Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-6: 2694-2699

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7692 **Special Issue-6 pp. 2694-2699**
Journal homepage: http://www.ijcmas.com

Original Research Article

Studies on Genetic Variability for Yield and Yield Contributing Traits in Wheat (*Triticum aestivum* L.)

D.L. Ubale, S.T. Rathod* and N.P. Ingle

Department of Agricultural Botany, College of Agriculture, Latur,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431 402 (M.S.), India
**Corresponding author*

A B S T R A C T

The present investigation was carried out with 30 genotypes of wheat to study the variability, heritability and genetic advance. Analysis of variance revealed considerable variability among the genotypes for 12 characters. The field experiment was conducted under timely sown condition during *Rabi* 2016-17 in a randomized block design in the field of Department of Genetics and Plant Breeding, College of Agriculture, Latur. VNMKV, Parbhani (Maharashtra). The highest values for GCV and PCV were recorded for the character grain weight per spike, number of spikelet's per spike and number of tillers per plant. High estimates of heritability for all the characters studied suggested high genetic control over the characters. High heritability along with high genetic advance was obtained for grain weight per spike, grain yield per plant and number of spike per plant indicating that traits were under additive gene control and selection for genetic improvement for these traits would be effective. Genotypes AKAW-4931 (34.22),GW-480 (29.31), AKAW-4627 (29.22) attributed high grain yield per plant and should be selected as high yielding genotypes for future experimentation to obtain a better yielding varieties.

Keywords

Wheat (*Triticum aestivum* L.) Variability, Heritability and genetic advance

Introduction

Wheat (*Triticum aestivum* L.) is an important food crop of the world and constitutes important source of carbohydrates and protein. "King of Cereals" because acreage it occupies, high productivity and prominent position in international food grain trade. Wheat is a crop of global significance grown in diversified environments. It is used to produce a wide diversity of baked food products. Grain morphology and texture are important quality traits because they influence the market value of wheat. It provides food for 36% of the global population and contributes 20% of the food calories (Singh and Choudhary, 2006). At global level, India ranks second largest wheat producing nation after China (USDA, 2012). Global demand for wheat by the year 2020 is forecasted around 950 million tones. This target will be achieved only if global wheat production is increased by 2.5 % per annum. The green revolution started from 12.5 million ton in 1964 and has reached to 92.29 million tons during 2014-2015. This increase in wheat production provided food security to the country. In India during 2014-2015 area under wheat cultivation was 30.96 million ha with the annual production of 88.94 million metric tons with an average

productivity of 28.72 q/ha. In Maharashtra it occupies an area of 8.95 lakh ha with production of 1.23 million metric tons with an average productivity 13.81 q/ha (Anonymous, 2014). Grain yield is a complex trait and highly influenced by many genetic factors and environmental fluctuations. Development of high yielding varieties requires a thorough knowledge of the existing genetic variation for yield and its components.

Materials and Methods

The field experiment was conducted during *Rabi* season of 2016-17 in the field of Department of Genetics and Plant Breeding college of Agriculture, Latur. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra), India. Genetically pure and physically healthy seeds of 32 diverse genotypes of wheat were collected from Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani and Panjabrao Deshmukh Krishi Vidyapeeth, Akola, (Maharashtra). The experiment was laid out RBD design with three replications. The individual plot was 3.4 m × 0.6 m in size with two row planting. The distance maintained between row to row and between plant to plant was 30 cm and 10 cm respectively. Recommended agronomic package and practices were applied to raise a healthy crop. Data were recorded on various parameters, *viz.*, days to heading, Days to 50% flowering, Days to maturity, Plant height (cm), No. of Tillers/Plant, Length of spike (cm), No. of spikes/plant, No. of Spikelet's/spike, No. of Grains/spike, Grain weight/spike (cm), 1000 grain weight (cm) and Grain yield/plant. Data from five plants of each genotype were averaged replication wise and mean data was used for statistical analysis. Mean, range and coefficient of variation (CV) were also estimated. Genotypic coefficients of variation (GCV) and phenotypic coefficients of variation (PCV) were estimated according to Burton (1952); heritability in broad sense (h^2bs) was estimated according to Burton and Devane (1953); genetic advance (GA) and genetic advance as per cent of mean (GAPM) were calculated by Johnson *et al*. (1955). Analysis of variance was done for partitioning the total variation into variation due to treatments and replications according to procedure given by Panse and Sukhatme (1957). In the present investigation three types of coefficient of variations were estimated viz., PCV, GCV and ECV. It was calculated by the formula given by Burton and Devane (1953). The estimates heritability formula given by Allard (1960) and genetic advance were obtained by the formula given by Johnson *et al*., (1955).

