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NATURE OF ASSOCIATION AMONG SOME QUANTITATIVE TRAITS IN WILD RICE

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ABSTRACT

Twenty genotypes comprised of three wild species of rice were studied for correlation among sixteen characters i.e. Plant height, number of tillers, test weight, number of internodes, number of leaves, length of leaf, number of spikelets, length of spikelets, length of anther, length of stigma, pollen viability, pollen size, length of awn, seed setting, yield and germination percentage. Correlations between grain yield and each of sixteen characters were partitioned into direct and indirect effects. Number of spikelets per panicle was the most important character in exerting maximum direct effect on yield.

Key words: Correlation, direct effect, indirect effect, path analysis, wild rice

INTRODUCTION

Yield is a complex character influenced by several genetic factors interacting with environment. Success of any breeding programme for its improvement depends on the efficiency of selection. For a successful selection, it is necessary to study the nature of association of the character in question, with other relevant traits. Path coefficient provides a better index for selection rather than mere correlation coefficient by separating the correlation coefficients of yield and its components into direct and indirect effects. The present investigation was therefore, undertaken to estimate the phenotypic and genotypic correlations and their direct and indirect effects on yield of wild rice.

MATERIALS AND METHODS

Twenty wild rice genotypes comprised of three species viz. *Oryza nivara*, *O. sativa* spontanea and *O. rufipogon* were evaluated in randomized complete block

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design with three replications. Each genotype was grown in a single row in each replication. The data were recorded on five randomly selected plants from each row and replication for sixteen quantitative characters viz., Plant height (X1), number of tillers (X2), test weight (X3), number of internodes (X4), number of leaves (X5), length of leaf (X6), number of spikelets (X7), length of spikelets (X8), length of anther (X9), length of stigma (X10), pollen size (X11), pollen viability (X12), length of awn (X13), seed setting percentage (X14), yield (X15) and germination percentage (X16). The mean data were utilized to estimate the correlation coefficients and their direct and indirect effects.

Correlation coefficients and path coefficient analysis were done by using standard methods [1 - 2].

RESULTS AND DISCUSSION

The phenotypic correlation coefficients among yield and yield components (Table 1) clearly indicated that yield had positive and significant correlation with plant height, number of internodes, number of leaves, length of leaf and number of spikelets.

Similarly other positive and significant correlations were recorded for plant height with number of internodes, number of leaves, length of leaf, number of spikelets and germination percentage, number of internodes with number of leaves, length of leaf and length of anther; number of leaves with length of leaf, number of spikelets, length of anther and germination; length of leaf with length of spikelets with length of anther; length of anther with pollen viability with seed setting.

The genotypic correlation coefficients were in general similar in direction but higher in magnitude than phenotypic correlation coefficients (Table 1). Similar observations were recorded in cultivated rice also [3 - 5].

The correlations with yield were further partitioned into direct and indirect effects to establish the cause and effect relationship among the yield and its component characters (Table 2). Path analysis revealed that plant height had direct negative effect on yield, number of internodes are positively correlated with number of leaves, number of internodes had direct positive effect on yield. Number of spikelets, anther length and length of leaf had direct positive effect on yield. Similar observations were reported in rice by some other works also [6].

The above findings revealed that the major contribution for grain yield came

Table 1. Estimates of genotypic (rg) and phenotypic (rp) correlation coefficients between different characters of wild rice

Characters	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}
X_1	rg	–0.301	0.242	0.512	0.808	0.996	0.949	–0.710	0.730	0.016	0.329	0.526	–0.843	0.072	0.510	0.937
	rp	–0.280	0.239	0.802**	0.794**	0.982**	0.946**	–0.689	0.725**	0.017	0.324	0.499*	–0.750	0.055	0.445*	0.935**
X_2		rg	–0.086	–0.142	–0.173	–0.244	–0.234	0.373	–0.195	0.043	–0.201	–0.386	0.030	0.136	0.248	–0.080
		rp	–0.084	–0.123	–0.143	–0.205	–0.217	0.343	–0.182	0.052	–0.187	–0.318	0.046	0.122	0.235	–0.076
X_3			rg	0.392	0.404	0.207	0.153	–0.382	0.084	–0.298	0.093	0.181	–0.216	0.180	–0.186	0.287
			rp	0.374	0.385	0.205	0.151	–0.360	0.086	–0.281	0.091	0.157	–0.182	0.161	–0.155	0.284
X_4				rg	1.000	0.790	0.814	–0.801	0.656	–0.127	0.063	0.546	–0.805	–0.030	0.946	0.848
				rp	0.992**	0.765**	0.804	–0.774	0.630**	–0.122	0.057	0.534*	–0.701	–0.036	0.428*	0.838*
X_5					rg	0.783	0.811	–0.821	0.654	–0.150	0.053	0.543	–0.789	–0.040	0.461*	0.844**
					rp	0.758**	0.796**	–0.789	0.638**	–0.147	0.050	0.534*	–0.688	–0.052	0.401*	0.828**
X_6						rg	0.962	–0.653	0.722	0.011	0.363	0.484	–0.843	0.114	0.546	0.945
						rp	0.941	–0.610	0.707**	0.012	0.349	0.454*	–0.749	0.098	–0.478*	0.929**
X_7							rg	–0.675	0.735	0.023	0.349	0.480	–0.894	0.127	0.540	0.965
							rp	–0.650	0.727**	0.014	0.345	0.455*	–0.780	0.108	0.480*	0.959**
X_8								rg	–0.408	0.167	0.051	–0.352	0.603	0.064	–0.271	–0.702
								rp	–0.387	0.153	0.060	–0.337	0.508*	0.020	–0.209	–0.683
X_9									rg	0.153	0.237	0.684	–0.667	–0.155	0.189	0.644
										0.145	0.230	0.647**	–0.582	–0.157	0.167	0.684
X_{10}										rg	0.310	0.076	0.178	0.006	0.073	–0.063
										rp	0.300	0.079	0.136	0.002	0.045	–0.059
X_{11}											rg	0.190	–0.162	0.820	0.421	0.360
											rp	0.176	–0.162	0.718**	0.366	0.353
X_{12}												rg	–0.537	–0.197	0.196	0.469
												rp	–0.434	–0.181	0.176	0.444
X_{13}													rg	–0.080	–0.531	–0.909
													rp	–0.113	–0.371	–0.809
X_{14}														rg	0.493	0.235
														rp	0.398	0.212
X_{15}															rg	0.625
															rp	0.539*

