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# **RESEARCH ARTICLE**

### GENETIC VARIABILITY, CORRELATION AND PATH ANALYSIS IN RICE (Oryza Sativa L.)

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ARTICLE INFO	ABSTRACT
Article History: Received 10 <sup>th</sup> June, 2012 Received in revised form 15 <sup>th</sup> July, 2012 Accepted 07 <sup>th</sup> August, 2012 Published online 29 <sup>th</sup> September, 2012	Estimates of variability, heritability, genetic advance, correlation and path analysis were carried out in rice for fifteen characters. The highest genotypic and phenotypic coefficient of variation for number of productive tillers per plant, grain L/B ratio and grain yield per plant. High heritability were observed for all the characters, except kernel breadth. High genetic advance as percent of mean were observed for all the characters except spikelet fertility and kernel breadth. Grain yield per plant exhibited high significant and positive genotypic correlation with number of productive tillers per
<i>Key words:</i> PCV, GCV, Correlation, Path analysis, rice.	plant, filled grains per panicle and total number of grains. Path analysis showed maximum positive direct effects for kernel L/B ratio, kernel length, filled grains per panicle, total number of grains and number of productive tillers per plant. Hence, the selection based on these traits could be more effective in rice.
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## **INTRODUCTION**

The presence and magnitude of genetic variability in a gene pool is the pre-requisite of a breeding programme. Heritability estimates provide the information on the proportion of variation that is transmissible to the progenies in subsequent generations. Genetic advance provides information on expected genetic gain resulting from selection of superior individuals. The grain yield is a complex character, quantitative in nature and an integrated function of a number of component traits. Therefore, selection for yield *per se* may not be much rewarding unless other yield attributing traits are taken into consideration. Correlation study provides a measure of association between characters and helps to identify important characters to be considered while making elucidates selection. The present study implication in deciding desirable traits for development of high yielding variability.

## **MATERIALS AND METHODS**

The experimental material comprised of 53 genotypes (Table 1) were evaluated during samba season (September-January) 2010 and 2011 at the Plant Breeding Farm ( $11^{0}24$ ' N latitude and 79<sup>0</sup> 44' E longitude,  $\pm$  5.79m MSL), Annamalai University, Annamalai Nagar, Tamilnadu, South India. Seeds of the 53 genotypes were sown in raised nursery bed. The seedlings were transplanted to the mainfield at the rate of one seedling per hill, after 25 days, with a spacing of 20cm x 15cm. The experiment was arranged in a randomized complete block design with three replications, in four – row plots of 3m length. The recommended agronomical practices and plant protection measures were followed to ensure a

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normal crop. Observations were recorded on five randomly selected plants in each replication from the two centre rows. Fifteen traits *viz.* days to first flowering, plant height (cm), number of productive tillers per plant, panicle length (cm), filled grains per panicle, total number of grains per panicle, spikelet fertility, 100 grain weight (g), grain length (mm), grain breadth (mm), grain L/B ratio, kernel length (mm), kernel breadth (mm), kernel L/B ratio and grain yield per plant (g) were recorded. Correlation coefficient at the genotypes and phenotypic levels was computed from the variance and Covariance components as suggested by panse and Sukhatme (1967). Path analysis was done as suggested by Dewy and Lu (1959).

### **RESULTS AND DISCUSSION**

The analysis of variance showed highly significant differences among the various genotypes for the characters under study. This indicated that the genotypes were possessing inherent genetic variances among themselves with respect to the characters studied. A close examination of experimental results (Table 2) revealed a high estimate of phenotypic and genotypic coefficients of variation for grain L/B ratio, number of productive tillers per plant and grain vield per plant. These results indicated high degree of genetic variability (Sharma and Sharma 2007). A moderate value of phenotypic and Genotypic coefficients of variation was observed for days to first flower, plant height, panicle length, filled grains per panicle, total number of grains, hundred grain weight, grain length, grain breadth, kernel length and kernel L/B ratio. Similar results were reported by Awasthi and Borthakur (1986). However, Ganeshan et al., (1995) differed with these observations and reported high genotypic coefficients of variation for these characters. A narrow magnitude of