Results and Discussion

The analysis of variance for all the characters under study revealed highly significant differences there by indicating presence of substantial genetic variation among the genotypes for all the twelve characters. The present findings corroborate the earlier reports of Kumar *et al*. (2003), Palve and Raghavaiah (2002) and Mahato and Kerketta (2004) in wheat. The average performances of the genotypes for all the characters under study are presented in table I. As revealed by the CD value, significantly higher mean value for the length of spike was recorded in AKAW-4928 and AKAW-4930. Interestingly the former genotype had produced the highest mean for number of grains per spike. However, considering number of tillers per plant and grain weight per plant, the genotype AKAW-4931 exhibited significantly higher mean with compared to those for most of the genotypes.

Table.1 Mean of twelve characters of thirty two genotypes of wheat (*Triticum aestivum* L.)

Sr. No.	Genotype	Days to/heading	Days to 50% flowering	Days to maturity	Plant height	No. of Tillers /Plant	Length of spike	No .of spikes/plant	No. of Spikelet's /spike	No. of Grains/ spike	Grain weight/ spike	1000 grain wt.	Grain yield/plant
1	AKAW-4928	65.66	69.33	114.00	94.33	10.23	15.40	9.00	21.40	68.70	3.26	54.20	24.19
2	AKAW-4890	60.33	64.66	109.33	88.80	13.06	11.331	13.23	16.40	34.36	1.82	48.20	14.60
3	AKAW-4839	62.00	65.00	111.66	88.00	14.90	11.43	11.40	20.00	49.61	2.14	55.19	26.48
4	AKAW-4901	66.00	69.66	115.00	85.06	11.73	12.40	9.20	22.60	35.28	1.74	54.62	20.53
5	AKDW-4883	73.33	77.00	117.33	84.00	9.53	7.13	7.20	18.20	43.36	2.72	45.40	12.49
6	AKAW-4934	67.66	72.00	112.00	84.06	13.43	10.20	11.83	17.80	53.26	2.40	43.71	27.17
7	AKAW-4927	64.33	72.00	122.33	85.86	6.76	13.30	6.10	18.20	61.93	2.26	44.66	20.72
8	AKAW-4930	64.00	70.33	121.00	88.60	5.66	15.40	5.80	21.00	73.95	5.52	53.30	26.62
9	AKAW-4794	61.33	65.00	110.66	80.66	11.16	10.80	9.06	18.40	55.40	2.84	46.76	22.29
10	AKAW-4931	61.33	71.33	110.33	87.06	15.70	12.00	15.20	20.60	47.63	2.61	46.54	34.22
11	AKAW-4210-6	62.00	65.66	113.33	83.00	12.73	11.56	10.10	20.00	57.00	3.25	52.95	24.85
12	AKAW-1071	75.33	80.00	114.33	79.60	11.20	9.93	10.40	20.00	47.39	2.54	48.54	18.29
13	AKAW-4627	66.33	72.00	112.33	84.26	17.30	8.40	15.80	14.80	43.46	2.21	49.28	29.22
14	MP-1323	63.33	76.66	107.33	81.06	13.73	11.03	9.16	19.40	43.26	1.57	44.29	15.64
15	GW-483	63.00	67.33	112.00	97.46	14.16	9.20	12.20	16.20	51.06	2.24	56.25	29.31
16	MP-3465	73.66	77.66	108.00	88.00	14.13	11.40	10.33	20.56	56.10	2.37	48.14	17.39
17	UAS-379	68.00	76.00	113.00	90.00	11.73	10.60	10.20	19.80	40.43	1.92	44.76	16.78
18	GW-480	65.33	72.00	110.33	83.86	11.20	9.33	10.33	17.80	62.13	2.87	55.73	24.10
19	CG-1021	63.33	67.00	113.33	83.13	11.36	9.36	10.60	16.60	48.83	2.07	42.66	20.69
20	HI-1618	63.00	70.33	112.33	81.20	11.36	10.43	10.40	17.00	39.43	1.73	47.37	17.84
21	MACS-6679	71.00	75.66	113.33	95.46	11.66	10.00	10.23	18.20	54.16	2.36	47.11	17.12
22	NIAW-2891	61.00	64.66	108.66	94.76	11.33	9.63	11.20	18.00	45.93	2.35	47.52	26.73
23	GW-488	64.66	72.66	111.00	82.46	9.40	10.60	8.60	19.80	49.20	2.20	53.65	15.41
24	PBN-4888	73.66	75.33	116.00	80.26	12.80	8.43	9.80	17.00	57.26	2.23	43.44	15.27
25	PBN-3958	60.33	66.33	113.66	110.06	11.40	11.70	9.43	19.80	47.60	2.33	39.72	18.33
26	PBN-4357	64.00	71.00	114.00	88.13	13.80	11.90	11.80	20.00	55.90	2.01	42.79	22.30
27	PBN-4818	59.00	65.33	108.66	98.00	13.56	10.00	12.33	14.80	39.46	1.97	55.10	21.16
28	PBN-4027-02	67.66	76.00	114.00	91.33	9.70	11.76	9.06	21.80	59.46	2.65	50.44	21.27
29	AKAW-2997-16	69.00	76.00	109.00	75.00	13.60	9.10	12.36	20.16	51.50	2.16	40.19	23.12
30	Ajantha (C)	66.33	73.66	114.66	82.06	14.26	12.16	12.40	19.03	47.33	2.27	47.50	20.44
31	HD 2189 (C)	75.00	81.33	115.33	99.55	13.63	10.76	10.53	21.76	54.40	2.19	43.69	22.21
32	PKV -Washim(C)	73.66	76.33	114.33	112.50	14.70	9.26	12.83	17.86	42.53	2.41	47.85	20.69
	Mean	66.08	71.72	112.89	88.36	12.21	10.81	10.56	18.90	50.54	2.41	48.17	21.48
	CV	2.14	2.54	2.04	2.67	2.74	2.01	1.90	2.75	1.79	3.35	0.32	0.61
	C.D.at 5% level	2.31	2.97	3.76	5.13	0.54	0.35	0.32	0.84	1.48	0.13	0.25	0.21

