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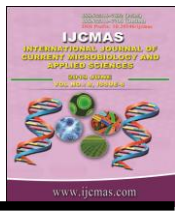

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Correlation and Path Analysis for Quality and Yield Contributing Traits in Wheat (*Triticum aestivum* L.)

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A B S T R A C T

The present experiment was undertaken to study correlation and path co-efficient analysis for 12 metric and two quality traits in 11 genotypes including two checks. The genotypic correlation co-efficient were found to be of higher magnitude than the corresponding phenotypic correlation co-efficient in most of the cases. Grain yield was significant and positively correlated with number of tillers per plant, number of spikelet per panicle, number of grains per panicle and harvest index whereas significantly and negatively correlated with protein content. Path analysis revealed highest positive direct effect of days to heading (1.212), number of grains per panicle (0.783), gluten content (0.709), number of grains per spikelet (0.56), harvest index (0.512) and number of tillers per plant (0.493) on grain yield. Hence emphasis should be given to number of tillers per plant, number of spikelet per panicle, number of grains per panicle and harvest index for genetic improvement of grain yield in wheat.

Introduction

Wheat (*Triticum aestivum* L.) area under cultivation during 2015-16 was 30.47 million ha with the annual production of 92.29 million tones with an average productivity of 30.75 q/ha. In Maharashtra it occupies an area of 9.13 lakh ha with production of 14.0 lakh metric tonnes with an average productivity 15.39 q/ha. In terms of area and production India ranks second after China among wheat growing countries in the world (Anonymous 2017). Considering production and harvested area wheat is a major staple crop in the world which provides almost 20 % energy (Nukasani *et al.*, 2013) and 30 % food grain production. Its unique gluten content and associated bread making properties assure its continuing role in society.

Wheat is used for the preparation of wide range of food stuff viz., flour for making chapattis, semolina, pasta products, biscuits animal feed etc. it is a challenge to breeders to enhance present level of production for growing population. Global demand for wheat by the year 2020 is forecasted around 95 million tones. In view of present situation, to

increase area under production is not possible. Only alternative with breeders is to increase productivity by evolving high yielding varieties and better crop management practices to cope up with increasing demands of food. Therefore efforts were made to study correlation and path analysis in timely sown irrigated wheat genotypes to determine criteria for selection that could be used to identify desirable genotypes with high yield potential.

Materials and Methods

The experimental material comprised of nine (09) different genotypes of bread wheat and two (02) check varieties were sown on 8th November, 2016 under normal irrigated condition during *rabi* 2016-17 in randomized block design with three replication at Experimental Farm, Department of Agricultural Botany, College of Agriculture, Latur. Each genotype was planted in two rows with plot size 3.40 X 0.4 m^2 with 20 cm row to row and 5 cm plant to plant distance.

All recommended agronomic practices were followed to grow good crop. The observations on 12 metric traits viz., plant height (cm), days to heading, days to 50 per cent flowering, days to maturity, number of tillers per plant, length of panicle, number of spikelet's per panicle, number of grains per spikelet, number of grains per panicle, test weight, harvest index and yield per plant (g) along with two quality traits viz., protein content (%) and gluten content (%) were recorded at proper growth stage. Five randomly selected plants were recorded for all the traits under study except of protein content (%) and gluten content (%).Protein content was estimated by Micro kjeldhal method and gluten content by AOAC procedure (1965). Correlation and path analysis were estimated as per the method suggested by Dewey and Lu (1959).

Results and Discussion

The genotypic correlation co-efficient were found to be of higher magnitude than the corresponding phenotypic correlation co-efficient in most of the cases presented in table 1. Genotypic correlation provides an estimate of an inherent association between genes controlling any two characters i.e., when two characters are invariably and nearly associated, the underlined genetic mechanism causing such association may be due to complex linkage between the two characters or pleiotrophy. Hence genotypic correlation is of greater significance and can be effectively utilized in the formulating an effective selection programme.