Table 1. List of	genotypes	selected
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Genotype code	Varieties / Cultures	Origin
$G_1$	ADT 36	Tamil Nadu Rice Research Institute (TRRI), Aduturai, Tamil Nadu, Ind
$G_2$	ADT 37	
G <sub>3</sub>	ADT 38	
$G_4$	ADT 39	
G <sub>5</sub>	ADT 40	
G <sub>6</sub>	ADT 41	
G <sub>7</sub>	ADT 42	
G	ADT 43	
Ğ	ADT 44	
G10	ADT 45	
Gu	ADT 46	
G <sub>12</sub>	ADT 47	
G12	ADT 48	
Gu	ADT 49	
G <sub>14</sub>	CR 1000	Central Rice Research Institute (CRRI) Cuttack Orissa India
G	DDT 5204	Agricultural college Banatla Andhra Bradesh India
G	DI 1 5204	International Diag Descorab Institute (IDDI), Dhilippings
G <sub>17</sub>	IN 04 IMDDOVED WILITE	Daddy Prooding station Combatora Tamilandy India
<b>U</b> <sub>18</sub>		raddy breeding station, Connoatore, Tanninadu, India.
C	PUNNI TDV 1	Assignational College and Dessent Institute Tricky Terribudy India
G <sub>19</sub>	TRI-I	Agricultural College and Research Institute, Thony, Taminadu, India.
G <sub>20</sub>	IKY-2	
G <sub>21</sub>	IRY-3	
G <sub>22</sub>	CSR-30	Central Saline Soil Research Institute (CSSRI), Karnal, Haryana, India
G <sub>23</sub>	AURC39	Annamalai University, Tamil Nadu, India
G <sub>24</sub>	CO 49	Paddy Breeding station, Coimbatore, Tamilnadu, India.
G <sub>25</sub>	AURC1	Department of Genetics and plant Breeding Faculty of Agricult
G <sub>26</sub>	AURC3	Annamalai University, Tamil Nadu, India
G <sub>27</sub>	AURC4	
G <sub>28</sub>	AURC5	
G <sub>29</sub>	AURC6	
$G_{30}$	AURC7	
G <sub>31</sub>	AURC8	
G <sub>32</sub>	AURC9	
G <sub>33</sub>	AURC10	
G <sub>34</sub>	AURC11	
G <sub>35</sub>	AURC12	
G <sub>36</sub>	AURC14	
G <sub>37</sub>	AURC15	
G <sub>38</sub>	AURC16	
G <sub>39</sub>	AURC18	
G <sub>40</sub>	AURC20	
$G_{41}$	AURC22	
G <sub>42</sub>	AURC23	
G <sub>43</sub>	AURC25	
G44	AURC26	
G <sub>45</sub>	AURC28	
G46	AURC29	
G40 G47	AURC30	
G49	AURC31	
G48 G40	AURC34	
G49	AURC34	
G:	AURCSS	
G.	AURC30	
G 52	AUKU3/	
U53	AUKU38	

