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Genetics of Certain Yield Components in Bread Wheat (Tritium Aestivum.)

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Abstract
The estimates of dominant components were greater than additive genetic components for all the traits. Over dominance was noted for all the traits. Dominant genes were more frequently distributed than the recessive genes in all the traits One major gene group was found controlling all the traits except-grain yield per plant which was controlled by more than two major groups of genes Experiment conducted comprising 10 parents and their 45 crosses generated from 10 parent diallel mating design indicated highly significant difference among the treatments for all the 10 characters. The variance component analysis indicated significant role of additive (15) dominant (Hu and H2) genetic components for all the 10 characters..
Key Words*: Diallel, additive, dominance.*

During the past three decades, wheat production in India has increased more than four times and area under cultivation has gone up two fold Productivity has increased from 9.13 q/ha to 30 q/ha. The data look very impressive but the wheat production is still below the population growth rate which needs the accelerating the productivity rate, the knowledge of yield components and their mode of inheritance which may be helpful in order to enhance the productivity level. Therefore for attaining higher yield level, the breeder is required to simplifythe complex situation through handling of yield components.

I. MATERIAIS AND METHODS

The basis material for the present study comprised of 10 genotypes/ varieties namely, HD2285, K8305, UP2121, K8565, K8020 HUW234, Pl3 W 226, K8103, HU W300 and

K1633. All possible single crosses excluding reciprocates were made among the above 10 genotypes to produce 45 crosses. An experiment comprised of 10 parents and their 45 F_1s weregrown in Randomized Block Design with three replications. Treatments were grown in two row plots of 1.5 m with inter-and intro row distance of 25 and 15 cm., respectively. Data wererecorded on randomly taken 10 plants each in parent and F_1. The observations were recorded on 10 characters namely days to reproductive phase, flag leaf area, spike area, plant height, number of productive tillers per plant, grain yield per spike, number of grains per spike, harvest index, 1000 grain weight and grain yield per plant. The data thus obtained were subjected to biometrical analysis.

The analysis of variance for parents and P_1s were calculated as usual whereas the genetic component analysis as well as the validity of diallel hypothesis, 't^2' test was done as per procedure of Hayman (1954). The differences of regression coefficient 'b' from zero and unitywas tested using t value of b-o / SE (b) and 1-b/SE (b).

The component of variance were computed as per procedure given by Hayman (1954)and estimates of Ď. F, $\hat{H}_1$, $\hat{H}_2$, h_2 and Ê were noted and other related estimates as mean degree of dominance, the proportion of dominant and recessive genes in parents, the number of gene groups which control the characters and coefficient of correlation between the parental order of dominance and parental measurement were also worked out using various respective formulae.

II. RESULT AND DISCUSSION

Component variance analysis revealed the presence of both additive (Ď) as well as dominance ($\hat{H}_1$ and $\hat{H}_2$, component for all the characters (Table 3). However, dominance variances were greater than additive one for all the traits. Thus both additive and lion-additivegenetic components were responsible for the expression of these quantitative characters. Several workers like Sharma and Ahead (1979); Gill*et at* (1984) Singh and Paroda (1985) havealso reported additive as well as dominance genetic variance for yield components in bread wheat.

The validity of assumption concerning to diallel cross analysis was tested by 't' list (Hayman 1954). Non-significant values of 't_2' (Table-1) for all the characters in F_1 generation revealed the validity of hypothesis except for number of days to productive phase, grain weightper spike and grain yield per plant. The regression coefficient 'b' deviated significantly for days to reproductive phase, spike area, plant height, number of productive tillers per plant, grain weight per spike, number of grains per spike. 1000 grain weight and grain yield per plant. Thesignificant deviation of regression - coefficient 'b' from unity indicated the presence of non-allelic gene interaction. Analysis of variance for all the 10 attributes indicated highly significantdifferences among the parents (Table 2) and F_1s and found to have highly significant differences for days to reproductive phase, flag leaf area, spike area, plant height, grain weightper spike, harvest index, 1000 pain weight and grain yield per plant.

The value of $\hat{H}_1$was recorded higher than the value

Table 1: Anova for 10 characters in a 10- Perent-Dialles cross of wheat: Mean sum of squares

Source of Variation	d.f.	Days to reproductive phase	Flag leaf area	SD pike area	Plant height	Number of productive tillers per plant	Grain weight per spike	Numberof grainsper	harvest index	1000-grain weight	Grain yield per plant
Replications	2	2.38	3.65	3.78	3.83	0.84	0.02	8.77	1.40	0.59	2.85
Treatments	54	102.16**	36.28**	37.88**	104.23**	8.98**	0.18**	133.63**	21.32**	32.69**	50.98**
Parents	9	111.29**	38.23**	35.80**	56.94**	4.41**	5.04**	43.09**	16.21**	10.91**	27.40**
F_1s	44	104.44**	35.26**	38.05**	115.38**	9.95**	0.18**	154.96**	19.84**	37.67**	39.39**
Parents v. F_1s	1	51.69**	63.65**	48.99**	39.35**	6.91*	1.33**	9.96	132.52**	9.41**	772.77**
Error	108	2.76	2.00	1.38	1.92	1.26	0.01	4.30	1.96	0.71	3.28

