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## Determining the Direct Selection Criteria for Identification of High Yielding Lines in Bread Wheat (*Triticum aestivum* L.)

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**Abstract:** A set of twenty elite bread wheat lines including one standard variety were evaluated in order to determine the selection criteria for identification of high yielding lines in bread wheat. The results showed that all varieties having highly significant variation for days to heading, days to maturity, plant height, 1000-kernel weight, test weight and grain yield. Grain yield was positively correlated with 1000-kernel weight and test weight while the other traits i.e, days to heading, days to maturity and plant height showed negative correlation. The results indicated that 1000 kernel weight had positive direct effect on grain yield. It was concluded that selection be made considering 1000-kernel weight and test weight.

**Key words:** Path coefficient, direct selection, 1000-kernel weight, genotypic and phenotypic correlation, bread wheat

### Introduction

Wheat is the major grain crop of Pakistan occupying the largest area (8.5 million ha) under any single crop. (Anonymous, 2000). Its yield, as in other field crops, is a complex character which is dependent on a number of variables (characters). To increase the yielding ability of wheat crop, the study of direct and indirect effects of various characters on yield is of prime importance. It also provides the basis for success in the breeding programmes and thus the problem of yield increase can be tackled more effectively. Selections based on correlation without taking into account the interaction between the component characters may sometime prove misleading. Path coefficient analysis (a statistical technique) makes it possible to quantify the interrelationship of different components for their direct and indirect effects on grain yield through correlation. Singh and Singh (2001) concluded that selection for grain yield in wheat should largely depend on 1000-kernel weight, early maturity and spike length. The study also showed highly significant negative correlation (-0.9067) between days to heading and grain yield. Dokuyucu and Akkaya (1999) worked out path coefficient analysis and showed positive and significant correlation of grain weight and test weight with grain yield. Narwal *et al.* (1999) conducted study on genetic variability, correlation and path coefficient analysis in bread wheat in two climatic zones of Haryana. Their results showed high and positive correlation of 1000-kernel weight with grain yield and had large and positive direct effect at one location. Days to 75% heading was negatively correlated with grain yield at both

locations. Mondal *et al.* (1997) concluded from the path coefficient study that 1000-kernel weight had a positive direct effect on grain yield while plant height and days taken to maturity had a negative direct effect on yield. Thus, they suggested that selection in bread wheat may be based on 1000-kernel weight. In this study, an effort has been made to evaluate the association of seed yield with some characters for developing selection criteria.

### Materials and Methods

Twenty bread wheat advance lines candidate<sup>-1</sup> varieties contributed by different research institute in the country were sown as a National Uniform Wheat Yield Trial (late seeding date) in the field area at National Agricultural Research Center (NARC) during 2001-02. The trial was planted late by 30 days to normal planting to identify the high yielding lines for fitting into the diverse agro-ecology with intensive cropping systems.

The experiment was laid out in a randomized complete block design (RCBD) with four replications. Each plot consisted of 6 rows, 5 m long and 25 cm apart. The net area harvested for each plot was 5 m<sup>2</sup>. Fertilizer was applied @ 80:80:0, N:P:K, respectively. Three irrigations including one pre-sowing were given to the crop during the growth period. Recommended agronomic practices were followed to raise a good crop stand. Margalla-99 was used as check. The analysis of variance was done according to Steel and Torrie (1980). Phenotypic and genotypic correlation coefficients were computed according to Kwon and Torrie (1964). Direct and indirect effects were calculated as purposed by Dewey and Lu (1959).

## Results and Discussion

All the traits showed highly significant values in the study (Table 1). The grain yield ranged from 3350-4850 (kg ha<sup>-1</sup>) with V-98059 giving the maximum yield in this category of trial. This line also possessed the maximum 1000-kernel weight (59.55 g) (Table 2). Highly significant variation was observed for days to heading, days to maturity, plant height, 1000 kernel weight, test weight and grain yield (Table 1) which shows a flexibility for selection of a trait under the specific desired ecology.

