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VARIABILITY AND ASSOCIATION OF GRAIN YIELD WITH VEGETATIVE AND GRAIN FILLING PERIOD IN SPRING WHEAT

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Abstract

Variability and interrelationship of characters were studied in fifteen wheat genotypes. Vegetative period, grain filling period and yield showed wide range of variation. Heritability estimates were high for vegetative period, grain filling period and maturity but it was low for yield. Days to maturity expressed low genotypic and phenotypic variability and genetic advance. Vegetative period and grain filling period having high heritability and appreciable genetic advance indicate the scope of improvement. The correlation of vegetative period was positive with days to maturity but it was negative with grain filling period and yield. Grain filling period had negative correlation with days to maturity and positive correlation with grain yield. Path coefficient analysis showed that vegetative period had high positive direct effect on yield while the direct effect of grain filling period and days to maturity of yield was negative. The findings imply that there should be compromise in choosing weight for the duration of vegetative and grain filling period at certain maturity for getting higher yield.

Key words : Vegetative period, Grain filling period, yield.

Wheat and other cereal crops have an approximately linear grain filling phase that begins after anthesis and lasts till physiological maturity. Several studies have dealt with the relationship between grain filling period and yield in various crop species. Several investigators have suggested that it is possible to increase yield in cereal crops through optimizing the duration of the vegetative and grain filling periods. Evans and Wardlaw (1976) reported the existence of variation in cereals for duration of the vagetative and grain filling periods. The present research was undertaken to study the variability of and relationship (if any) exists among the growth periods and yield in spring wheat.

Fifteen wheat genotypes were used for the study. The experiment was conducted at Wheat Research Centre, Dinajpur during 1990-91. A randomized complete block design with 3 replications was used. Each unit plot was 3m x 6 rows. Seeds were solid seeded at the rate of

11 gm in each row of 30cm apart on Nov 24, 1990. The crop was raised following recommended practices under irrigated condition. The characters vegetative period, days to maturity, grain-filling period and grain yield (g) from 2.4 m^2 from the middle of the plot were recorded.

The analyses of variance and covariance were performed on the data recorded. Correlations (Miller *et. al.*, 1958), variability (Burton, 1952), heritability in broad sense (Johnson *et al.*, 1955) and genetic advance in per cent of mean at 5% selection intensity (Allard, 1960) were calculated.

The variation among the genotypes were highly significantly for all the characters studied. Relatively high magnitude of genotypic coefficient of variation (GCV) for yield, vegetative period and grain filling period (Table 2) indicated that the genotypes under test had broad genetic base for these traits. The differences between genotypic and phenotypic variations were less for the vegetative, maturity and grain filling periods indicated that major portion of variation was due to genetic only. Heritability estimates for the two growth periods were high but it was low for yield. Vegetative and grain filling periods with high heritability value also showed higher value of genetic advance. Islam (1976) and Das and Rahman (1984) got similar findings where they found that characters with combination of appreciable heritability and good amount of genetic advance are expected to give good response in selection.

The genotypic correlation of vegetative period with yield was negative but the phenotypic value was positive and insignificant. There was no significant correlation between days to maturity and yield. Significant positive correlation was found between grain filling period and yield both genotypically and phenotypically. Similar findings were reported by Nass and Reiser (1975), Razzaque *et. al.* (1981) in wheat, Rasmusson *et. al.* (1979) in barely and Daynard and Kannenberg (1976) in corn.

The nature of relationship is further explained by path coefficient analysis (Table 2). Vegetative period had positive direct effect

Table 1. Estimates of genetic parameters for vagetative period, grain filling period and grain yield in spring wheat.

Characters	Mean±SE and Range*	Coefficient of variation		Heritability	Genetic Advance in% of mean
		Genotypic	Phenotypic		
Vegetative period (days)	70 ± 0.68 (62-83)	9.1	9.28	96.90	18.53
Maturity period (days)	112 ± 0.86 (106-120)	2.80	3.10	81.54	5.21
Grain filling period (days)	40 ± 0.93 (32-49)	9.94	10.73	85.90	18.99
Grain yield (g/plot)	506 ± 37.0 (300-700)	10.97	16.78	42.73	14.77

* Range in the parenthesis

Table 2. Partitioining of correlation (phenotypic) with grain yield into direct and indirect components

Pathways of association	Direct effect path coefficient (P)	Indirect effect path coefficient (P x r)	Correlation coefficient (r)
Yield vs Vegetative period			
Direct effect	0.5457		
Indirect effect via days to maturity		-0.6146	
Indirect effect via grain-filling period		-0.3311	
Total			-0.40
Yield vs days to maturity	-0.7404		
Indirect effect via vegetative period		0.4529	
Indirect dffect via grain filling period		0.2381	
Total			-0.05
Yield vs grain filling period	-0.3720		
Indirect effect via vegetative period		0.4857	
Indirect effect via days to maturity		0.4739	
Total			0.59

Residual effect : 0.7746

on yield but it possessed sufficient negative effect via maturity and grain filling period resulting negative correlation with yield. Maturity had the highest negative direct effect on yield but its positive indirect effect via vegetative period and grain filling period minimized the correlation between maturity and yield to be insignificant. Grain filling period showed negative direct effect on yield. Considerable positive indirect effect of grain filling period via vegetative period and maturity revealed that it is indirectly related to grain yield through these two characters.

It appeared from the results that there should be some compromise in choosing weight for vegetative period and grain filling period at certain maturity for getting higher yield.

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