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Genetic Variability and Heritability Studies in Wheat Genotypes under Late Sown Condition in Chhattisgarh Plains

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ABSTRACT

Sixteen genotypes of wheat genotypes were evaluated during Rabi 2013-14 for variability parameters. The analysis of variance revealed significant for the characters. The estimates of PCV and GCV were high for days to 50% flowering, days to maturity, plant height (cm), number of productive tillers/ plant, spike length (cm) number of grains/ spike, 1000 grain weight (g), biological yield /plot (g), harvest index (%) and grain yield /plot (g). High heritability coupled with high genetic advance expressed as percentage of mean was observed for spike length, productive tillers per plant and the genetic advance as percent of mean in pooled analysis was highest for plant height and genetic advance as percent of mean in pooled analysis was lowest for harvest index by grain yield/plot (g) and biological yield/plot (g) indicating that these traits were mainly governed by additive gene action and responsive for further improvement of these traits.

Key words: *Wheat, Genetic variability, Heritability, Genetics advace.*

INTRODUCTION

Wheat is the world's most important crop that excels all other cereal crops both in area and production, thereby providing about 20 per cent of total food calories for the people of the world. Wheat products such as bread, biscuit, pasta and noodles regularly appear in the shopping lists. India has been giving special emphasis to improve productivity of wheat under harsh environments *viz.* high temperature[6]. In the present study wheat genotypes were used for assessing the diversity considering yield as one of the criteria of selection for evaluation of genotypes well performing under late sown condition, in rice-wheat cropping system of Chhattisgarh. The possible reasons for low yield of wheat in Chhattisgarh may be the high temperature during milking stage, forced maturity and unavailability of varieties performing well under late sown condition. Genetic variability is the basic requirement for crop improvement as it provides wider scope for selection. Thus, effectiveness of selection is dependent upon the nature, extent and magnitude of genetic variability present in the material and the extent to which it is heritable.

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Hence, in present investigation an attempt was made to assess the variability of important grain yield and yield contributing traits, along with the indices of variability *i. e.* genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense genetic advance (Gs) and genetic advance as percentage of mean (GA).

MATERIAL AND METHODS

The present investigation was conducted during Rabi season of 2013-2014 at the Instructional cum Research farm, College of Agriculture, Raipur, Department of Genetics and Plant breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh. The farm is situated at $17^0$14"N and $24^0$45"N latitudes and 84^0 15" E longitudes with an altitude of 289.60 meter above the mean sea level. The experimental materials consist of sixteen wheat genotypes were selected from Department of genetics and Plant breeding, college of Agriculture, Raipur CG. The experiment was laid out in a randomized block design with four replications. The genotypes were sown in a plot of 10 rows each of 5 m length with row to row spacing 23 cm. crops was provided with protective irrigations and recommended doses of fertilizers. Five competitive plants of each genotypes were randomly selected from each replication during appropriate physiological growth stage and data were recorded on 10 quantitative characters namely, days to 50% flowering, days to maturity, plant height (cm), number of productive tiller/plant, spike length (cm), number of grains/spike, 1000 grain weight (g), biological yield/plot, harvest index (%) and grain yield/plot (g). The data subjected to different statistical analysis *viz*., analysis of variance, magnitude of genetic variability were performed following the standard procedures, phenotypic (PCV) and genotypic (GCV) coefficients of variation were estimated as suggested by Burton[3], heritability (broad sense) and genetic advance as followed by Hanson *et al.*,[4].

RESULTS AND DISCUSSION

The analysis of variance revealed (Table 1) significant variation among sixteen genotypes for all the quantitative traits studied depicted. The highest significant variation at genotypic level was recorded for biological yield/ plot, followed by grain yield/plot, plant height, days to maturity, days to 50 % flowering, number of grains/ spike, 1000- grain weight, harvest index was found non- significant (Table 2). The least variance at genotypic level was recorded for number of productive tillers/ plant, followed by spike length. These results confirms the findings of Sheikh and Singh[18], Bargale *et al.*[1], Lad *et al.*[10], Munawar *et al.*[13], Kumar and Mishra[9], Yadav and Raje[21], Kumar *et al.*,[7,8] and Kumar *et al.*,[7,8].

The highest phenotypic coefficient of variance (PCV) was (Table 3) observed for number of productive tillers per plant (17.8), followed by spike length (17.4), plant height (13.0), biological yield per plot (12), harvest index (11.08), days to 50 percent flowering (10.44), number of grains per spike (10.17), 1000- grain weight (7.91) whereas, minimum being for days to maturity (6.82) exhibited lowest value. Earlier wheat researcher[12,19,20] also reported similar results.

