Chapter-VI

Summary and Conclusion
The present investigation entitled "A study on stability for yield and yield contributing characters in barley (Hordeum Vulgare L.)" was undertaken with a view to work out variability, heritability, genetic advance, character association, path analysis and phenotypic stability among the 40 genotypes of barley grown over four environments at the research farm Atarra post graduate college, Atarra, Banda (U.P.) and four environments at Brahma nad Mahavidhalaya, Rath, Hamirpur (U.P.) during 2006-07. The experiments were conducted in randomized block design consisting of three replications with two row of two meter for each genotype in each environment. Row to row distance was kept 30cm and plant to plant spacing 10cm. Experiments were conducted with two levels of nitrogen (N) and two levels of sowing date at two locations over one year. The seeds of 40 genotypes were obtained from C.S. Azad University of Agriculture and Technology, Kanpur. Normal cultural practices were followed in all the experiments to raise better crop.

The observations were recorded on three randomly picked plants of 40 genotypes on the 13 morphological characters ( Eleven quantitative and two qualitative). The quantitative characters studied were days to flowering, days to maturity, plant height, number of tillers per plant, ear length, number of spikelets per ear, number of seeds per spike, grain yield per plant, 1000-grain weight, biological yield per plant and harvest index and qualitative characters i.e., malt and starch percentage. The data obtained from experiments at different growth stages and finally
at harvest were subjected to the statistical analysis following the suitable procedure to workout the following objectives :-

I. To find out the variability, heritability and genetic advance for the characters under study.

II. To estimate the character association between yield and its component characters through correlation and path analysis.

III. To find out the phenotypic stability for the characters under study under different environments.

The salient features of the present investigation are summarized here under, environment wise. Experimental data were subjected to analysis of variance, heritability genetic advance, character association, path coefficient analysis and phenotypic stability.

1. The analysis of variance, environment wise as well as pooled analysis showed that mean square due to treatments were significant for all the traits except ear length.

2. Number of tillers per plant, number of spikelets per ear, number of seeds per spike, grain yield per plant, biological yield per plant, 1000-grain weight and harvest index exhibited maximum amount of phenotypic and genetic variability, therefore these characters may offer considerable scope for improvement in the present material.

3. Malt and starch percentage and days to maturity exhibited low phenotypic and genotypic variability suggesting that more
variability is required to be generated for these characters, through hybridization or mutation breeding.

4. The number of tillers per plant, harvest index, grain yield per plant, 1000-grain weight, number of spikelets per ear, number of seeds per spike, biological yield per plant, malt and starch percentage had high heritability therefore simple selection procedure for these traits will be effective. However, only one trait namely days to maturity showed low heritability.

5. On the basis of pooled analysis the maximum genetic advance was observed for number of seeds per spike, number of spikelets per ear and harvest index.

6. High heritability coupled with high genetic advance over mean was observed for number of tillers per plant, biological yield per plant, harvest index, 1000-grain weight, grain yield per plant, number of seeds per spike and number of spikelets per ear indicated that the additive gene effects are of probable importance and improvement in these traits may be achieved through selection. While plant height, ear length, days to flowering, malt and starch percentage exhibited low genetic advance indicating the presence of non-additive gene effects therefore, heterosis breeding programme may be useful for these characters.

7. The success of plant breeding programme depends on the association of various yield component characters with grain yield and quality character. In present study, the characters biological
yield per plant, harvest index, number of spikelets per ear and number of tillers per plant, ear length, number of seeds per spike and 1000-grain weight exhibited positive and highly significant correlation with grain yield per plant; therefore, a population improvement programme should be based on these characters using simple selection procedure.

On the basis of pooled analysis it was observed that the character days to flowering showed positive and significant correlation with ear length, and number of seeds per spike; days to maturity significantly and positively correlated with number of spikelets per ear; plant height with ear length; number of tillers per plant with grain yield and biological yield per plant; number of spikelets per ear exhibited significant positive correlation with number of seeds per spike, biological yield per plant and grain yield per plant; number of seeds per spike with grain yield per plant and biological yield per plant. Biological yield per plant showed positive and significant correlation with tiller number per plant, number of spikelets per ear, number of seeds per spike and grain yield per plant and harvest index showed positive significant association with malt percentage.

Biological yield per plant and harvest index exhibiting positive and significant correlation with grain yield per plant also had high revealed the positive direct effects on grain yield per plant, which reveals true relationship between yield and both characters. Therefore, direct selection for these traits will be rewarding for yield improvement.
10. The number of spikelets per ear and number of seeds per spike also contributed indirectly towards grain yield through biological yield per plant.

11. The characters number of tillers per plant, number of spikelets per ear and number of seeds per spike had low direct effect but contributed towards grain yield per plant via biological yield per plant.

12. Thousand grain weight showed low direct effect on grain yield, contributed towards grain yield per plant via days to maturity, number of tillers per plant, number of spikelets per ear, number of seeds per spike and biological yield per plant.

13. Out of 40 genotypes, seven genotypes were identified as desirable and stable for grain yield per plant in barley i.e., K-273, K-169, K-252, K-792, K-784, RD-2035 and K-794 because these varieties were having high mean performance, unity regression coefficient and non significant deviation from regression. Therefore, these genotypes can be recommended for commercial cultivation under varied environmental conditions.

14. The genotype K-678, BH-851, K-341, K-791, K-675 and K-804 were high yielding and stable but their corresponding “bi” values were significantly lower than unity. These genotypes would perform better in poor environmental conditions hence, these genotypes can be utilized as donor parent to breed a suitable line for poor environments.
Similarly the genotypes Lakhan, Vijaya, Jyoti, K-551, K-790, Lakhan. K-804 and K-141 were observed to be high yielding and stable but its corresponding "bi" values was greater than unity. These genotypes would perform better in favourable conditions and hence could be recommended for cultivation under better management practices.

All the seven stable genotypes for grain yield with high mean performance showed stability for different characters mentioned against each in table-36. Some other genotypes were also identified with medium mean performance and stable for grain yield showing stability with other characters mentioned against each genotype in aforesaid table.

Considering high mean (>80.02), regression coefficient close to unity (b=1) and deviation from regression zero (S²di=0), the seven promising genotypes namely RD-2684, Manjula, K-678, BH-851, K-792, K-790 and K-794 were detected as desirable and stable for malt percentage over eight environments. These varieties could be recommended for commercial cultivation for malt percentage in environments tested in the present study.

While, the genotypes Jagrati, PL-781, K-370, K-729, BEU-73 and K-675 were observed high yielding for malt and stable but their corresponding "bi" values were significantly greater than unity. It shows that these genotypes would perform better in favourable environments and hence could be recommended for general cultivation.
19. Seven stable genotypes for malt percentage with high mean performance (>80.02) had stability with different other characters mentioned against each genotypes in Table-37. Some more genotypes were also identified with medium mean performance and stable for malt percentage showing stability with other characters in the same table.

20. Considering stability criteria, for starch percentage under eight environments only four genotypes were identified as desirable and stable i.e., PL-781, K-1155, K-633 and K-794. Therefore these genotypes could be recommended for general cultivation.

21. However, the genotypes RD-2684, K-729, BEU-73, K-792, K-784, K-1149 and K-804 had high starch percentage and stable but their "bi" values were found significantly lower than unity. Therefore, these genotypes would perform better in poor environments hence can be involved as a parent in the breeding programme of abridging to breed a suitable line for poor environment.

22. Genotypes K-169, Lakhan, K-791, K-318, Anber and K-141 showing stability for starch percentage and medium mean performance also showed stability with other characters mentioned against each genotype in Table-37.