Yield per plant had not only significant and positive correlation with number of tillers per plant, number of spikelet per panicle, number of grains per panicle and harvest index but also highly significant and positively correlated with days to heading, days to 50 % flowering and days to maturity. These results are in agreements with earlier reports of Kashte (2013) for days to maturity, Dabi *et al.*, (2016), for test weight and harvest index, Singh (2016) for tillers per plant, harvest index and days to maturity. Intercorrelations among yield contributing traits revealed highly significant and positive correlation among length of panicle with number of grains per spikelet and number of grains per panicle at both genotypic and phenotypic level.

Days to maturity was significantly and positively correlated with days to heading and days to 50 % flowering at genotypic level. Similar results were reported by Kashte (2013) for length of panicle, number of grains per panicle, number of grains per spikelet, days to heading, days to 50 % flowering and days to maturity, Dabi *et al.*, (2016) for days to heading and days to maturity.

Table.1 Genotypic and phenotypic (upper and lower diagonal respectively) correlation co-efficient among yield contributing and quality characters in wheat

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1		-0.008	0.038	-0.047	-0.162	0.072	-0.070	0.233	0.024	0.164	-0.690**	0.151	0.149	-0.237
2	0.002		0.983**	0.997**	-0.147	0.488**	0.756**	0.876**	0.842**	0.011	0.064	-0.562**	0.234	0.580**
3	0.044	0.969**		0.989**	-0.178	0.485**	0.759**	0.827**	0.808**	0.149	-0.014	-0.591**	0.348*	0.511**
4	-0.044	0.970**	0.955**		-0.112	0.521**	0.770**	0.801**	0.814**	0.038	0.063	-0.574**	0.305	0.549**
5	-0.141	-0.153	-0.193	-0.115		-0.239	-0.502**	-0.361*	-0.443**	-0.192	-0.276	-0.143	0.234	0.379*
6	0.079	0.405*	0.395*	0.419*	-0.165		0.703**	0.683**	0.801**	-0.132	0.222	-0.195	-0.016	0.166
7	-0.058	0.714**	0.708**	0.716**	-0.437*	0.695**		0.730**	0.943**	0.029	0.405**	-0.539**	-0.018	0.441*
8	0.187	0.739**	0.688**	0.701**	-0.358*	0.457**	0.579**		0.923**	-0.310	-0.068	-0.216	-0.152	0.273
9	0.023	0.805**	0.775**	0.796**	-0.425*	0.697**	0.907**	0.823**		-0.153	0.248	-0.407*	-0.110	0.400*
10	0.160	0.012	0.141	0.025	-0.170	-0.125	0.029	-0.262	-0.159		0.195	-0.458*	0.610**	0.104
11	-0.574**	0.074	0.034	0.087	-0.203	0.098	0.316	-0.124	0.202	0.173		-0.370*	-0.224	0.386*
12	0.133	-0.576**	-0.593**	-0.560**	-0.087	-0.160	-0.502**	-0.182	-0.384*	0.421*	0.279		-0.203	-0.871*
13	0.147	0.215	0.323	0.292	0.232	-0.015	-0.019	-0.125	-0.108	0.603**	-0.212	-0.186		0.084
14	-0.211	0.520**	0.464**	0.515**	0.356*	0.111	0.387*	0.199	0.361*	0.104	0.426**	-0.738**	0.073	

** and * indicates significant at 1% and 5%, respectively.

1=Plant height (cm), 2=Days to heading, 3=Days to 50% flowering, 4=Days to maturity, 5=Number of tiller/ plant, 6=Length of panicle (cm), 7=Number of spikelet per panicle, 8=Number of grains per spikelet, 9=Number of grain per panicle, 10=1000 grain weight (g), 11=Harvest index (%), 12=Protein content (%), 13=Gluten content (%), 14=Yield/ plant (g)

Table.2 Direct and indirect effects (genotypic) of yield components on yield of wheat