Table 2.	Mean, range,	PCV,	GCV.	, heritability a	nd genetic advan	ice for fifteen c	characters in Ric
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Characters	Mean	Range	PCV (%)	GCV (%)	$h^{2}(\%)$	GA as % Mean
Days to first flower (days)	83.51±.0.46	66.00-105.00	12.28	12.24	99.38	25.14
Plant Height (cm)	101.03±1.61	69.85-151.70	16.21	15.97	97.06	32.41
Number of productive tillers per plant	13.84±0.66	9.50-27.30	26.05	24.69	89.82	48.20
Panicle Length (cm)	21.23±0.48	15.50-27.25	12.44	11.80	90.09	23.08
Filled grains per panicle	87.98±3.57	52.43-116.90	17.22	15.69	83.01	29.44
Total Number of grains	107.52±3.97	72.36-150.60	16.75	15.46	85.16	29.38
Spikelet Fertility	81.83±1.31	70.72-89.24	5.61	4.85	74.96	8.65
Hundred grain weight (g)	2.30±0.01	1.46-3.06	16.98	16.98	99.98	34.97
Grain Length (mm)	0.83±0.05	0.60-1.21	13.42	13.38	99.42	27.49
Grain Breadth (mm)	0.26±0.01	0.20-0.31	19.17	19.11	99.45	39.28
Grain L/B ratio	3.39±0.04	1.99-5.75	27.74	27.64	99.31	56.75
Kernel Length (mm)	0.61±0.04	0.41-0.90	13.60	13.56	99.39	27.85
Kernel Breadth (mm)	0.20±0.03	0.20-0.22	2.94	1.52	26.78	1.62
Kernel L/B ratio	3.00±0.05	1.96-4.54	13.77	13.45	95.54	27.09
Grain yield per Plant (g)	17.96±0.50	14.49-23.25	22.56	21.94	86.92	22.15