Table.2 Mean, range and other genetic parameters in wheat (*Triticum aestivum* L.)

Sr. No	Characters	Mean	Range	GCV	PCV	ECV	h^2 Broad sense (%)	Genetic Advance	Genetic Advance as % of Mean
1	Days to/heading	66.08	59.00-75.33	7.08	7.40	2.14	91.62	9.23	13.97
2	Days to 50% flowering	71..72	64.66-81.33	6.51	6.99	2.54	86.78	8.96	12.49
3	Days to maturity	112.89	107.33-122.33	2.73	3.41	2.04	64.12	5.09	4.51
4	Plant height	88.36	75.00-112.50	9.41	9.78	2.67	92.52	16.47	18.64
5	No. of Tillers/Plant	12.21	5.66-15.70	19.72	19.91	2.74	98.10	4.91	40.24
6	Length of spike	10.81	7.13-15.40	16.55	16.68	2.01	98.53	3.66	33.85
7	No. of spikes/plant	10.56	5.80-15.80	20.70	20.79	1.90	99.16	4.48	42.47
8	No. of Spikelet's/spike	18.90	14.80-22.60	10.34	10.70	2.75	93.40	3.89	20.60
9	No. of Grains/spike	50.54	34.36-73.95	17.92	18.01	1.79	99.01	18.57	36.74
10	Grain weight/spike	2.41	1.57-5.52	28.47	20.66	3.35	98.63	1.40	58.25
11	1000 grain wt.	48.17	39.72-56.25	9.82	9.82	0.32	99.89	9.74	20.22
12	Grain yield/plant	21.48	12.49-34.22	23.00	23.01	0.61	99.93	10.18	47.38

Number of spikes per plant was highest in AKAW-4627 whereas number of spikelet per spike was highest in AKAW-4901 while 1000-grain weight was highest in GW-483. Such significant intervarietal differences for different characters might have appeared due to differential genotypic constitution. Similar reports have earlier been made by Mandal *et al*. (1991) and Mahato and Kerketta (2004).