**Significant at 1% level, *Significant at 5% level

Table 2: Estimate of b,S_b, (b-0)/ S_b, (1-b)/Sb and t_2 for 10 characters of F_1 in a 10- parent-Diallel cross of wheat

Character	b	Sb	(b-0)/Sb	(1-b)/Sb)	t^2
Days to reproductive phase	0.15	0.16	0.97	5.31**	5.88**
Flag leaf area	0.73	0.34	2.15	0.79	0.46
Spike area	0.28	0.11	2.45	6.38**	2.09
Plant height	0.14	0.22	0.64	3.81**	1.64
Number of productive tillers per plant	-0.17	0.19	-0.89	6.01**	2.91
Grain weight per spike	-0.07	0.08	-0.84	12.70**	30.95**
Number of grains per spike	0.13	0.18	0.75	4.88**	1.20
Harvest index	0.32	0.37	0.86	1.80	0.09
1000-grain weight	0.04	0.12	0.34	8.19**	2.32
Grain yield per plant	0.20	0.17	1.19	4.86**	5.03**

**Significant at 1% level, *Significant at 5% level

of $\hat{H}_2$ for all the traits in F_1 generation which reflected the unequal distribution of positive andnegative alleles. The positive and significant values of F components indicated that dominantgenes were frequently distributed than the recessive genes for all the traits; Sharma *et al. (*1991) have also reached to the same conclusion for grain and related productive traits in bread wheat. The positive and significant h2 values indicated the presence of dominance for flag leaf area, grain weight per spike, harvest index and grain yield per plant.

The value of mean degree of dominance of exhibited over dominance for all the traits under study. Sharma and Ahmad (1979) for number of productive tillers per plant and grain yield, Singh and Rai (1991) for number of day of maturity and grain yield per plant in bread wheat have also reported over dominance in F_1 generation.

The proportion of genes with positive and negative effects ($H2/4\hat{H}_1$) was found less than the theoretical value 0.25 for all the traits, indicated dominant alleles for all the characters. Sharma *et al.* (1991) also reported similar findings for grain yield and related traits. The ratio of dominant and recessive genes in the parents indicated distribution of dominant genes for allthe traits. The positive value of coefficient of correlation between parental orders of dominance and parental measurement 'r' indicated that negative genes were mostly dominant in expressionof all the traits except for number of productive tillers per plant, 1000 grain and harvest index.

Character	Ď	Ĥ1	Ĥ2	F	ĥ2	Ê	Degree of dominant nce	H2/4 H1	Dominant Recessi vegene	h2/H2	r
Days of reproductive phase	36.18**±12.69	140.72**±27.02	86.89**±22.96	60.59*±29.29	6.49±15.37	0.92±3.83	1.97	0.15	2.48	0.57	0.0077
Flag leaf area	12.08**±2.65	31.51**±5.64	29.58**±4.80	3.55±6.12	8.16±3.21	0.67±0.80	1.62	0.23	1.20	0.27	-0.4112
Spike area	11.48**±4.32	28.54**±9.19	24.61**±7.81	0.67±9.96	6.30±5.23	0.46±1.30	1.58	0.22	1.04	0.25	0.0453
Plant height	18.34*±8.07	155.27**±25.70	129.16**±21.84	30.46±27.85	4.97±14.62	0.64±3.64	2.91	0.21	1.80	0.04	0.5988
Number of productive tillers per plant	1.05*±0.40	12.74**±1.92	11.53**±1.63	1.65±2.08	-0.03±1.09	0.42±0.27	3.48	0.23	1.58	-0.003	-0.4758
Grain weight per spike	0.010**±0.03	0.26**±0.06	0.23**±0.05	0.02±0.06	0.17±0.03	0.10±0.01	4.90	0.22	1.61	0.71	-0.0706
Number of grains per spike	12.93**±4.10	192.80**±30.02	178.60**±25.51	14.19±32.54	0.80±17.08	1.43±4.25	3.86	0.23	1.33	0.94	-0.1402
Harvest index	4.75*±2.07	31.35**±6.11	25.78**±5.19	8.89±6.62	17.26**±3.47	0.66±0.86	2.57	0.21	2.15	0.67	-0.7625
1000 grain weight	3.40**±1.07	49.83**±7.18	41.90**±6.10	7.21±7.78	1.16±1.02	0.24±1.02	3.83	0.21	1.77	0.03	0.0145
Grain yield per plant	8.04*±4.06	52.05**±9.70	49.53**±8.25	2.83±10.52	101.61±5.52	1.10±1.37	2.54	0.24	1.15	2.05	-0.5496

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