

Short Communication

GENETIC ARCHITECTURE OF METRIC TRAITS IN WHEAT  
(*TRITICUM AESTIVUM* L. EM. THELL)

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Six generations i.e. P1, P2, F1, F2, BC1 and BC2 of three cross combinations viz., CPAN-1866 × HD-2009, CPAN- 1866 × DL-153-2 and CPAN-1959 × DL-153-2 were grown in a randomised block design with three replications at the Research farm of Meerut University, Meerut, in 4m long rows spaced 30 cm apart. Plant to plant distance within a row was 10 cm. Observation on plant height (cm), ear length (cm), spikelets per ear, grains per ear, grain weight per ear (g), 1000-grain weight(g) and grain yield per plant (g), were recorded on five randomly selected plants. The data collected on seven quantitative traits were computed for each generations of all the crosses. The genetic parameters were estimated following Jinks and Jones [1].

A simple additive dominance model was adequate in CPAN-1866 × DL-153-2 for yield per plant, CPAN-1959 × DL-153-2 for ear length, and CPAN-1866 × DL-153-2 for grain weight per ear (Table 1).

The digenic epistatic model was used for yield per plant in the cross CPAN-1866 × HD-2009, for plant height in cross CPAN-1959 × DL-153-2, and for spikelets per ear, in the two crosses, CPAN-1966 × HD-2009 and CPAN-1959 × DL-153-2. All the three crosses showed the significance of fixable as well as non fixable gene effects for grain no./ear and 1000-grain weight. Gill *et. al.*, [2] also reported the importance of these effects for wheat yield components. Complementary type of epistasis was observed for yield per plant, spikelets per ear, grains per ear and grain weight per ear in cross CPAN-1866 × HD-2009, and for plant height in CPAN-1959 × DL-153-2. Duplicate epistasis was noticed for 1000 grain weight in all the crosses, for spikelets per ear and grains per ear in CPAN-1866 × DL- 153-2 and CPAN-1959 × DL-153-2 and for plant height and ear length in CPAN-1866 × HD-2009 and CPAN-1866 × DL-153-2.

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Table 1. Scaling tests and estimates of genetic parameters for seven traits in wheat

Characters	Scales			Estimates						Type of epistasis
	A	B	C	(m)	(d)	(h)	(i)	(j)	(l)	
<i>Yield per plant (g)</i>										
CPAN-1866 × HD-2009	*	*	-	24.4**	3.4	25.4*	8.3	0.9	15.9	C
CPAN-1866 × DL-153-2	-	-	-	20.9**	0.9	20.6	-	-	-	-
CPAN-1959 × DL-153-2	*	*	*	17.2	-9.9	24.5	18.2	-10.5*	-26.6	D
<i>Plant height (cm)</i>										
CPAN-1866 × DH-2009	*	-	*	102.0**	1960.6	5.8	-14.7	-8.9	-23.3	D
CPAN-1866 × DL-153-2	*	*	*	93.2	-8.4	-12.6	-8.6	7.6	25.4	D
CPAN-1959 × DL-153-2	*	*	-	90.1	12.9	49.6	39.3**	8.4*	28.7*	C
<i>Ear Length (cm)</i>										
CPAN-1866 × HD-2009	*	*	*	12.4**	0.3	0.2	7.4	1.8	-0.4	D
CPAN-1866 × DL-153-2	-	*	*	11.5**	0.4	1.6	0.9	0.8	-0.2	D
CPAN-1959 × DL-153-2	-	-	-	10.6**	0.7	2.3	-	-	-	-
<i>Spikelets per ear</i>										
CPAN-1866 × HD-2009	*	-	-	17.6**	9.8**	4.9*	3.4	0.8	2.9	C
CPAN-1866 × DL-153-2	*	*	*	16.3**	0.6	3.8*	4.8*	-0.6	-1.8	D
CPAN-1959 × DL-153-2	-	*	*	15.6**	8.8**	-5.7	4.91*	2.7*	5.3*	D
<i>Grains per ear</i>										
CPAN-1866 × HD-2009	*	-	*	58.7**	14.9**	24.9*	19.8	5.7*	37.4*	C
CPAN-1866 × DL-153-2	*	*	*	55.0**	9.7*	12.6*	7.5	0.1	-4.3	D
CPAN-1959 × DL-153-2	*	*	-	56.3	9.4	10.4	3.5	7.9	-4.7	D
<i>Grain weight per ear (g)</i>										
CPAN-1866 × HD-2009	-	*	*	2.9**	0.3	3.0*	2.7*	0.9	3.9*	C
CPAN-1866 × DL-153-2	-	-	-	2.4*	-0.2	1.9*	-	-	-	-
CPAN-1959 × DL-153-2	*	*	*	2.3*	-1.6	0.8	0.7	-1.2	-0.7	D
<i>1000 grain weight (g)</i>										
CPAN-1866 × HD-2009	*	*	*	30.4**	6.9*	26.8**	23.4**	9.9*	-30.1**	D
CPAN-1866 × DL-153-2	*	*	-	36.4**	5.4*	19.9**	16.7**	-1.4	-16.9**	D
CPAN-1959 × DL-153-2	-	*	*	33.6	-10.8	20.5**	14.1**	-10.7**	19615.4**	D

\* \*\*Significant at 5% and 1% levels, respectively

Both additive (d) and dominance (h) gene effects were significant in respect of 1000 grains weight and grains per ear in all the three crosses, in respect of grain yield per plant and spikelets per ear in CPAN-1866 × HD-2009, and in respect of plant height in the cross CPAN-1866 × DL-153-2

The dominance gene effects were significant for grain yield and spikelets per ear in CPAN-1866 × DL-153-2, for grain weight per ear in two crosses i.e. CPAN-1866 × 2009 and CPAN-1866 × DL-153-2. Khalifa *et. al.*, [3] also reported the importance of dominance component for these traits in wheat. Additive gene action has also been earlier reported for these trait [4].

The additive × additive (i) gene interaction was significant for 1000 grain weight in all the three crosses, for grain yield per plant and grain weight per ear in the cross CPAN-1866 × HD-2009; for plant height and grain per ear in CPAN-1866 × DL-153-2 cross, and for spikelets per ear in two crosses CPAN-1866 × DL-153-2 and CPAN-1959 × DL-153-2. Additive × dominance (j) interaction was significant for grain yield per plant, plant height, spikelets per ear in CPAN-1959 × DL-153-2; grains per ear and 1000 grain weight in the crosses CPAN-1866 × HD-2009 and CPAN-1959 × DL-153-2. The dominance gene interaction (l) was significant for plant height and spikelets per ear in CPAN-1959 × DL-153-2; for grains per ear and grain weight per ear in CPAN-1866 × HD-2009 and for 1000 grain weight all the crosses. All the three epistatic interactions were significant in all the three crosses for 1000 grain weight. On the other hand, none of the gene interaction was significant in respect of ear length in all the crosses.

Recurrent selection followed by pedigree breeding or biparental mating or selective diallel mating system may prove to be effective in improvement of these traits.

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