

## Study on quality improvement through biometrical approaches in bread wheat (*Triticum aestivum* L.)

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Forty five crosses in F<sub>1</sub> generation of wheat (*Triticum aestivum* L.) were used for studying the character association among grain yield and its related characters. The results showed that the number of grains per spike, grain weight per spike and number of productive tillers per plant were significantly and positively associated with grain yield per plant in parents and F<sub>1</sub> cross combinations.

Key words : Genotypes, Phenotypes, Cultivars correlations, Bread wheat

### INTRODUCTION

Grain yield in wheat, is a complex multicomponent character. Fonseca and Patterson (1963) emphasized the significance of component approach in formulating a successful breeding programme. The present study examines the nature of association of yield with other characters by utilizing parental and their all possible F<sub>1</sub> hybrid lines.

### MATERIALS AND METHODS

Forty five hybrids were obtained by crossing ten genotypes /cultivars namely, K 8020, K 2021, UP 2425, K 8565, K 9107, HUW 234, PBW 373, K 9351, NW 1012 and HD 2285 in a 10 x 10 diallel mating system excluding reciprocals. The experiment comprising 10 parents and their 45 F<sub>1</sub>s was grown in Randomized Complete Block Design with three replications at research farm of C.S.A. University of Agriculture and Technology, Kanpur. The experiment was conducted in two row plots. The length of each row consisted 1.5 m with inter and intra row distance of 25 and 15cm, respectively. Recommended dose of fertilizers with five irrigations were applied to raise a good crop. Ten plants for observations were randomly taken from each parent and F<sub>1</sub> generation. Data were recorded on 10 characters viz., days to reproductive phase, plant height, number of productive tillers per plant, grain weight per spike, number of grains per spike, 1000-grain weight, grain yield per plant, seed hardness, protein content and tryptophan content. Simple correlations were worked out between grain yield and other characters for each parent and hybrid as per method suggested by Al-Jibouri *et al.* (1958). The significance of phenotypic

coefficient was tested against 'r' values from 'r' table of Fisher and Yates (1938) for n-2 degree of freedom.

### RESULTS AND DISCUSSION

The phenotypic and genotypic associations between all possible 45 combinations involving all the 10 characters separately for parental and first generations were computed. The results are presented in Table 1 and 2 for parents and F<sub>1</sub>, accordingly.

In parents, the correlation coefficient were positive and significant for 9 combinations, out of 45 days to reproductive phase, was positively and significantly associated with 1000-grain weight and grain yield per plant. Grain yield was highly significant and positively associated with grain yield per spike number of grains per spike and 1000-grain weight. Grain weight per spike was positively and significantly associated with 1000-grain weight, Tryptophan content was also correlated positively and significantly with seed hardness.

In F<sub>1</sub> generation, the significant associations were recorded in 8 cases out of 45, among these the significant and positive values were found in 10 combinations which were days to reproductive phase with 1000-grain weight; number of spikelets with protein content; number of reproductive tillers per plant with grain yield per plant; grain weight per spike with 1000-grain weight and grain yield per plant; number of grains per spike with grain yield per plant; 1000-grain weight with grain yield per plant; seed hardness with tryptophan content. Negative and significant associations were recorded for grain weight per spike with number of grains per spike; with 1000-grain weight. Rest of the combinations exhibited weak association.

**Table 1 : Phenotypic (upper diagonal) and genotypic (lower diagonal) correlations among 10 attributes in parents of bread wheat**

Characters	Days to reproductive phase	Plant height	No. of productive tillers/plant	Grain weight per spike	No. of grain per spike	1000-grain weight	Grain yield per plant	Seed hardness	Protein content	Tryptophan content
Days to reproductive phase	g <sup>r</sup> p	0.12	0.23	0.12	-0.01	0.68*	0.84*	-0.10	0.23	0.24
Plant height	0.21	g <sup>r</sup> p	0.31	0.17	0.31	0.16	0.08	0.31	0.27	0.17
No. of productive tiller per plant	0.27	0.34	g <sup>r</sup> p	0.37	-0.16	0.21	0.69*	0.17	0.31	0.21
Grain weight per spike	0.15	0.20	0.39	g <sup>r</sup> p	0.72**	0.87**	0.74**	0.32	0.12	0.18
No. of grain per spike	0.01	0.33	-0.14	0.74	g <sup>r</sup> p	0.21	0.82**	0.07	0.02	0.05
1000-grain weight	0.72	-0.13	0.26	0.91	0.24	g <sup>r</sup> p	0.71**	0.08	0.32	-0.21
Grain yield per plant	0.12	-0.06	0.78	0.78	0.85	0.75	g <sup>r</sup> p	0.17	0.21	0.15
Seed hardness	0.87	-0.21	0.21	0.34	0.15	0.20	0.20	g <sup>r</sup> p	0.06	0.68*
Protein content	0.40	-0.23	0.34	0.14	0.04	-0.21	0.27	0.10	g <sup>r</sup> p	0.39
Tryptophan content	0.32	0.24	0.24	0.20	0.09	-0.12	0.18	0.74	0.28	g <sup>r</sup> p