DF (days) P  1.0000  .463*** 273*  3276*  .3511*  .364*  .1229  .1401 2916*  .1826 2897*  .1855  .0612 2010 1320    PH (cm) P  1.0000  .4723** 2927*  .3436*  .3839**  .3627**  .1426  .1406 2936*  .1844 2921*  .1857  .0997  .2202  .1606    G  1.0000  .1341  .4281**  .381**  .3491*  .1400  .1277  .2745*  .3659**  .4056**  .2804*  .0801  .2662  .0998  .341*  .1403  .2202*  .1448  .2791*  .1418*  .2902*  .1448  .2791*  .1420  .2662  .0998  .3352*  .002*  .2464*  .374*  .1490  .202*  .0017  .322*  .141  .1235  .1237  .2264  .3586**  .2988  .3440*  .316*  .0998  .3352*  .302*  .216    G  1.0000  .361***  .3335*  .1237  .2126  .1365  .1205  .0459  .0144  .0207  .0079			DF (days)	PH (cm)	NPT	PL (cm)	FGP	TNG	SF	HGW (g)	GL (mm)	GB (mm)	GLBR	KL (mm)	KB (mm)	KLBR	GYD (g)
G    1.0000    4723***    -2927*    3436*    3839**    3627***    1.426    1.406    -2936*    1.844    -2921*    -1.857    0.997    -2.029    -1.000      G    1.0000    -1.141    4.281**    3.819**    3.617**    .1416    1.955    -2745*    3.659**    -4.056**    -2940*    -0.404    -2020*    -1.448    -2.291    -1.453    -2.125    -1.457    .1237    -2.469    3.374*    -1.940    .3205*    2.942*    -0.421    .3029*    .3129    .3029*    .3126*    .3029*    .3140*    .316*    .0998    .3325*    .3029*    .3019*    .3019*    .	DF (days)	) P	1.0000	.4653**	2732*	.3276*	.3511*	.3364*	.1229	.1401	2916*	.1826	2897*	1855	.0612	2010	1392
PH (cm)  P  1.0000  -1.341  4.281**  3.381**  3.491*  1.400  1.927  -2.745*  3.565***  -4.056**  -2.840*  -0.801  -2.662  -0.998    NPT  P  1.0000  -1.495  4.379**  4.269**  3.819**  1.611  1.955  -2.796*  3.718**  -4.131**  -2.902*  -1.442  -2.020*  .2141  -2.261    G  1.0000  0.0326  -1.767  -1.233  -1.237  -2.404  3.586**  -1.949  3.316*  -0.998  3.340*  3.163*  -0.998  .3352*  .3029*    PL (cm)  P  1.0000  .0326  -1.773  -1.413  .1866  .1056  .1205 0494  .0143  .0207  .0087  .1216    G  1.0000  .9423**  .3186*  .0965 1945  .1228  .2044  .1431  .4000  .3163*  .337*  .1400  .1403  .0523  .1218  .306*  .1000  .2212  .1000  .2216  .1907  .1574  .24100  .133  .4444****    <		G	1.0000	.4723**	2927*	.3436*	.3839**	.3627**	.1426	.1406	2936*	.1844	2921*	1857	.0997	2029	1606
G  1.0000 1455  4.379**  4.269**  3.819***  1.611  .1955 2796*  3.718** 4131** 2902* 1448 2791* 1455    NPT  G  1.0000  0.0375 1237 2269  .3374* 1940  .3205*  .2942* 0421  .3029*  .2511    PL (cm)  P  1.0000  0.3613**  .3395*  .1051  .1773  .0971  .1200 0439  .0163*  .0298  .3325*  .3029*  .1216    G  1.0000  .3613**  .3395*  .1051  .1773  .0971  .1200 0439  .0134  .0227  .0079  .1216    G  1.0000  .9423**  .3186*  .0965  .1945  .1298  .2044  .1403  .0523  .1288  .3700**    G  1.0000  .943**  .3186*  .0965  .1945  .1298  .2215  .1949  .1907  .1636  .1575  .1438    G  1.0000  .0174  .0199  .2421  .0970  .2038  .2328  .320	PH (cm)	Р		1.0000	1341	.4281**	.3851**	.3491*	.1400	.1927	2745*	.3659**	4056**	2840*	0801	2662	0998
NPT  P  1.0000  0.375 121 1257 2469  3374* 1940  3205*  2.942* 0421  3029*  2.511    G  1.0000  .3365 1279 1439 2604  .3586** 2098  .3440*  .3163* 0998  .3352*  .3029*    PL (cm)  P  1.0000  .3613**  .3395*  .1051  .1773  .0971  .1200  .0449  .0149  .0200  .00079  .1216    G  1.0000  .3911**  .3636**  .1243  .1866  .1056  .1205  .0459  .0134  .0227  .0087  .1490    G  1.0000  .9423**  .1818*  .0965  .1912  .2084  .1403  .0227  .0.083  .1440**    TNG  P  .0000  .0184  .2246  .0925  .1902  .2115  .1089  .1288  .3407*    G  .0000  .0184  .2246  .0925  .1907  .2328  .2326*  .2063  .1273  .3070    G  .00000  .2128 <td></td> <td>G</td> <td></td> <td>1.0000</td> <td>1495</td> <td>.4379**</td> <td>.4269**</td> <td>.3819**</td> <td>.1611</td> <td>.1955</td> <td>2796*</td> <td>.3718**</td> <td>4131**</td> <td>2902*</td> <td>1448</td> <td>2791*</td> <td>1455</td>		G		1.0000	1495	.4379**	.4269**	.3819**	.1611	.1955	2796*	.3718**	4131**	2902*	1448	2791*	1455
