SUMMARY

The present study entitled **"Genetic divergence and impact of seed size variation in durum wheat"** was undertaken to obtain the information on (i) impact of seed size on growth and yield characters, (ii) the genetic variability, character associations, and (iii) genetic divergence.

As the present study consists of two experiments; in experiment I, four genotypes viz., RAJ-1555, MACS-2846, PDW-233 and WH-896 with three seed grade i.e. small, medium and bold were grown in RBD with three replications during 2004-05 and 2005-06. The data on growth characters (plant height, tiller number , number of leaves and leaf area) at 3,6,9,12 and 15 week stages and maturity characters (tiller number, number of spikelets per spike, number of grains per spike, 100-grain weight and grain yield per plant) were recorded. In experiment-II, forty diverse genotypes of durum wheat were grown in randomised block design experiments in three replications in two environments each, during 2004-05 and 2005-06 at Research Farm of Kisan P.G. College, Simbhaoli, (Ghaziabad). All the recommended cultural practices were adopted for raising the crop. The data were recorded on five competitive plants from each genotype in each replication on the following eleven characters viz., days to heading, days to maturity, plant height, number of tillers per plant, spike length, spikelets per spike, grains per spike, 100-grain weight (g), grain yield per plant (g), biological yield (g) and harvest index (%). Plot means were used for the analysis of data to work out the (i) critical differences (C.D.), (ii) genetic

parameters, (iii) correlation and path coefficient analysis, and (iv) genetic divergence and clustering pattern. The main findings of the present study are summarised below:-

1. In all the seed size categories, the plants grown from medium and bold seeds were initially more vigorous than those grown from small seeds for all the growth characters at early stages of plant growth.

2. At later stages of growth i.e. 12 and 15 week stage, the differences in mean values were prominent between the plants produced from small and bold seeds in almost all the varieties during both the years.

3. Pooled analysis of variance showed significant differences due to varieties and seed grades for grain yield and its components observed at maturity. Further, the mean squares due to variety x seed size were significant for 100-grain weight (during both the years), number of spikelets per spike and grains per spike (during 2nd year) suggesting that sufficient genetic variation exist in varieties and seed size for grain yield and its components.

4. The mean values of grain yield and its components were relatively higher during Ist year. Further, the mean difference were significant for all the maturity characters between the plants produced from small and bold seeds. However, the mean differences were mostly non significant for the plants produced from medium and bold seeds.

5. The simple correlation analysis among various maturity characters indicated that yield showed significant and positive association with tillers per plant, spikelets per spike and grains per spike.
6. The analysis of variance ANOVA) showed significant differences among the genotypes for all the eleven characters in the four environments, suggesting that the genotypes differed significantly for all the characters.
7. The estimates of heritability (broad sense) were relatively high for days to heading, plant height, spike length, spikelets per spike and 100-grain weight.
8. The genetic advance were relatively high for plant height and grains per spike. Further, genetic advance as percent of mean were relatively high for plant height, spike length, grains per spike, 100-grain weight, gain yield per plant and biological yield. The high value of genetic advance shows that the characters are governed by additive genes and selection will be rewarding for improvement of such characters.
9. The estimates of PCV were higher than the estimates of GCV for all the characters. This may result due to the involvement of high environment and genotype x environment effects in characters expression.
10. The estimates of GCV were high for spike length, grains per spike and grain yield indicating the presence of rich exploitable variability for these characters.

11. Regarding the mean performance of forty genotypes in four environments, it is observed that Motia was found to be an earliest heading and PDW-254 was screened as earliest maturing genotypes and also having high harvest index. The genotype Bihar yellow for plant height, IDSN-148 for number of tillers per plant, Bihar wheat for spike length and grains per spike, IDSN-72 for spikelets per spike, EC-39 for 100-grain weight and Kiran for biological yield were screened as desirable over the four environments. Similarly, the mean values for grain yield ranged from 5.67g to 18.79g and HI-8381 (in environment III) exhibited highest grain yield. On the basis of their mean performance these genotype can be subjected for genetic improvements to be developed as varieties or can be used as parents in hybridization programme.

12. The correlation studies among eleven characters generally showed similar trend both at genotypic and phenotypic levels in almost all the environments. Further, in general, the estimates of genotypic correlation coefficients were higher than the estimates of phenotypic correlation coefficients for almost all the character combinations suggesting the genetic nature of associations between characters. The nature and magnitude of correlation coefficients between most pairs of characters were inconsistent over the four environments.

13. The grain yield showed significant and positive correlation with number of tillers per plant, grains per spike and biological yield (in all

the environments), spikelets per spike (environment I, III and IV), days to heading and 100-grain weight (environment II and IV) and harvest index (environment I, II and IV).

14. Among the significant *inter se* associations, number of tillers per plant showed positive associations with biological yield in all the environment.

15. It is also observed that magnitude of phenotypic correlation coefficient of number of tillers per plant and biological yield with grain yield was highest and also the magnitude of tiller number with biological yield was maximum among the significance *inter se* associations.

16. Since the correlation coefficients only measure the direction and degree of associations between attributes, the direct and indirect contributions of each character towards grain yield was estimated. From the path coefficient analysis, it is observed that the magnitude of direct effects for biological yield and harvest index were maximum in all the environments. Further, almost all the characters also showed indirect contribution towards grain yield through biological yield and harvest index.

17. Among all the characters, the high and positive estimates of direct effects were observed by biological yield and harvest index, and the direct effects for other characters were low to very low. Among all the characters, the indirect effects of different characters were important through biological yield and harvest index.

18. The magnitude of residual effects were very low in all the environments suggesting thereby that most of the important characters have been included in the path coefficient analysis.

19. From the study of correlation and path coefficient, it is concluded that the grains per spike, number of tillers per plant, biological yield and harvest index were the important characters which not only showed positive correlation with grain yield but contributed directly towards grain yield.

20. Based on D^2 analysis, the forty genotypes of durum wheat were grouped in the five clusters each in environment I, II and IV, and six clusters in environment II.

21. It is observed that Malwa Raj (environment I) and Bihar Wheat (environment II) form the separate cluster, thus indicating that these genotypes may be considered as the most divergent genotypes.

22. Further, it is evident that the pairs of genotypes like Bihar Yellow and Kiran, MASA-35 and IDSN-72, DDW-01 and DDW-05, Jairaj and Vijay, EC-38 and EC-39, IDSN-148 and IDSN-195, MPO-215 and PDW-254, RAJ-1555 and EC-34, PKD-5 and DWL-5023, Jai and Jairaj, Meghdoot and NI-146 grouped together in almost all the environments, indicating that these genotypes are not divergent from each other but these are divergent from the remaining genotypes.

23. The maximum inter-cluster distance was observed between cluster II and I (5.987) in environment I, between cluster V and VI (7.844) in

environment II, between cluster IV and I (5.425) in environment III and between cluster V and II (7.106) in environment IV.

24. Maximum contribution to the divergence was made by spikelets per spike, number of tillers per plant and harvest index. The other important characters which contributed to divergence are days to maturity and biological yield.