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GENETIC DIVERSITY IN WHEAT GERMPLASMS FOR YIELD AND IMPORTANT QUALITY TRAITS

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ABSTRACT

864 germplasm Lines of wheat were evaluated for 15 yield and quality traits. Five traits showed high variability, while rest 10 characters showed moderate to low variability. Following non-hierarchical Euclidean cluster analysis all the genotypes were grouped in to thirteen clusters with variable number of genotypes. The genotypes falling in cluster III had maximum divergence followed by cluster XII. The maximum and minimum divergence was revealed between cluster III and XII and between VI and VII, respectively. On the basis of the data on genetic divergence and the mean performance of yield and other traits 27 superior and diverse genotype have been identified as donor for use in future breeding programmes.

Key Words : *Wheat, variability, genetic divergence, Germplasm, non-hierarchical cluster analysis.*

Wheat has been one of the most important food crops in India since ages. The modern farming system included few high yielding varieties dominant in cultivation which often leads to genetic homogeneity and leads to genetic vulnerability to abiotic and biotic stresses. (1) reported that genetic diversity and location specific varieties are essential for achieving sustainable advances in productivity. In crop breeding programme, germplasm serves as the most valuable reservoir of variability for useful traits. Proper screening and evaluation of the germplasm lines would provide an estimate of their potential donor for utilization in hybridization programme. The knowledge of genetic variability of the breeding lines with regards to the character to be improved is basic requirement for designing the production breeding programme. So, for selection of lines, the performance of germplasm is required along with the genetic diversity existing among them. The screening helped in identifying the genotypes having the specific traits suitable for quality as well as yield traits, which could serve as potential donors for yield and important characters. The genetically diverse and economically desirable genotypes for exploitation in a breeding programme aimed at improving quantitative and qualitative characters of wheat.

MATERIALS AND METHODS

The Experimental material consisted of 864 germplasm lines and 4 check varieties (UP-2338, PDW-215, Raj-3765 and UP-2382). The material was evaluated at Crop Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar, which is located in foothills of Himalayas and falls in the humid sub tropical zone. The experiment was planted in an augmented block design. The experimental material was planted in 18 blocks having 4 checks and 864 test genotypes. Recommended package of practices for timely sown irrigated condition were followed to raise a good crop. Data on 15 characters viz., Days to heading,

Table-1: The general means and coefficient of variation for different characters.

Characters	Mean	Coefficient of variation
Plant height (cm)	91.08	11.35
Days to heading	80.47	7.16
Days to maturity	118.43	4.75
Ear length (cm)	9.74	15.64
Spikelets/ear	19.91	10.36
Grain/ear	42.89	32.55
Grain yield/ear (g)	3.11	44.32
1000 grain weight (g)	41.34	33.41
Grain yield/ plant (g)	10.33	38.78
Biological yield/ plant (g)	27.32	44.84
Harvest index (%)	39.04	23.02
Tillers/ plant	12.75	20.87
Protein content (%)	12.21	8.74
Sedimentation value (cc)	41.13	19.31
Hectoliter weight (kg/hl)	73.56	4.79

Table-2: Estimates of average inter and intra (bold) cluster distance for 13 clusters in wheat.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I	**2.62**	2.62	2.83	3.09	3.15	3.02	2.85	2.77	2.55	3.51	3.10	3.13	2.71
II		2.60	3.47	2.66	2.54	2.49	2.67	2.43	2.65	2.82	2.66	2.79	2.69
III			**3.00**	2.82	2.82	2.78	3.23	3.00	2.87	3.28	3.47	3.87	2.74
IV				**2.63**	2.53	3.67	3.02	2.76	2.83	3.07	2.82	3.34	3.11
V					**2.35**	2.37	2.24	2.59	2.52	3.52	2.82	2.85	2.45
VI						**2.43**	2.64	2.19	2.59	2.92	2.87	3.03	2.63
VII							**2.45**	2.51	2.82	2.61	3.18	2.95	2.46
VIII								**2.39**	2.33	2.75	3.10	2.59	2.88
IX									**2.37**	2.82	2.97	2.90	2.29
X										**2.72**	3.04	3.15	2.99
XI											**2.70**	2.80	2.62
XII												**2.96**	3.13
XIII													**2.77**

Table-3: List of diverse and superior genotypes selected from different clusters.