G  1.0000  .0326 1769 1575 1439 2604  .3586** 2098  .3440*  .3163* 0998  .3352*  .3029*    PL (cm)  G  1.0000  .3613**  .3395*  .1051  .1773  .0971  .1200 0494  .0149  .0200  .0079  .1216    G  1.0000  .3911**  .3636**  .1243  .1866  .1056  .1205 0459  .0134  .0227  .0087  .1480    FGP  P  1.0000  .9423**  .3186*  .0965 1945  .1298  .2267 1574  .2400 1383  .340***    TNG  P  1.0000  .0091  .0184  .22246  .0925 1012  .2115  .106*  .2006  .3371**    SF  P  1.0000  .0174  .0199  .2421  .0970  .2328  .3206*  .2006  .3971**    G  1.0000  .216*  .0837  .1636  .0976  .2203  .2718  .1917  .2308    G  1.0000  .2148<	NPT	Р			1.0000	.0375	1421	1253	1237	2469	.3374*	1940	.3205*	.2942*	0421	.3029*	.2511
PL (cm)  P  1.0000  .3613***  .3395*  .1051  .1773  .0971  .1200  .0494  .0149  .0200  .0079  .1216    G  1.0000  .3911**  .3636**  .1243  .1866  .1056  .1205 0459  .0134  .0227  .0077  .1216    FGP  P  1.0000  .9423**  .3186*  .0965 1945  .1298 2084 143  .0227  .1218  .333  .4440**    TNG  P  .0000  .0014  .0199  .2241  .0970  .2038 2328  .3206*  .2000  .3971**    SF  P  .0000  .0174  .0199  .2148  .183**  .2555  .251  .1965  .1213  .0700    (g)  G  .0000  .2148  .518**  .2505  .251  .1917  .233  .4494    .0000  .2148  .518**  .2505  .251  .1917  .233  .0720    (g)  G  .0000  .2148  .518***  .2505  .251  .1917 <td></td> <td>G</td> <td></td> <td></td> <td>1.0000</td> <td>.0326</td> <td>1769</td> <td>1575</td> <td>1439</td> <td>2604</td> <td>.3586**</td> <td>2098</td> <td>.3440*</td> <td>.3163*</td> <td>0998</td> <td>.3352*</td> <td>.3029*</td>		G			1.0000	.0326	1769	1575	1439	2604	.3586**	2098	.3440*	.3163*	0998	.3352*	.3029*
G  1.0000  .3911**  .3636**  .1243  .1866  .1056  .1205 0459  .0134  .0227  .0087  .1490    FGP  G  .10000  .9423**  .3186*  .0965 1945  .1298 2084 1603 0253 1288  .3700**    G  .10000  .9484**  .2940*  .1058 2126  .1574 2000  .1333  .4440**    TNG  P  .10000  .0091  .0184 2246  .0925 1902 2115  .1069  .1886  .3477*    G  .10000  .2017  .0090  .2421  .0970  .2038  .2328 3206*  .2006  .3477*    SF  P  .10000  .2706  .0729  .1421  .0849  .1007  .1633  .1559  .1494    G  G  .10000  .2148  .5183**  .2550  .2551  .1965  .2123  .0720    G  G  .10000  .2148  .5183**  .2559  .375*  .2133  .8202	PL (cm)	Р				1.0000	.3613**	.3395*	.1051	.1773	.0971	.1200	0494	.0149	.0200	.0079	.1216
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		G				1.0000	.3911**	.3636**	.1243	.1866	.1056	.1205	0459	.0134	.0227	.0087	.1490
G  1.000  .9484**  .2940*  .1058 2128  .1396 2267 1574 2400 1333  .4440**    TNG  P  1.000 0091  .0184 2246  .0925 1902 2115 1069 1836  .3477*    G  1.0000 0174  .0199 2421  .0970 2038 2328 3206*  .2006  .3971**    SF  P  1.0000  .2176  .0729  .1421 0849  .1907  .1653  .1559  .1494    G  1.0000  .2168  .5183** 2505  .2551  .1965  .2173  .0820    GL  P  1.0000  .2148  .5183** 2505  .2551  .1965  .2173  .0820    GL  P  1.0000  .3125*  .197*  .2213  .255*  .379**  .2173  .0820    GB  P  .0000  .3198*  .7393**  .8988**  .0510  .8816**  .0643    (mm)  G	FGP	Р					1.0000	.9423**	.3186*	.0965	1945	.1298	2084	1403	0523	1288	.3700**
TNG  P  1.0000 0091  .0184 2246  .0925 1902 2115 1069 1886  .3477*    G  1.0000 0174  .0199 2421  .0970 2038 2328 3206* 2060  .3971**    G  1.0000  .2016  .0729  .1421  .0849  1.907  .1653  .1559  .1494    G  1.0000  .3125*  .0837  .1636 0976  .2203  .2718  .1917  .2308    HGW  P  1.0000  .2155  .5197**  .2513  .2559  .3795**  .2173  .0820    GL  P  .0000  .2188  .5193**  .2553  .3795**  .2173  .0820    GL  P  .0000  .320*  .7404**  .9041**  .1143  .9027**  .0625    GB  P  .0000  .320*  .370**  .3255*  .0523  .333**  .0643    (mm)  G  .0000  .695**  .0100  .695**  .0257  .036*  .0100		G					1.0000	.9484**	.2940*	.1058	2128	.1396	2267	1574	2400	1333	.4440**
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	TNG	Р						1.0000	0091	.0184	2246	.0925	1902	2115	1069	1886	.3477*
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		G						1.0000	0174	.0199	2421	.0970	2038	2328	3206*	2006	.3971**