Days taken to heading produced negative direct effect and indirect effect (Table 3) via days to maturity, plant height and 1000-kernel weight which resulted in the highly significant negative association between days to heading and grain yield (Singh and Singh, 2001; Narwal *et al.*,

1999). Days to maturity has negative direct and indirect effect via days to heading and 1000-kernel weight resulting negative and significant correlation with grain yield. The positive indirect effect via plant height and test weight can be ignored while selecting desirable genotypes but the direct negative effect of plant height and its indirect effect through days to heading may not be ignored during the selection process as suggested by Mondal *et al.* (1997).

The correlation between 1000-kernel weight and grain yield was positive and highly significant. It also has positive direct and indirect effects via days to heading and days to maturity. These results are in agreement with Singh and Singh (2001), Narwal *et al.* (1999), Mondal *et al.* (1997) and Dokuyucu and Akkaya (1999). The strong

Table 1: Analysis of variance of different parameters studied during 2001-02

	Days to heading	Days to maturity	Plant height	1000-kernel weight	Test weight	Grain yield
MS (varieties)	160.039	8.092	191.938	76.938	10.255	747648.00
MS (replicates)	06.271	6.458	11.542	12.714	1.917	87125.34
MS (error)	01.481	0.840	09.936	04.469	4.463	120151.60
F. ratio (v)	108.036**	51.086**	19.317**	17.216**	2.298**	6.223**
F. ratio (r)	04.233 NS	16.829**	01.162NS	02.854*	0.429NS	0.725NS

\*\*Significant at 1% level, \*Significant at 5% level, NS = non-significant

Table 2: Treatment means for various traits of the twenty elite bread wheat lines during 2001-02

Traits							
Lines	Traits <sup>-1</sup>	Days to heading	Days to maturity	Plant height (cm)	1000-kernel weight	Test weight (kg ha <sup>-1</sup> )	Grain yield (kg ha <sup>-1</sup> )
V-97046		120	155	88.5	56.55	77.78	3350
V-97052		111	153	96.0	31.40	77.90	4150
V-98059		115	154	87.3	59.55	78.32	4800
D-97603		118	153	95.5	31.70	74.93	4650
V-1076		104	150	98.0	32.05	78.49	4300
V-8975		116	151	93.3	28.85	77.85	4200
97B2210		117	151	94.8	34.05	79.55	4150
97B2333		108	151	72.3	35.45	78.57	4150
91BT010-84		122	153	93.5	30.15	75.32	3550
SDK-1		104	151	83.3	40.20	80.57	5200
TD-1		119	154	84.5	26.05	76.40	3950
V-7014		115	154	100.3	32.65	77.00	3950
SI-91195		112	152	96.0	32.45	78.41	4500
IBW-96405		118	153	96.0	28.70	75.23	3850
PR-74		117	151	96.0	32.50	76.13	3900
PR-75		113	151	92.8	32.00	79.00	4100
V-5		111	151	94.5	35.70	76.63	4650
92T009		117	152	101.6	29.90	77.55	4150
MAW-1		97	151	100.5	44.75	80.25	4450
MARGALLA-99		119	153	094.5	31.15	78.78	3850

Table 3: Direct and indirect effects of various characters on grain yield

Variables	Days to heading	Days to maturity	Plant height	1000-kernel weight	Test weight	Genotypic correlation with grain yield
Days to heading	<b>-0.6827</b>	-0.1246	-0.0056	-9.2200	0.2764	-0.6287**
Days to maturity	-0.4474	<b>-0.1902</b>	0.0222	-6.9300	0.1714	-0.5133*
Plant height	-0.023	-0.0255	<b>-0.1655</b>	0.0025	0.0612	-0.993*
1000-kernel weight	0.58	0.1214	-0.0038	<b>0.1086</b>	-0.2301	0.576**
Test weight	0.5795	0.1001	0.311	0.0767	<b>-0.3256</b>	0.4618*

\*\*Significant at 1% level, \*significant at 5% level, Note: Direct effects are given in bold

positive and significant correlation was also found between test weight and grain yield. Although its direct effect was negative but its indirect effect via days to heading, days to maturity, plant height and 1000-kernel weight was positive. Therefore, indirect selection through these traits might be helpful in yield improvement under the specific ecology where these lines were tested.

From this study, it is concluded that positive direct effect of 1000-kernel weight on grain yield of wheat coupled with high value of genotypic correlation suggested that direct selection for this trait would be effective to identify the wheat genotypes with high yield.

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