Variability with respect to the characters measured in terms of range, mean, PCV, GCV, heritability in broad sense and genetic advance in terms of per cent of mean have been presented in Table II. The values for range among different genotypes varied highly for the characters like Plant height, Number of grains per spike, 1000 grain weight, grain weight per plant and number of tillers per plant. Similar findings have earlier been reported by Sahu *et al*. (2005) in wheat. Generally, the magnitude of PCV was higher than the corresponding GCV as noted Kumar *et al*. (2003).The highest values for GCV and PCV were recorded for the character Grain weight per spike, grain yield per plant, number of spikes per plant and number of tillers per plant. A close proximity between GCV and PCV values for almost all the characters revealed less influence of the environment on expression of the characters (Sharma *et al*., 1995; and Kumar *et al*., 2003). Estimates of heritability and genetic advance are critical for predicting genetic improvement for any quantitative character (Khali and Afridi, 2004). High estimates of heritability for all the characters studied suggested high genetic control over the characters. Heritability estimates indicate effectiveness of selection for phenotypic performance but it does not necessarily mean a high genetic gain for particular characters. But, the high heritability estimates along with high genetic advance is more useful for the selection (Johnson *et al*., 1995). In the present experiment high heritability along with high genetic advance was obtained for grain weight per spike, grain yield per plant, number of spikes per plant, number of tillers per plant, number of grains per spike, length of spike, number of spikelet's per spike and 1000 grain weight.

In conclusion, the results showed that significant variation existed among thirty two wheat genotypes. Genotype AKAW-4931 showed high mean performance for grain yield per plant (34.22). High heritability along with high genetic advance was observed for grain weight per spike, grain yield per plant and number of spike per plant. Genotypes AKAW-4931 (34.22),GW-480 (29.31), AKAW 4627 (29.22) attributed high grain yield per plant and should be selected as high yielding genotypes for future experimentation to obtain a better yielding varieties under Maharashtra condition.

References

Anonymous . 2014. Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Annual Report (2014-15).

Allard RW 1960**.** Principles of Plant Breeding, John Willey and Sons. Inc. p. 96.

Burton, G. W., and Devane, E. H. 1953**.** Estimating heritability in table fercue from replicating clonal material *Agron J.* 45: 45-481

Johnson, H.W., K. Robinson and R.E. Comstock. 1955. Estimation of genetic and environmental variability in soybeans. Agron. J., 47: 314 – 318

Singh, G. and H. Chaudhary, 2006**.** Selection parameters and yield enhancement of wheat (*Triticum aestivum* L.) under different moisture

stress condition. *Asian J. Plant Sci.*, 5: 894-898.

Robinson, H. F., R. E. Comstock and P. H. Harvey 1951. Genotypic and phenotypic correlation's in wheat and their implications in selection. *Agronomy Journal*, 43 : 282- 287.

Burton, G. W. 1952. Quantitative inheritance in grasses. Proceeding 6th International Grass Land Congress, 1: 227- 283.

Panse, V.S. and Sukhatame, P.V. 1957. Statistical method for Agricultural workers I.C.A.R. New Delhi.

Palve, S.M. and P. Raghavaiah. 2002. Genetic variation and interrelationship of agronomic traits in interspecific derivatives of durum wheat (*Triticum durum* Desf.). Annals of Agricultural Research, 23 (4): 602-607.

Mahato Chandrashekhar and V. Kerketta. 2004. Estimation of some genetic parameters under normal and late sown conditions in wheat (*Triticum aestivum* L.). J. Res., Birsa Agricultural University, 16 (1): 119-121.

Kumar Salendra, V.K. Dwivedi. and N.K. Tyagi. 2003. Genetic variability in some metric traits and its contribution to yield in wheat (*Triticum aestivum* L.). Progressive Agriculture, 3 (1/2): 152-153.

Khali, I.H. and Nadia Afridi. 2004. Heritabilities and selection responses for yield and yield associated traits in spring wheat. Sarhad J. Agric,. 20 (3): 401-404.

Kumar, Pramod and Y. Mishra. 2004. Genetic variability in wheat (*Triticum aestivum* L.) biodiversity and sustainable utilization of biological resources .proc. of National Conference, sugar MP, India, March 16-18,2001,pp.144-149.