Characters	Plant height (cm)	Days to heading	Days to 50% flowering	Days to maturity	Number of tillers/ plant	Length of panicle (cm)	Number of spiklets per panicle	Number of grains per spiklets	Number of grain per panicle	1000 grain weight (g)	Harvest index (%)	Protein content (%)	Gluten content (%)
Plant height (cm)	**0.1339**	-0.0011	0.0051	-0.0063	-0.0217	0.0097	-0.0094	0.0313	0.0032	0.0220	-0.0925	0.0202	0.0200
Days to heading	-0.0100	**1.2129**	1.1930	1.2097	-0.1793	0.5921	0.9170	1.0633	1.0220	0.0143	0.0784	-0.6826	0.2847
Days to 50% flowering	-0.0135	-0.3442	**-0.3500**	-0.3464	0.0626	-0.1698	-0.2658	-0.2897	-0.2828	-0.0524	0.0049	0.2070	-0.1219
Days to maturity	0.0866	-1.8223	-1.8084	**-1.8271**	0.2051	-0.9523	-1.4070	-1.4644	-1.4886	-0.0699	-0.1159	1.0501	-0.5585
Number of tillers per plant	-0.0801	-0.0730	-0.0883	-0.0554	**0.4937**	-0.1181	-0.2483	-0.1785	-0.2192	-0.0952	-0.1365	-0.0711	0.1157
Length of panicle (cm)	-0.0411	-0.2760	-0.2744	-0.2947	0.1353	**-0.5654**	-0.3978	-0.3866	-0.4530	0.0747	-0.1256	0.1105	0.0091
Number of spikelet's per panicle	-0.0015	0.0164	0.0164	0.0167	-0.0109	0.0152	**0.0216**	0.0158	0.0204	0.0006	0.0088	-0.0117	-0.0004
Number of grains per spikelet	0.1313	0.4925	0.4650	0.4503	-0.2030	0.3841	0.4104	**0.5618**	0.5189	-0.1743	-0.0385	-0.1214	-0.0856
Number of grain per panicle	0.0189	0.6598	0.6329	0.6380	-0.3476	0.6274	0.7388	0.7233	**0.7830**	-0.1205	0.1949	-0.3192	-0.0866
1000 grain weight (g)	-0.0744	-0.0053	-0.0678	-0.0173	0.0873	0.0597	-0.0134	0.1404	0.0696	-0.4523	-0.0883	0.2074	-0.2760
Harvest index (%)	-0.3538	0.0331	-0.0072	0.0325	-0.1416	0.1138	0.2079	-0.0351	0.1275	0.1000	0.5122	-0.1898	-0.1149
Protein content (%)	-0.1401	0.5215	0.5482	0.5327	0.1334	0.1812	0.4998	0.2003	0.3778	0.4249	0.3434	-0.9268	0.1887
Gluten content (%)	0.1060	0.1666	0.2472	0.2170	0.1664	-0.0115	-0.0128	-0.1081	-0.0785	0.4330	-0.1593	-0.1445	0.7098
Yield per plant (g)	-0.2376	0.5809	0.5119	0.5494	0.3796	0.1660	0.4410	0.2737	0.4003	0.1049	0.3861	-0.8718	0.0843

Days to heading, days to 50 % flowering and days to maturity were highly significant and positively correlated with length of panicle, number of spikelet per panicle, number of grains per spikelet and number of grains per panicle at genotypic level. Similar results were reported by Avinashe *et al.,* (2015) for days to heading, days to maturity, Dabi *et al.*, (2016) for days to heading, days to maturity and number of spikelet per panicle.

In present study protein content was found significantly and negatively correlated with grain yield at genotypic and significantly and positively correlated with grain yield at phenotypic level.

The results of path co-efficient analysis (Table 2) revealed that days to heading exerted the highest positive direct effect on grain yield followed by number of grains per panicle, number of grain per spikelet, harvest index and number of tillers per plant. Similar results were reported by Tripathi *et al.*, (2011). The highest negative direct effect on grain yield was recorded for days to maturity, protein content, length of panicle, 1000 grain weight and days to 50 % flowering. Parnaliya *et al.,* (2015) also reported negative direct effect of days to maturity, number of tiller per plant and ear length on grain yield which supports our findings.

Hence emphasis should be given to number of tillers per plant, number of spikelet per panicle, number of grains per panicle and harvest index for genetic improvement of grain yield in wheat.

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