G  1.000  .3125*  .0837  .1636 0976  .2203  .2718  .1917  .2308    HGW  P  1.0000  .2148  .5183** 2505  .2551  .1965  .2123  .0720    (g)  G  1.0000  .2145  .5183** 2505  .2559  .3795*  .2173  .0820    (mm)  G  .0000  .3198*  .7393**  .8988**  .0510  .8816**  .0643    (mm)  G  .0000 3200*  .7404**  .9041**  .1143  .9027**  .0625    GB  P  .0000 8700** 3255* 0523 3338*  .0989    (mm)  G  .0000 8698** 3272*  .1041 3425*  .1098    GLBR  P  .0000  .691** 0155  .686**  .0216    (mm)  G  .0000  .691**  .0155  .686**  .0216    (mm)  G  .0000  .1676  .9941**  .0242    KB  P  .0000  .1676	SF	Р							1.0000	.2706	.0729	.1421	0849	.1907	.1653	.1559	.1494
HGW  P  1.0000  .2148  .5183** 2505  .2551  .1965  .2123  .0720    (g)  G  1.0000  .2155  .5197** 2513  .2559  .3795**  .2173  .0820    GL  P  1.0000  .2155  .5197** 2513  .8988**  .0510  .8816**  .0643    (mm)  G  1.0000 3200*  .7404**  .9041**  .1143  .9027**  .0625    GB  P  1.0000 8700** 3255*  .0523  .338*  .0989    (mm)  G  .0000 8698** 3272*  .1041 3425*  .1098    GLBR  P  .0000  .6911** 0165  .6896** 0416    G  .0000  .6952** 0257  .7068** 0510    KL  P  .10000  .0671  .9782**  .0236    (mm)  G  .10000  .1676  .9941**  .0242    KB  P  .10000  .1676  .9941**  .0242    KB<		G							1.0000	.3125*	.0837	.1636	0976	.2203	.2718	.1917	.2308
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	HGW	Р								1.0000	.2148	.5183**	2505	.2551	.1965	.2123	.0720
GL  P  1.0000 3198*  .7393**  .8988**  .0510  .8816**  .0643    (mm)  G  1.0000 3200*  .7404**  .9041**  .1143  .9027**  .0625    GB  P  1.0000 8700** 3255* 0523 3338*  .0989    (mm)  G  .0000 8698** 3257*  .1041 3425*  .1098    GLBR  P  .0000 8698** 3257*  .00165  .6896** 0416    G  .0000  .6952** 0257  .7068** 0510    KL  P  .10000  .0671  .9782**  .0236    (mm)  G  .10000  .0671  .9782**  .0236    (mm)  G  .10000  .1676  .9941**  .0242    KB  P  .10000  .1676  .9941**  .0242    KB  P  .10000  .1397  .0083    (mm)  G  .10000  .1397  .0083    KLBR  P  .10000  .0254	(g)	G								1.0000	.2155	.5197**	2513	.2559	.3795**	.2173	.0820
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	GL	Р									1.0000	3198*	.7393**	.8988**	.0510	.8816**	.0643
GB  P  1.0000 8700** 3255* 0523 3338*  .0989    (mm)  G  1.0000 8698** 3272*  .1041 3425*  .1098    GLBR  P  1.0000  .6911** 0165  .6896** 0416    G  1.0000  .6952** 0257  .7068** 0510    KL  P  1.0000  .0671  .9782**  .0236    (mm)  G  1.0000  .1676  .9941**  .0242    KB  P  1.0000  .0606  .0155    KLBR  P  1.0000  .0254  1.0000  .0254    G  G  1.0000  .0243  .0243  .0243	(mm)	G									1.0000	3200*	.7404**	.9041**	.1143	.9027**	.0625
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	GB	Р										1.0000	8700**	3255*	0523	3338*	.0989
GLBR  P  1.0000  .6911** 0165  .6896** 0416    G  1.0000  .6952** 0257  .7068** 0510    KL  P  1.0000  .0671  .9782**  .0236    (mm)  G  1.0000  .1676  .9941**  .0242    KB  P  1.0000  .1676  .9941**  .0242    KB  P  1.0000  .1397 0083    (mm)  G  1.0000  .0606  .0155    KLBR  P  1.0000  .0254  1.0000  .0254    G  G  1.0000  .0243  1.0000  .0243	(mm)	G										1.0000	8698**	3272*	.1041	3425*	.1098
G  1.000  .6952** 0257  .7068** 0510    KL  P  1.0000  .0671  .9782**  .0236    (mm)  G  1.0000  .1676  .9941**  .0242    KB  P  1.0000 1397 0083    (mm)  G  1.0000  .0254  1.0000  .0254    KLBR  P  1.0000  .0254  1.0000  .0254    G  G  1.0000  .0243  1.0000  .0243	GLBR	Р											1.0000	.6911**	0165	.6896**	0416
KL  P  1.0000  .0671  .9782**  .0236    (mm)  G  1.0000  .1676  .9941**  .0242    KB  P  1.0000 1397 0083    (mm)  G  1.0000  .055  1.0000  .0254    G  I.0000  .0254  1.0000  .0243		G											1.0000	.6952**	0257	.7068**	0510
(mm)  G  1.0000  .1676  .9941**  .0242    KB  P  1.0000 1397 0083    (mm)  G  1.0000  .0606  .0155    KLBR  P  1.0000  .0254    G  1.0000  .0243	KL	Р												1.0000	.0671	.9782**	.0236
KB  P  1.0000 1397 0083    (mm)  G  1.0000  .0606  .0155    KLBR  P  1.0000  .0254    G  1.0000  .0243	(mm)	G												1.0000	.1676	.9941**	.0242
(mm)  G  1.0000  .0606  .0155    KLBR  P  1.0000  .0254    G  1.0000  .0243	KB	Р													1.0000	1397	0083
KLBR P G 1.0000 .0254 1.0000 .0243	(mm)	G													1.0000	.0606	.0155
G 1.0000 .0243	KLBR	Р														1.0000	.0254
		G														1.0000	.0243

