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SHORT COMMUNICATION

Genetic Variability, Heritability and Correlation Studies in Wheat Genotypes (*Triticum aestivum* L.)

EKTA SINGH[1], RAMTEKE P.W.[2], M. RAM[2], B.A. WANI[2] AND SADHNA SINGH[3]

Department of Biological Sciences[1], Genetics and Plant Breeding[2], Plant Protection[3]

Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Formerly Allahabad Agriculture Institute)

Allahabad U.P. 211 007

email: ekta1701@gmail.com[1]

Wheat (*Triticum aestivum* L.) is one of the most important crop of the world and contributes about 40% of India's food grain pool. The present investigation was conducted for selected 24 genotypes to determine the extent of genetic variability, genetic coefficient, heritability, genetic advance and correlation of different characters in wheat.

The field experiment was carried at the experimental field of Genetics and Plant Breeding/ Seed Science and Technology, Department of GPB, SHIATS, Allahabad. The experimental methods consist of 24 diverse wheat lines. The trail was laid down in RBD with three replications during two consecutive years (2009-2010 and 2010-2011) with average plot size of 3 sq.cm. sowing was done during both the years at the row to row spacing of 20 cm apart and 5 cm plant to plant distances. The observation were recorded on 5 randomly selected plants from each line in each replicate for 17 characters Table 1. The phenotypic and genotypic coefficient of variability was calculated according to the method suggested by Burton, 1953. For estimation of heritability (Broad sense), genetic advance and correlation were calculated according to the suggested by Johnson, *et al*., 1955.

Analysis of variance of two year data revealed significant differences among the genotypes for all the traits indicating the presence of sufficient genetic variability in the genotypes and considerable scope for their improvement. Sufficient genetic variability for many of the quantitative traits studied in wheat. The extent of variability with respect to 17 characters in different genotypes is measured in terms of range, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), along with the heritability expected genetic advance and genetic advance as percentage of mean (GAM) are given in (Table 1). The considerable amount of variation was observed for all the characters. The phenotypic coefficient of variability (PCV) was *at par* with the genotypic coefficient of variability in all the characters (Table 1). The estimates of GCV and PCV were high for leaf nitrogen (35.34 and 35.44), gluten content (32.47 and 32.70), chlorophyll a (18.62 and 19.13), total chlorophyll (16.19 and 17.10), tillers per plant (13.58 and 15.66) and low for harvest index (3.08 and 4.16). The yield per plot (11.51 and 11.70) and spike length (11.20 and 11.52) recorded higher GCV and PCV values for yield attributing traits in wheat which was also reported by Walia and Garg, 1996 and Gupta and Verma, 2000. The high heritability was noticed for protein content (%) (99.63%) and low for chlorophyll b (66.70%). This indicates that chlorophyll b is highly influenced by environmental factors and not much exploited as selection criteria while all those which demonstrated high heritability values could be exploited as selection criteria by integrating with conventional breeding methods. Our findings are supported by observation of Singh and Singh, 2001 and Dwivedi, *et al.,* 2002. Similarly, among yield and yield traits , yield is a well known trait not directly under genetic control (Grafius, 1965). But among the yield component characters, the heritability for tillers/plant (75.15%), spike length (94.46), grains/spike (93.84%) and 1000 grain weight (94.75%) were found of very high order. Therefore these characters are well under genetic control and selection can result high yielding lines. Shoran, 1995 also reported high heritability for 1000 grain weight, harvest index, tillers/plant and plant height.

In the present experiment, the study of correlation among different characters revealed that, in general the genotypic correlation coefficients were positive and of high order which indicate high degree of association of physiologic traits with the yield and yield components. This indicates that the physiologic traits such as chlorophyll-a had significant positive correlation with grain yield/plot and yield components like 1000 grain weight, spike length and tillers/plant and plant height; chlorophyll-b with grain yield/plot and yield components like grains/spike; total chlorophyll content with yield/plot; 1000 grain weight and plant height; leaf nitrogen with grain yield/plot, tillers/plot and 1000 grain weight; Harvest Index with 1000 grain/weight and grain filling period with plant height; Days to 50% flowering was found negatively correlated with plant height and days to maturity positively correlated with plant height.