The genotypic coefficient of variance (GCV) was found maximum for spike length (15.68) followed by plant height (12.97), number of productive tillers per plant (12.61), number of grains per spike (9.47), days to 50 percent flowering (7.68), biological yield per plot (5.53), 1000-grain weight (5.42), days to maturity (5.20), grain yield per plot (5.19) whereas, genotypic coefficient of variation was lowest for harvest index (3.05). These finding are in conformity to the results of previous workers Bergale *et al.*[1], Shah and Deora[17], Sachan and Singh[16], Patel and Monpara[14], Bilgin *et al.*[2], Rashidi *et al.*,[15] and Singh *et al.*,[19].

Highest heritability were recorded for plant height (99.1) followed by number of grains per spike (86.8) and spike length (80.9) whereas, days to maturity (58.09), days to 50 percent flowering (52.02), number of productive tillers per plant (50) and 1000-grain weight (46.9) exhibited moderate heritability. However, lowest heritability was observed for harvest index (7.5) followed by biological

yield per plot (21.3) and grain yield per plot (22.9). Present finding are confirms the finding of previous worker Shah and Deora[17], Sachan and Singh[16], Patel and Monpara[14] and Kumar *et al.*,[7,8].

The highest amount of genetic advance was observed for Biological yield/plot (52.58), followed by grain yield/plot (21.68), plant height (20.55), days to maturity (8.31), number of grains/spike (8.15), days to 50 percent flowering (7.08), 1000- grain weight (3.67) and spike length (1.94). However, the lowest genetic advance observed in harvest index (0.75). The use of heritability estimate to predict the genetic advance from selection for hypothetical testing programme appears to be advantageous. The heritability alone, however, provides no information of the amount of genetic progress that would result from the selection of best individual. Johnson *et al*.[5] had pointed out that heritability value alone can predict the resultant effect for the selection of best individual. The limitation of heritability in broad sense is that it includes both additive and non-additive gene effect, which will be more reliable if accompanied by high advance. Present findings support the previous findings of Kumar *et al.*,[7,8], Kumar *et al*., Mittal and Sethi[11].

Among all the characters studied spike length (28.99) had maximum genetic advance as percentage of mean followed by plant height (26.61), number of productive tillers per plant (18.20), number of grains per spike (18.17), days to 50 percent flowering (11.64), days to maturity (8.16), 1000-grain weight (7.63) whereas, minimum genetic advance observed in harvest index (1.75) followed by grain yield per plot (5.11) and biological yield per plot (5.22). The high genetic advance as percentage of mean revealed for spike length (28.99) and plant height (26.61). Moderate genetic advance as percentage of mean observed in number of productive tillers per plant(18.20), number of grains per spike (18.17), days to 50 percent flowering (11.64) and lowest genetic advance revealed for days to maturity (8.16), 1000-grain weight (7.63), harvest index (1.75), grain yield per plot (5.11) and biological yield per plot (5.22). High heritability with high genetic advance as percentage of mean was observed for plant height (99.15, 26.61) and spike length (80.88, 28.99). High heritability with moderate genetic advance as percentage of mean was observed for number of grains per spike (86.77, 18.17). Moderate heritability with moderate genetic advance as percentage of mean was observed for number of productive tillers per plant (50, 18.20) and days to 50 percent flowering (52.02, 11.64). However, low heritability with low genetic advance as percentage of mean was observed for harvest index (7.58, 1.75). Present findings supports the previous findings of Kumar *et al.*,[7,8], Kumar *et al*., , Mittal and Sethi[11], Patel and Monpara[14], Kumar *et al.*,[7,8] and Nukasani *et al.*,.

Table 1: Analysis of variance for grain yield and its components in wheat during *rabi* 2013-14.
***, ** Significant at level of 5% and 1% respectively**

S.N.	Source of variance	d.f.	Characters									
			Days to 50% flowering	Days to maturity	Plant Height (cm)	Number of productive tillers/plant	Spike length (cm)	Number of grains/ spike	1000 - grain weight (g)	Biological yield/ plot (g)	Harvest Index (%)	Grain yield/ plot (g)
	1	2	3	4	5	6	7	8	9	10	11	12
1	Replication	3	24.56	98.09	1.97	0.26	0.49	6.02	331.02	3206145	73.31	252185.70
2	Genotype	15	105.89*	132.30*	402.47*	1.35*	4.66*	74.96*	34.85*	2343257*	27.67	356695.70*
3	Error	45	18.50	20.21	0.86	0.27	0.26	2.75	7.69	1123112	20.83	163098.90
4	Total	63										

