



Variability studies in wheat (*Triticum aestivum* L.) under late sown condition

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Variability and association of plant traits with the grain yield is important to be known for efficient selection. This is especially more important for developing wheat varieties in late sown areas where crop gets relatively less time (110-120 days as compared to 130-140 days) for crop growth and development. Around one-third of the wheat area under high input management falls under late sown category. In North Eastern Plains Zone late sown wheat comprises more than 50% area. The information regarding the extent of variability for important root traits and chlorophyll content and their correlation with grain yield and its components is lacking. Hence the present study was undertaken with a view to studying the extent of variation and degree of association of root traits, chlorophyll content and other yield traits with grain yield under late sown condition.

One hundred two wheat genotypes including popular wheat varieties namely HUW 234 and HUW 206, which are commercially grown in the North Eastern Plains Zone of India were utilized for the study during 1995-96 and 1996-97 crop season at the research farm of Institute of Agricultural Sciences, B.H.U., Varanasi. These genotypes were raised in a randomized block design with three replications. In each block there were 102 plots and each plot consisted of two rows of 2-metre length. Row to row and plant to plant spacing was 25cm and 5cm, respectively. Observations were recorded on root traits, chlorophyll content, grain yield and other yield traits. For the root traits (root number and root dry weight per plant), the wheat varieties were grown in polythene packets in glass house. Polythene bags (1m × 0.5m size) were filled with a mixture of sand and FYM (50:50). The bags were perforated by pin to provide proper drainage and aeration. Wheat seeds were sown such that 2 plants survived in each bag. The bags were watered every fifth day. Observations were recorded at three-week stage after removing the roots by gradual washing under tap water.

The chlorophyll content was measured in terms of chlorophyll concentration of the flag leaf in SPAD units by the help of Minolta Chlorophyll Meter SPAD 502. The reading was taken at the anthesis stage on twenty randomly selected competitive plants between 12 noon to 2 pm to maintain uniformity of sunlight. Grain yield per plant and other yield traits were also recorded on twenty randomly selected plants. The mean data over two years were subjected to statistical analysis. The phenotypic and genotypic coefficients of variation were estimated as suggested by Burton [1]. The correlation coefficients were computed as per the procedure given by Singh and Chaudhury [2].

The genetic parameters of variation for grain yield and other traits are given in Table 1. Maximum range was observed for plant height followed by 1000-grain weight. Heritability estimates were high for all the characters except grain yield per plant which showed moderate heritability. Moderate to low values of heritability for grain yield were also reported by Pathak and Nema [3] and Belay *et al.* [4] in wheat. Root weight per plant revealed high PCV, GCV and genetic advance as percent of mean followed by grain yield per plant.

Phenotypic and genotypic correlation coefficients among the various characters (Table 2) showed that the genotypic correlation coefficient were higher than phenotypic correlation coefficients indicating inherent association between the characters under study but the phenotypic expression of the correlation was influenced by environmental factors. The two yield components, number of spikes per plant and 1000-grain weight were positively and significantly correlated with the yield. Similar findings were reported by Belay *et al.* [4], Sinha and Sharma [5].

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Table 1. Variations for root traits, chlorophyll content, grain yield and yield components in late sown wheat

Sl. No.	Characters	Range	Mean	PCV (%)	GCV (%)	H (%)	GA*
1	Root number per plant	2.66-5.11	4.06	13.66	13.23	93	1.07
2	Root weight per plant (g)	0.02-0.09	0.04	34.70	32.50	87	0.03
3	Chlorophyll conc. (SPAD value)	33.70-51.60	44.59	7.76	7.13	84	6.01
4	Grain yield/plant	2.73-7.42	4.98	25.13	20.77	68	1.76
5	Number of spikes per plant	2.00-5.57	3.54	18.63	17.55	88	1.21
6	1000-grain weight	24.00-51.33	39.75	14.12	13.71	94	10.91

PCV = Phenotypic coefficient of variation, GCV = Genotypic coefficient of variation, H = Heritability, GA = Genetic advance, *The selection differential used was 2.06 at 5% selection intensity.

Table 2. Phenotypic (P) and Genotypic (G) correlation coefficients among root traits, chlorophyll content, yield and yield traits in late sown wheat

Characters	Correlation	Root wt. (RW)	Chloro-phyll conc. (CHL)	No. of spikes/plant (NSP)	1000-grain wt. (GW)	Grain yield (GY)
Root No.	P	0.321**	-0.078	0.033	0.559**	0.239*
	G	0.356	-0.086	0.034	0.588	0.303
RW	P		-0.232*	-0.006	0.302**	-0.001
	G		-0.276	0.006	0.336	0.031
CHL	P			0.098	-0.301**	0.097
	G			0.128	-0.330	0.162
NSP	P				0.081	0.551**
	G				0.086	0.738
GW	P					0.321**
	G					0.409

*, **Significant at 5% and 1% probability levels, respectively

Root number per plant showed positive and significant association with grain yield per plant and 1000-grain weight. This indicated that if a suitable root screening technique is available, root traits might be exploited in breeding programmes to obtain high yielding wheat genotypes. Positive association of number of seminal roots with 1000-grain weight has been reported by Gut and Ptak [6] and with grain yield by Mondal and Mondal [7]. However, correlation between chlorophyll content and grain yield was not significant.

The results of the present study indicate a relatively greater emphasis on yield component characters than grain yield itself, which could be more useful during selection. Traits like root number per plant may also be exploited to realize better yield performance of wheat genotypes.

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