S.No.	Genotype	Cluster No.	Desirable Characters		
			Grain Yield/ Plant (g)	Protein content (%)	Hectoliter weight (kg/hl)
1.	UPAGP 36	6	Y(16.75)	P(14.15)	H(71.33)
2.	UPAGP 239	12	Y(17.13)	P(13.94)	H(78.2)
3.	UPAGP 241	8	Y(16.75)	P(14.15)	H(71.33)
4.	UPAGP 260	10	Y(16.75)	P(14.15)	H(71.33)
5.	UPAGP 431	9	Y(16.75)	P(14.15)	H(71.33)
6.	UPAGP 1134	9	Y(16.75)	P(14.15)	H(71.33)
7.	UPAGP 1135	12	Y(16.75)	P(14.15)	H(71.33)
8.	UPAGP 1160	7	Y(16.75)	P(14.15)	H(71.33)
9.	UPAGP 2262	13	Y(16.75)	P(14.15)	H(71.33)
10.	UPAGP 2281	2	Y(16.75)	P(14.15)	H(71.33)
11.	UPAGP 2283	2	Y(16.75)	P(14.15)	H(71.33)
12.	UPAGP 2360	11	Y(16.75)	P(14.15)	H(71.33)
13.	UPAGP 2385	8	Y(16.75)	P(14.15)	H(71.33)
14.	UPAGP 2401	1	Y(16.75)	P(14.15)	H(71.33)
15.	UPAGP 2405	4	Y(16.75)	P(14.15)	H(71.33)
16.	UPAGP 2408	11	Y(16.75)	P(14.15)	H(71.33)
17.	UPAGP 2438	1	Y(16.75)	P(14.15)	H(71.33)
18.	UPAGP 2444	13	Y(16.75)	P(14.15)	H(71.33)
19.	UPAGP 2448	13	Y(16.75)	P(14.15)	H(71.33)
20.	UPAGP 2501	6	Y(16.75)	P(14.15)	H(71.33)
21.	UPAGP 2555	1	Y(16.75)	P(14.15)	H(71.33)
22.	UPAGP 2575	12	Y(16.75)	P(14.15)	H(71.33)
23.	UPAGP 2578	4	Y(16.75)	P(14.15)	H(71.33)
24.	UPAGP 2607	9	Y(16.75)	P(14.15)	H(71.33)
25.	UPAGP 2633	5	Y(16.75)	P(14.15)	H(71.33)
26.	UPAGP 2649	7	Y(16.75)	P(14.15)	H(71.33)
27.	UPAGP 2663	3	Y(17.20)	P(13.10)	H(74.76)

Days to maturity, Tillers/plant, Plant height (cm), Ear length (cm), Spikelets/ear, Grains/ear, Grain yield/ear (g), 1000 grain weight (g), Grain yield/ plant (g), Biological yield/ plant (g), Harvest index (%),Protein content (%), Sedimentation value (cc), Hectoliter weight (kg/hl) were recorded and average was taken for statistical analysis. The Mean and coefficient of variation were calculated as per the statistical procedures. The Euclidean cluster analysis, described by (2, 3), was conducted to estimate the intra- and inter cluster distances and to group the genotypes into different clusters.

RESULTS AND DISCUSSION

The estimates of mean and coefficient of variation are given in Table-1. The population under study possesses high variation for biological yield/plant (44.84%), grain yield/ear (44.32%), grain yield /plant (38.78%), 1000-grain weight (33.41%) and grain/ear (32.55%). This variability is quite sufficient in generating the transgressive seggrgants for these characters. Parallel to present result, considerable variability exhibited in germplasm collection of wheat for these characters was previously reported by (4, 5,6). The lowest variability was observed for days to maturity (4.75%), followed by hectoliter weight (4.79%), days to heading (7.16%), Protein content (8.74%), spikelets/ear (10.36%) and plant height (11.35%). Moderate variability was observed for ear length (15.64%), sedimentation value (19.31), tillers/plant (20.87%) and harvest index (23.02%).

The germplasm under study grouped into 13 groups comprising of varying numbers. The number of genotypes per cluster ranged from 41 to 87. Inter- and intra cluster distance of 864 germplasm lines are presented in Table-2. Maximum intra cluster distance observed in cluster III (3.00) and minimum in cluster V (2.35). Maximum inter cluster distance (3.87) observed between cluster III and cluster XII followed by cluster IV and cluster VI (3.67) and cluster I and X (3.51). Minimum divergence (2.19) reported between cluster VI and cluster VII. The superior lines from distant clusters maybe identified and used in crossing programme to create wide spectrum of variability for the improvement of characters under question. Accordingly, 27 superior genotypes from these distant clusters as well as from other clusters have been selected for inclusion in breeding programme (Table-3). While selecting genotypes for superior characters the scores of other characters were kept above the mean. Similar approach was followed by other workers in germplasm of wheat (7, 8).

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