

Genetic determination of yield in wheat (*Triticum aestivum* L.)

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ABSTRACT

Grain yield per plant exhibited positive and highly significant correlation with characters like plant height, numbers of productive tillers per plant, ear length, number of grains per ear and 1000 grain weight. Days to 75 percent flowering had non significant correlation with grain yield per plant. The character namely number of productive tillers per plant, number of grains per ear and 1000 grain weight had high and positive direct effect on grain yield per plant however, days to 75 per cent flowering had maximum negative direct effect on grain yield per plant. But its indirect effect via., number of productive tillers per plant and number of grains per ear more positive.

Key words: Wheat, Correlation, Path analysis, Yield attributes.

INTRODUCTION

Bread wheat is most widely grown crop in the world. Approximately one sixth of the total arable land in the world is cultivated with wheat. India has emerged as the second largest producer of wheat after china surpassing USA in 1996-97 having almost same acreage. Bihar comes under North Eastern Plain zone. The production and productivity of the zone is low because of late sowing of wheat, due to late harvesting of paddy under rice-wheat cropping system. Due to late sowing and chill winter period during vegetable phase, which restricted growth of the crop followed by imposed maturity due to hot westerly wind leads to the shriveled and shrunken grain, resulting in poor productivity of the crop. Thus to meet the challenging objectives of wheat breeding for Bihar, it was most essential to study the range of variation percent in the breeding stock. So, evaluation of existing germplasm for yield and yield attributing traits are of utmost important.

MATERIALS AND METHODS

The experimental material consists of 495 germplasm of wheat (*Triticum aestivum* L.) (mostly the entries from different international wheat screening nursery) including two checks, was sown in a three row of 3.0 meter length, spaced 23 cm apart from row to row and 10 cm from plant to plant during *rabi* 1999 at Pusa farm of Rajendra Agricultural University. Data were recorded on 5 competitive plants per genotype for days to 75 per cent flowering, plant height, number of productive tillers per plant, ear length, number of grains per ear, 1000 grain weight and grain yield per plant. The mean values were used to estimate phenotypic correlation coefficient and path analysis as per method of Dewey and Lu (1959).

RESULTS AND DISCUSSION

Simple correlation coefficients were computed for pairs of all the seven quantitative characters and presented in table-1. Perusal of Table 1 revealed that plant height, number of productive tillers per plant, ear length, number of grains per ear and 1000 grain weight were positively correlated with grain yield per plant and these correlations were highly significant. Among the component traits positive and significant correlations were observed between number of productive tillers per plant and number of grains per ear; ear length and number of grains per ear; days to 75 per cent flowering and number of grains per ear as well as number of productive tillers per plant. Plant height was positively correlated with a number of component traits viz., number of productive tillers per plant, ear length, number of grains per ear and 1000 grain weight. However, significant negative correlation was found between days to 75 per cent flowering and 1000 grain weight; number of grains per ear and 1000 grain weight.

The present finding of significant positive correlation of 1000-grain weight, tillers number, plant height, grains number per ear and ear length with grain yield has also been supported by Choudhary *et al.*, (1991) and Singh (1995). Wajid *et al.* (1997) and Kumar (2000) also observed highly significant and positive correlation between yield per plant and tillers per plant. The significant and positive correlation between yield per plant and grain weight was also recorded by Kumar (2000), but significant and negative association of 1000-grain weight with grain yield was reported by Khan *et al.* (1999).

Phenotypically number of productive tillers per plant had maximum positive direct effect on yield per plant followed by 1000

Table 1 : Phenotypic correlation coefficient between different pairs of quantitative characters in wheat germplasm.

Characters	Plant height (X ₂)	Number of productive tillers per plant (X ₃)	Ear length (cm) (X ₄)	Number of grains per ear (X ₅)	1000-grain weight (g) (X ₆)	Grain yield per plant (g) (Y)
Days to 75 percent flowering (X ₁)	-0.053	0.151**	-0.057	0.196**	-0.482**	-0.032
Plant Height (X ₂)		0.091*	0.230**	0.093*	0.248**	0.174**
Number of productive tillers per plant (X ₃)			0.027	0.233**	-0.081	0.809**
Ear length (cm) (X ₄)				0.175**	0.203**	0.170**
Number of grains per ear (X ₅)					-0.176**	0.376**
1000-grain weight (g) (X ₆)						0.217**

*, ** Significant at 5 and 1 percent levels of significance, respectively

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grain weight and number of grains per ear and also these traits showed highly significant positive correlation with grain yield per

characters which should have been identified and included in the study in order to reduce residual effect.

Table 2 : Direct (diagonal) and indirect phenotypic effect of different characters towards grain yield in wheat germplasm.

Sl. No.	Characters	Days to 75 per cent flowering	Plant height (cm)	Number of productive tillers per plant	Ear length (cm)	Number of grains per ear	1000 grain weight (g)	Grain yield per plant (g)
1.	Days to 75 percent flowering	<u>-0.0574</u>	-0.0003	0.1181	0.0026	0.0487	-0.1391	-0.0320
2.	Plant height (cm)	0.0030	<u>-0.0052</u>	0.0712	0.0103	0.0231	0.0716	0.1740**
3.	Number of productive tillers per plant	-0.0087	0.0005	<u>0.7824</u>	0.0012	0.0579	-0.0234	0.8090**
4.	Ear length (cm)	0.0033	-0.0012	0.0211	<u>0.0447</u>	0.0435	0.0586	0.1700**
5.	Number of grains per ear	-0.0113	-0.0005	0.1823	0.0078	<u>0.2484</u>	-0.0508	0.3760**
6.	1000-grain weight (g)	0.0277	-0.0013	-0.0634	0.0091	-0.4370	<u>0.2886</u>	0.2170**

The residual effect =0.4499

** significant at 1 percent level of significance

Under lined digits represents direct effect of character on grain yield per plant

plant, may be considered as significant yield components for the improved of grain yield per plant.

Ear length also had highly significant positive correlation as well as positive direct effect of medium magnitude on grain yield per plant. Plant height showed negative direct effect on grain yield per plant however, its indirect effects via., all other yield contribution traits were positive which ultimately showed a significant positive correlation between plant height and grain yield per plant in the present study.

Direct and positive effect of grain weight on yield per plant was also reported by Singh (1995) in wheat. Positive direct effect of effective tillers per plant on yield per plant in the present study was also observed by Kumar (2000). Number of grains per ear had direct positive phenotypic effects on yield per plant. Similarly direct positive phenotypic effect of number of grains per ear on grains yield per plant was also reported by Kumar (1991) and Singh (1995).

Thus path coefficient analysis suggested that number of productive tillers per plant, 1000 grain weight and number of grains per ear were important characters which may be given due importance in formulating selection under.

Phenotypic residual effect indicated that there were other

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Received : September, 2005; Accepted : February, 2006

ISSN : 0973-4899

ASIAN JOURNAL OF BIO SCIENCE
AN INTERNATIONAL JOURNAL