As regards genotypic correlation coefficient of physiologic traits with quality characteristics, chlorophyll a showed significant positive correlation with protein; chlorophyll b, showed negative correlation with gluten; total chlorophyll content showed positive correlation with protein content; leaf nitrogen showed positive correlation with protein

Table 1. Range, mean, GCV, PCV, heritability and genetic advance of mean for 17 traits in wheat

Traits	Range (pooled)	Grand mean (Pooled)	GCV	PCV	Heritability (%) (Broad scence)	Genetic advance	Genetic advance as (%)of mean (Genetic gain)
Chlorophyll a (mg/g)	0.62-1.49	1.29	18.62	19.13	94.70	0.46	37.32
Chlorophyll b (mg/g)	0.25-0.45	0.36	15.61	19.11	66.70	0.09	26.26
Total chlorophyll (mg/g)	1.02-1.92	1.60	16.19	17.10	89.66	0.50	31.59
Leaf nitrogen (mg/g)	1.28-4.40	2.96	35.34	35.44	99.48	2.15	72.63
Nitrate Reductase Activity	0.135-0.175	0.156	7.42	7.89	88.36	0.02	14.37
Harvest Index(%)	40.08-46.03	43.27	3.80	4.16	83.46	3.09	7.15
Grain Filling Period	33.83-44.00	39.56	5.91	6.16	91.78	4.61	11.66
Days to 50% flowering	65.00-80.00	73.49	5.14	5.23	96.55	7.65	10.41
Days to maturity	109.00-119.00	113.07	2.40	2.48	93.38	5.40	4.78
Grains/spike	41.00-52.33	45.45	6.62	6.83	93.84	6.00	13.21
1000 grain weight(gm)	32.04-47.64	39.76	10.26	10.55	94.75	8.17	20.55
Spike length(cm)	9.58-14.34	11.73	11.20	11.52	94.46	2.63	22.43
Gluten content (%)	4.12-11.98	7.45	32.47	32.70	98.60	4.95	66.43
Protein content (%)	10.90-12.51	11.53	4.06	4.11	99.63	0.955	8.28
Plant height (cm)	90.16-122.07	101.16	7.96	7.99	99.26	16.53	16.34
Tillers/plant	5.50-9.83	8.06	13.58	15.66	75.15	1.95	24.25
Grain yield/ plot	2.04-3.21	2.73	11.51	11.70	98.60	0.63	23.33

GCV= Genotypic coefficient of variance, PCV= Phenotypic coefficient of variance.

content; NRA also showed negative correlation with both protein and gluten content; HI positive correlation with protein only. Grain filling period though non-significant but showed positive correlation with protein and gluten content. Days to 50% flowering and maturity showed significantly negative correlation with gluten content and non-significant positive correlation with protein content.

The physiologic traits like chlorophyll a, b, leaf nitrogen are synonym to enhance photosynthesis and higher NRA synonym to efficient in plant nutrient (Nitrogen) uptake from soil could be integrated with conventional breeding as selection criteria to enhance the yield without raising input level (nitrogen in particular). Not the least, integration of physiologic traits having higher correlation with yield and yield components can be tapped to achieve another breakthrough in the *perse* productivity of wheat. Our findings are supported by Collaku and Harrison, 2005, Mohammadi, *et al.,* 2006, Limulwar, *et al.,* 2003 who also independently reported significant positive correlation of chlorophyll with yield. Rafat and Malik, 2005 observed significant positive correlation of plant height with grain yield. Payal, *et al.,* 2007 observed significant positive correlation of Harvest Index and tillers/plant with grain yield.

The present study showed the presence of considerable variations among wheat genotypes for all traits tested which gives an opportunity to plant breeders for the improvement of these traits. Genetic correlation coefficient analysis indicated that important agronomic traits are positively correlated with grain yield. This suggests a common genetic/ physiological basis among these traits. Hence, simultaneous improvement of these traits would be possible and can be considered as suitable selection criteria for the development of high yielding wheat varieties.

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