	-0.13	-0.30	0.21	-0.06	-0.07	0.21	-0.24	0.59**	0.13	-0.22	0.14	0.32*	0.11
No. of grains/panicle										1	1	1	-0.17	0.38**	0.30*	0.23	0.48**	0.41**	0.44**	0.47**	0.50**	0.98**	0.99**	0.98**
Length of panicle (cm)													1	1	1	0.21	0.50**	0.33*	-0.17	0.68**	0.26	-0.17	0.45**	0.30*
1000 seed weight(g)																1	1	1	0.27	0.28	0.51**	0.22	0.50**	0.40**
Days to maturity (days)																			1	1	1	0.46**	0.54**	0.51**
Seed yield/plant (g)																						1	1	1

Note: I-2010, II- 2011, III-2012, \* and \*\* - 5% and 1% level of significance respectively

**Table 10**  
**Phenotypic correlations of pooled mean for saline zone**

Characters	Plant Height (cm)	No. of Tillers / hill	No. of panicles/plant	No. of grains/panicle	Length of panicle (cm)	1000 seed weight(g)	Days to Maturity (days)	Seed yield/plant (g)
Plant Height (cm)	1.00	-0.0542	-0.0394	0.3447*	0.2856	0.4668**	0.4258**	0.3740*
No. of tillers/hill		1.00	0.8068**	0.1434	-0.0479	-0.0801	0.1399	0.1479
No. of panicles/plant			1.00	0.1076	-0.0403	-0.0638	0.2619	0.1154
No. of grains/panicle				1.00	0.2499	0.3670*	0.4665**	0.9865**
Length of panicle (cm)					1.00	0.3679*	0.3509*	0.2780
1000seed weight(g)						1.00	0.3535*	0.3711*
Days to maturity (days)							1.00	0.4972**
Seed yield/plant(g)								1.00