Table 2: Mean performances of grain yield and its components in wheat (*rabi* 2013-14)

S.N.	Genotypes	Characters									
		Days to 50% flowering	Days to maturity	Plant Height (cm)	No. of productive tillers/ plant	Spike length (cm)	No. of grains/ spike	1000 grain weight (g)	Biological yield /plot (g)	Harvest Index(%)	Grain yield /plot (g)
1	2	3	4	5	6	7	8	9	10	11	12
1	**MPO 1215**	58	101	72	4.3	7	38.92	46.68	11737.5	39.21	4327.50
2	**HI 8725**	56	85	97	4.0	9.8	47.62	44.47	11050	40.39	4413.50
3	**GW 440**	61	103	63	2.5	5.6	43.57	52.20	10592.5	43.76	4645.00
4	**HI 8498**	62	103	78	3.9	6.8	42.10	49.86	9711.2	42.75	4152.50
5	**GW 322**	63	99	72	4.8	7.2	44.17	48.81	10440	42.42	4422.50
6	**HI 8736**	63	105	63	3.8	7.1	44.02	48.72	9975	43.15	4305.00
7	**HI 8737**	71	114	76	4.6	8.1	40.55	50.49	9737.5	44.40	4327.50
8	**DDW 23**	51	99	78	4.8	7.3	39.30	48.00	9930	42.71	4241.25
9	**HI 1588**	59	108	77	4.0	6.4	47.60	40.60	8410	43.22	3635.00
10	**HI 8727**	63	106	76	4.7	6.4	45.30	49.67	9763.7	43.05	4199.75
11	**HI 8713**	60	103	71	3.8	6.6	47.97	47.56	9201.2	45.93	4155.00
12	**MP 3382**	62	104	77	4.4	7 .0	56.90	45.75	9995	49.41	4810.75
13	**HI 8735**	68	104	69	4.1	5.9	44.85	45.07	9837.5	43.60	4286.75
14	**HI1544**	66	104	91	3.6	4.4	47.90	50.55	10312.5	38.29	3955.00
15	**HD 3114**	58	98	78	4.5	5.9	44.20	49.80	9843.7	42.87	4212.50
16	**HI 8724**	53	98	96	3.7	5.8	42.35	50.63	9227.7	40.20	3693.75
	Mean	**61**	**102**	**77**	**4.12**	**6.7**	**44.83**	**48.05**	**9985.3**	**42.83**	**4236.45**
	SE±m	2.15	2.24	0.46	0.26	0.25	0.83	1.38	529.88	2.28	201.92
	C.D.(5%)	**6.12**	**6.77**	**1.40**	**0.78**	**0.77**	**2.50**	**4.18**	**1597.25**	**6.87**	**608.67**
	CV%	**10.35**	**6.98**	**12.72**	**17.68**	**17.16**	**10.00**	**11.31**	**12.31**	**11.66**	**10.90**

Table 3: Genetic parameters of variation for grain yield and its components in wheat during *rabi* 2013-14

S.N.	Characters	Mean	Range		PCV	GCV	h^2(bs)%	GA	GA as % of mean
			Max.	Min.					
1	**2**	**3**	**4**	**5**	**6**	**7**	***8***	**9**	**10**
1	Days to 50% flowering	60.78	71	53	10.44	7.68	52.02	7.08	11.64
2	Days to maturity	101.79	114	101	6.82	5.20	58.09	8.31	8.16
3	Plant height(cm)	77.20	98.50	62.4	13.03	12.97	99.1	20.55	26.61
4	No. of productive tillers/plant	4.12	5.80	2.0	17.83	12.61	50.0	0.75	18.20
5	Spike length (cm)	6.69	9.80	4.10	17.43	15.68	80.9	1.94	28.99
6	No. of grains/ spike	44.83	58.30	37.2	10.17	9.47	86.8	8.15	18.17
7	1000 grain weight (g)	48.05	56.80	33.50	7.91	5.42	46.9	3.67	7.63
8	Biological yield/plot (g)	9985.33	14625	7250	11.96	5.53	21.3	52.58	5.26
9	Harvest Index (%)	42.83	56.89	29.12	11.08	3.05	7.5	0.75	1.75
10	Grain yield/plot (g)	4236.45	5500	3250	10.86	5.19	22.9	21.68	5.11

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