Table 3. Phenotypic and Genotypic correlation for fifteen quantitative characters in rice

\* Significant 5% Level

\*\* Significant 1% Level

Table 4. Genotypic Path Coefficient for fifteen components in rice

	DF (days)	PH (cm)	NPT	PL (cm)	FGP	TNG	SF	HGW (g)	GL (mm)	GB (mm)	GLBR	KL (mm)	KB (mm)	KLBR	GYD (g)
DF (days)	.2356	1113	0554	0809	0904	0854	0336	0331	.0692	0435	.0688	.0437	0235	0208	1606
PH (cm)	1886	3994	.0597	1749	1805	1525	0644	.1781	.1117	.1485	.1716	.1159	.1178	.1115	1455
NPT	1522	1778	1.5202	.0169	0920	0873	0748	1355	3114	1691	.1789	.1645	0519	3256	.3029*
PL (cm)	.0180	.0229	.0017	.0524	.0205	.0190	.0065	.0028	.0055	.0063	0090	.0007	.0012	.0005	.1490
FGP	8004	8601	.3688	8154	2.0851	-1.8574	6131	2110	1.4436	2911	1.4728	1.3282	-2.1063	1.3003	.4440**
TNG	.9618	1.0126	4178	.9642	2.5149	1.8554	9461	.6273	-2.6420	.6544	5873	-1.2182	-1.8501	5320	.3971**
SF	.1484	.1677	-1.1497	.1293	.3059	-1.0181	.4405	.3252	1.0879	.1703	-1.0882	.2293	.2829	.1994	.2308
HGW (g)	.0201	.0279	0372	.0267	.0151	.0028	.0446	1428	.0308	0001	0359	.0366	.0542	.0392	.0820
GL (mm)	0425	0434	.0019	.0153	1308	1350	.0121	.0312	.1400	1463	.1021	.1108	.0165	.1306	.0625
GB (mm)	.0188	.0378	0213	.0123	.0142	.0099	.0166	.0529	0325	.1017	0471	0333	.0146	0348	.1098
GLBR	.0013	.0019	0716	.0002	.0019	.0009	.0034	.0011	0033	.0239	0045	0031	.0001	0032	0510
KL (mm)	4181	6536	7122	.0303	3544	5243	.4962	5763	2.0171	7367	1.5656	2.2519	.1773	-2.5386	.0242
KB (mm)	0202	.0293	.0402	0057	.0485	.0648	.0549	.0767	1231	1210	.0052	1339	.2121	1123	.0155
KLBR	.5287	.7270	8732	2227	.3472	.5226	4993	5660	-2.4318	.8922	1.8422	-2.5896	2580	2.6050	.0243
GYD (g)	.2356	1113	0554	0809	0904	0854	0336	0331	.0692	0435	.0688	.0437	0235	0208	1606
Residual effect 0.1926				* Significa	int 5% Level		**	Significant 1	% Level						