\* and \*\* indicate significance of values at P=0.05 and 0.01, respectively

**Table 2 : Phenotypic (upper diagonal) and genotypic (lower diagonal) among 10 attributes in F<sub>1</sub> generation of a 10-parent-diallel cross in bread wheat**

Characters	Days to reproductive phase	Plant height	No. of productive tillers/plant	Grain weight per spike	No. of grain per spike	1000-grain weight	Grain yield per plant	Seed hardness	Protein content	Tryptophan content
Days to reproductive phase	g <sup>r</sup> p	-0.14	0.06	-0.13	-0.02	0.28*	-0.09	0.13	0.09	0.07
Plant height	-0.14	g <sup>r</sup> p	0.05	-0.01	0.10	-0.15	-0.09	0.01	-0.21	0.06
No. of productive tiller per plant	0.09	0.06	g <sup>r</sup> p	0.13	-0.06	0.09	0.39**	-0.11	0.05	0.07
Grain weight per spike	-0.15	0.01	0.15	g <sup>r</sup> p	-0.59	0.45**	0.62**	0.10	0.02	0.13
No. of grain per spike	-0.04	0.12	-0.04	-0.68	g <sup>r</sup> p	-0.42**	0.26**	-0.29	-0.04	-0.01
1000-grain weight	0.33	-0.15	0.12	0.52	-0.46	g <sup>r</sup> p	0.29	-0.06	-0.04	-0.09
Grain yield per plant	-0.11	-0.10	0.40	0.67	0.28	0.34	g <sup>r</sup> p	0.06	0.14	0.05
Seed hardness	0.10	0.01	-0.18	0.13	-0.13	-0.07	0.08	g <sup>r</sup> p	-0.01	0.26*
Protein content	0.23	-0.28	0.02	0.04	-0.03	-0.02	0.29	-0.08	g <sup>r</sup> p	0.21
Tryptophan content	0.08	0.07	0.06	0.16	-0.01	-0.11	0.06	0.31	0.25	g <sup>r</sup> p

\* and \*\* indicate significant of values at P=0.05 and 0.01, respectively

The extent of genotypic interrelationship was higher than phenotypic association in both the parental and F<sub>1</sub> generations under study involving 45 character

combinations in each case. Ahmad *et al.* (1978) reported similar findings in bread wheat. Hence, the significant phenotypic associations between characters were

primarily due to genetic causes, which might be due to pleotropic effect rather than linkage between gene affecting direct characters. The self-pollination mechanism is a prelude the fixation of blocks of genes as well as due to limited chances of breaking linkage compared with random mating system prevailing in cross pollinated crops. Such reports have been made by Waber and Moorthy (1952) and Johnson *et al.* (1955).

Grain yield per plant possessed positive and significant association with grain weight per spike, number of productive tillers per plant, number of grains per spike and 1000-grain weight in F<sub>1</sub> generation and similar was the situation in parental generation. Hence, the selection for these component traits could lead to higher productivity. Positive correlation was reported by Donald and Hamblin (1976), Ali and El-Haddeg (1978), Mc Vetty and Evans (1980) for grain yield with same component traits. Paroda *et al.* (1974), Virk and Anand (1970), Virk and Singh (1972) and Ahmad *et al.* (1978) reported for grain yield with 1000-grain weight and Pandey *et al.* (1983) and Sharma *et al.* (1987) for grain yield with number of production tillers.

Positive and significant correlation between tryptophan content and seed hardness was observed and protein content was found positively associated with tryptophan content. The similar finding was reported by Gill and Brar (1973), Pandey (1980) and Kerkhi (1983).

A positive association between protein content and seed hardness provided a check as the seed hardness could be taken as indicator of protein level in grain. Therefore, a large number of germplasm could be screened for protein content with the help of seed hardness which is quickly measurable in the laboratory and field conditions.

The positive and significant association between protein content and tryptophan content in both the parental and F<sub>1</sub> generations was accordance with Srivastava *et al.* (1971) who reported the increase of concentration with the increase in protein content in per cent which might be possible due to application of nitrogenous fertilizers to experimental crops.

On the basis of the result, it may be concluded that maximum emphasis during selection should be given for grain weight per spike, number of grain per spike and number of productive tillers pre plant for the improvement of grain yield in bread wheat.

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