Table 2. Direct and indirect effect of different characters on yield at genotypic level in wild rice for genotypic path

Characters	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{16}	rg with yield
X_1	**–0.914**	0.045	0.143	0.700	–1.337	0.446	1.093	0.219	0.444	–0.001	–0.125	–0.035	–0.124	–0.003	0.380	0.937
X_2	0.275	**–0.150**	–0.051	–0.123	0.286	–0.109	–0.269	–0.115	–0.118	–0.002	0.076	0.026	0.004	0.005	0.184	–0.080
X_3	–0.221	0.013	**0.589**	0.338	–0.669	0.093	0.176	0.118	0.051	0.010	–0.035	–0.013	–0.032	0.007	–0.138	0.287
X_4	–0.742	0.021	0.231	**0.862**	–1.655	0.354	0.937	0.247	0.399	0.004	–0.024	–0.036	–0.118	–0.001	0.369	0.848
X_5	–0.738	0.026	0.238	0.862	**–1.655**	0.351	0.934	0.253	0.397	0.005	–0.020	–0.036	–0.116	–0.001	0.343	0.844
X_6	–0.910	0.037	0.122	0.681	–1.297	**0.448**	1.108	0.202	0.434	0.000	–0.138	–0.032	–0.124	0.034	0.407	0.945
X_7	–0.867	0.035	0.090	0.701	–1.343	0.431	**1.151**	0.209	0.446	–0.001	–0.133	–0.032	–0.131	0.005	0.402	0.963
X_8	0.649	–0.056	–0.225	–0.690	1.360	–0.293	–0.777	**–0.309**	–0.248	–0.006	–0.019	0.023	0.088	0.002	–0.202	–0.702
X_9	–0.667	0.029	0.050	0.565	–1.081	0.323	0.846	0.126	**0.608**	0.005	–0.090	–0.045	–0.098	–0.005	0.140	0.694
X_{10}	–0.017	–0.007	–0.175	–0.110	0.250	0.005	0.026	–0.052	0.093	**–0.035**	–0.118	–0.005	0.026	0.000	0.055	–0.063
X_{11}	–0.301	0.030	0.055	0.054	–0.088	0.163	0.402	–0.016	0.14	–0.011	**–0.380**	–0.013	–0.024	0.030	0.313	0.360
X_{12}	–0.480	0.058	0.107	0.471	–0.898	0.217	0.553	–0.108	0.416	–0.003	–0.072	**–0.056**	–0.079	–0.037	0.146	0.469
X_{13}	0.770	–0.004	–0.127	–0.694	1.305	–0.378	–1.029	–0.186	–0.405	–0.006	0.061	0.036	**0.147**	–0.003	–0.395	–0.909
X_{14}	–0.066	–0.020	0.106	–0.027	0.066	0.051	0.146	–0.020	–0.094	0.000	–0.311	0.013	–0.012	**0.036**	0.367	0.235
X_{16}	–0.466	–0.037	–0.109	0.428	–0.763	0.244	0.621	0.084	0.115	–0.003	–0.160	–0.013	–0.078	0.018	**0.745**	0.625

Residual effect = –0.006

X_1 = Plant height; X_2 = No. of tillers/plant; X_3 = Test Weight; X_4 = No. of internodes

X_5 = No. of leaves; X_6 = Length of leaves; X_7 = No. of spikelets; X_8 = Length of spikelets

X_9 = Length of anther; X_{10} = Length of stigma; X_{11} = Pollen viability; X_{12} = Pollen size

X_{13} = Length of awn; X_{14} = Seed setting; X_{16} = Germination %

through number of spikelets followed by number of internodes, germination percentage, length of anther, leaves and awn. Most of the characters exhibited their indirect effect mostly through number of spikelets is the main trait which is responsible for manipulation of grain yield in wild rice. The traits like test weight and number of internodes, should also be given due importance during selection for high yielding genotypes.

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