difference between phenotypic and Genotypic coefficients of variation for characters, namely days to first flower, plant height, panicle length, total number of grains per panicle, spikelet fertility, hundred grain weight, grain length, grain breadth, grain L/B ratio, kernel length, kernel L/B ratio and grain yield per plant. Suggested a limited role of environmental variation in the expression of these characters. Thus selection based on genotypic performance of the characters would be effective to bring about considerable improvement in these characters. The estimates of heritability were observed to be high in magnitude for all the characters, except kernel breadth. The percentage of heritability is ranged from 26.78 per cent (kernel breadth) and 99.98 per cent (hundred grain weight) (Table 2). Similar results were reported by Panwar and Gupta (1967) for days to first flower, panicle length and hundred grain weight. High estimates of heritability coupled with high genetic advances were observed for the characters viz., days to first flower, plant height, number of productive tillers per plant, panicle length, filled grains per panicle, total number of grains, hundred grain weight, grain length, grain breadth, grain L/B ratio, kernel length, kernel L/B ratio and grain yield per plant. Low genetic advances were observed for spikelet fertility and kernel breadth (Table 2).

In the present investigation, the genotypic correlation coefficients were generally higher than their respective phenotypic correlation coefficients (Table 3). At phenotypic level, grain yield per plant exhibited highly significant and positive correlation with filled grains per panicle and total number of grains. In genotypic level grain yield per plant exhibited highly significant and positive correlation with number of productive tillers per plant, filled grains per panicle and total number of grains. Similar results were reported by Lalitha and Shreedhar (1996). A perusal of the correlation coefficients at genotypic level revealed that days to first flower, plant height, number of productive tillers per plant and grain length were highly and positive correlated with each other indicating that these characters are interdependent. Selection of any easily observable traits among these will ultimately enhance the mean performance of all the concerned interdependent characters. Genotypic path analysis studies revealed that the all the characters were showed positive direct effects except for plant height, hundred grain weight and grain L/B ratio (Table 4). The maximum positive direct effects were observed for kernel L/B ratio, kernel length, filled grains per panicle, total number of grains, and number of productive

tillers per plant. Positive direct effect as well as correlation coefficients indicated that selection may be exercised for these traits for yield improvement. Similar results were reported by Janardhanm *et al* (2001), Makwana *et al* (2010) and Yolanda and Das (1995). The result revealed high estimates of genotypic and phenotypic coefficient of variation for number of productive tillers per plant, grain L/B ratio and grain yield per plant. Estimates of heritability in broad sense coupled with high genetic advance as per cent of mean were observed for all the traits except spikelet fertility and kernel breadth. grain yield per plant exhibited high significant and positive genotypic correlation with number of productive tillers per plant, filled grains per panicle and total number of grains. Hence, the selection based on these traits could be more effective in rice.

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