SUMMARY

The aim of this study was to investigate the extent of heterosis, combining ability and association among grain yield, its components, heading date, plant height and some of quality characters in common wheat. This study was performed using ten spring wheat varieties and lines of divergent origins; i.e. 1) Sakha 3, 2) Giza 139, 3) Giza 157, 4) Sakha 69, 5) Veery's", 6) Pat (73121), 7) CM 21840, 8) CM30170, 9) SunBird"s" and 10) CM 32973 in a half diallel. The experimental work was conducted at Sids Agric. Res. Sta. Agricultural Research Center, during the two successive seasons 1983/84 and 1984/85.

Heterosis was computed as the percentage deviation of F_1 mean performance from better parent for individual crosses. Estimates of general and specific combining ability effects were obtained by employing Griffing's diallel cross analysis method 2, model 1, correlation coefficients and path analysis were obtained of the three levels; i.e. phenotypic, genotypic and environmental.

The obtained results could be summarized as follows :
Means :
Sakha 3, was the best of the tested lines in earliness, number of kernels per spike and gluten quality. Giza 139 gave the highest value for plant height. The common check Sakha 69 was the highest in grain yield, harvest index, protein content and most of yield components e.g. number of spikes per plant and 100-kernel weight. SunBird"s" variety significantly surpassed all the test parents in number of spikes per plant. The parental line CM 32973 gave the highest values for

number of spikes per plant and total plant weight. The parental line Veery"s" was amongst the highest in number of spikes per plant and number of kernels per spike. Also, CM 30170 was amongst the highest in number of spikes per plant. The parental line Pat (73121) may be considered highest for spike length, number of spikelets per spike and number of kernels per spike.

Heterosis :

> * Considerable heterotic effects, as compared to the better parent, exhibited in all traits, ranging from -1.579 to -8.164 % for earliness, 4.231 to 17.273 % for tallnes, 8.649 to 16.751 % for number of spikes per plant, 9.013 to 13.305 % for spike length, 4.545 to 7.727% for number of spikelets per spike, 12.060 to 17.711 % for number of kernels per spike, 7.890 to 80.777 % for 100-kernel weight, 6.374 to 33.032 % for total plant weight, 6.082 to 59.390 % for grain yield per plant, 10.070 to 45.928 % for harvest index, 11.128 % for lysine content and 6.711 to 14.607 % for gluten quality.

* The highest performing crosses were :

- 1x10, 2x7, 3x5, 4x7, 4x9, 5x7, 6x7, 6x9, 7x8, 7x9 and 7x10 for earliness.

- 1x5, 1x10, 2x7, 3x4, 3x5, 5x6, 5x8, 5x9, 5x10, 6x7, 6x8, 6x9, 6x10, 7x8, 7x9, 7x10, 8x9 and 8x10 for at least one of yield components.

- 1x5, 5x6, 5x8, 5x10, 6x7, 6x9, 6x10, 7x8 and 7x9 for grain yield per plant with at least one of yield components.

-   1x3 for high lysine, and

-   4x7, 4x8 and 4x9 for gluten quality.

Combining ability :

*   The highest general combiners were,

    -   Sakha 3, Giza 157, Sakha 69, SunBird"s" and CM 32973 for earliness,

    -   Sakha 3, Giza 157, Sakha 69, SunBird"s" and CM 32973 for shortness and Giza 139, Pat (73121) and CM 30170 for tallenss.

    -   Sakha 69, Veery"s", Pat (73121), CM 21840 and SunBird"s" for high number of spikes per plant.

    -   Sakha 3, Veery"s", CM 21840 and CM 32973 for long spike,

    -   Sakha 3, Giza 157, Veery"s" CM 21840 and CM 32973 for higher number of kernels per spike.

    -   Sakha 3, Pat (73121), CM 21840, SunBird"s" and CM 32973 for heavy kernels,

    -   Sakha 69, Veery"s", Pat (73121), CM 21840 and SunBird"s" for high grain yield per plant,

    -   Sakha 69 and CM 32973 for lysine content, and

    -   Sakha 3, Pat (73121), Veery"s" and CM 32973 for gluten quality.

*   Significantly specific combining ability effects were detected for all traits, toward both negative and positive directions.

*   Significantly positive correlations between heterotic expression and respective specific effects for all traits revealing the non-additive type of gene action for heterosis and usefullness of SCA to search for hybrid vigour. However some crosses did show significant SCA but without heterosis.

i.e. spike length, number of spikes per plant, number of spikelets per spike, number of kernels per spike exhibited positively significant correlations with each other and with grain yield per plant, at both phenotypic and genotypic levels.

- Weight of 100 kernels showed positively significant correlation with grain yield per plant at genotypic level, being comparable to that at environmental level. With other traits it was not significant, being negative with days to heading, plant height, number of spikelets per spike and number of kernels per spike, but positive with spike length and number of spikes per plant.

* Path coefficient analysis and coefficient of determination :
    - The three components, number of spîkes per plant, number of kernels per spike and 100-kernel weight accounted for 60 % and 73 % of variation in grain yield at both phenotypic and genotypic levels, respectively.

    - The most important factor was number of spikes per plant (35 and 47 %), followed by number of kernels per spike (17 and 19 %), while 100-kernel weight could not exceed 8 % at both levels.

    - The direct effects were 29 % and 37 % for number of spikes per plant, 12 % and 11 % for number of kernels per spike at phenotypic and genotypic levels, as compared to 7 % for 100-kernel weight at both levels.