



VARIABILITY IN PARENTAL AND F_2 POPULATIONS OF WHEAT
IN RELATION TO SELECTION FOR YIELD.

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SUMMARY

1. Experiments were conducted on parents and hybrids of wheat to compare the variability within parental populations (P_1 and P_2) and within hybrid (F_2) populations and to examine the effectiveness of selection at the F_2 generation. In 1975, the P_1 , P_2 and F_2 of eight crosses were grown at crop density and three of the crosses were also grown at low density. For each of these 24 populations at crop density approximately 450 plants were assessed and for each of the 7 populations at low density 200 plants were assessed.
2. Assessments were made on the characters; head number, total plant weight, total grain weight, main shoot total weight, main shoot grain weight, main shoot grain number, main shoot spikelet number and head length, tiller grain weight, tiller grain number, height. The frequency distribution means, variances, CV's, and skews for each character and population formed the bases of the comparisons.
3. It had been anticipated that as the variances of the F_2 would have genetic and environmental components they would be larger than that of the parents which would have only an environmental component. It was found that the variances for the F_2 were not consistently or significantly larger than the variances of the parents with the exception of height. In several instances the variances of the parents were often significantly different from each other.
4. The range of the F_2 distributions in most circumstances covered the combined ranges of the parental distributions. Transgressive segregation was evident in many characters but its manifestation differed between crop density and low density.
5. Nearly all the distributions were significantly skewed. Those characters which were positively skewed were; head number, total plant

weight, total grain weight, tiller grain weight and tiller grain number, and those that were negatively skewed were; main shoot total weight, main shoot grain weight, main shoot grain number, height, spikelet number and head length. Similar skews were found for the characters at both densities but they were stronger at crop density.

6. Heterosis defined as occurring when the F_2 had a mean value that exceeded the parental means, was evident in many characters at both densities.

7. To study the effect of selection at the F_2 , twenty five percent of the F_2 derived lines from three crosses, grown at crop and low density in 1975, were grown as F_4 plots in 1976 (experiment 3) at two locations. Further plot trials were conducted in 1978 but now with fifty percent of the F_2 derived lines from the eight crosses at crop density and the three crosses at low density. F_4 or F_5 plots were grown at two locations. In some trials only one replicate was grown but check plots were given on a grid pattern in the trials.

8. Correlation analyses were used to estimate the relationship between characters measured on the F_2 's and their derived line (F_4 or F_5) plot yields.

9. The significant correlations that were found occurred mostly with the characters measured on the main shoot of the F_2 's; main shoot total weight, main shoot grain weight and main shoot grain number. A few correlations only were found with total plant weight, total grain weight, tiller grain weight and tiller grain number. Significant correlations occurred mainly in the crosses in which the F_2 showed a larger variance than the parents for that character.

10. Harvest index in the F_2 was not as good as main shoot yield as an indicator of high yield in the subsequent F_4 or F_5 plots. For some crosses in which the main shoot total weight and grain weight had a significant correlation with the F_4 or F_5 yields, the main shoot harvest index also showed a significant correlation.

11. It was concluded that prediction of high yielding genotypes in early generations may become feasible if attention is paid to main shoot yield.

12. The Discussion was concerned with the means and variances of the F_2 's, the causes for the positive and negative skews in the populations and the value of various characters in selection procedures.