V. SUMMARY AND CONCLUSION

Wheat occupies an outstanding position among the world major crops it is the most important cereal crop flour for making bread in Egypt. The consumption of wheat in Egypt is greater than the production. The amount of imported wheat is about 50% of the consumption. The increase of wheat production is a very important goal and must be achieved. The solution may be by increasing the yield Per unit area, through selection of new varieties and application of the most favorable culture treatments. Supply of wheat with its need of fertilizers, either macro or micro nutrients, is considered one of the most important factor affecting yield of grains. The objective of the present investigation was to study the effect of N levels and K fertilization, in the presence and in the absence of boron on wheat yield, yield components, the chemical composition of grain and straw and quantitative relations between plant and added fertilizer.

a- The maximum and optimum yields (Y_m ' $Y_{o)}$ which obtained by the maximum and optimum rates (X_m ' X_o).
b- Relative efficiency of fertilizer (Ex).
c- Efficiency of soil N (ex_s).
d- The soil N content (X_s).
e- The contribution of soil N and fertilizer in grain yield.
f- The returns from applied optimum rates.

The field experiment was conducted at Kafr EL-Sheikh during two successive seasons using the split–split–plot design. The main plots of the experiment were arranged to nitrogen levels (0, 30, 60,

90 and 120 kg N/fed). The sub-plots were devoted for two potassium fertilization rates 0 K_2O and 50 kg K_2O/fed. The sub-sub-plots were for two boron rates. The variety of wheat Sakha 69 was used in both seasons.

The nitrogen fertilizer was applied as urea (46.5%N) and added in four doses. The first dose 15 kg N/fed, was broadcasted together with 15 kg P_2O_5/fed, as calcium superphosphate (15% P_2O_5) and 50 kg K_2O/fed, as potassium sulphate (48% K_2O) at planting. The second dose (50% of fertilizer)at the tillering stage. The third dose (25% of fertilizer) was applied at elongation stage. The last dose of urea (25% of fertilizer) was applied at the flowering stage. The potassium was added in two levels, (without adding and 50 kg K_2O/fed) at the form of potassium sulphate (48% K_2O).

Boron was applied in the form of boric acid in two rates (without adding boron and 0.1%) and sprayed on plants after 80 days from sowing.

At maturity the yield, yield components and chemical composition of grins and straw were determined.

Yield components:

The following yield component were measured:

- 1000–grain weight (gm).
- Number of spikes per meter square.
- Number of kernels per spike.
- Harvest index: (grain: total dry matter ratio)

Grain and straw yield:

- Grain yield:

After maturity the grain of each plot were weighed and the average of grain yield was calculated (ardab/fed).

- Straw yield:

Estimates were obtained by weighing all the plants in harvested area in each plot before threshing (kg/plot) for each plot. The results were expressed in terms of ton/fed.

Chemical composition of grain and straw:

Plant samples were digested to determine, total nitrogen, phosphorus, potassium and boron, protein percent was calculated by total nitrogen percent multiplied by the factor 5.7.

Effect of N level, K fertilization and spraying with boron on the yield components of wheat:

The 1000–grain weight:

The 1000–grain weight was significantly increased by increasing the rate of nitrogen up to 60 kg N/fed. The highest 1000–grain weight (47.7 gm in first season and 46.0 gm in second season) were obtained, at 60 kg N/fed and in the presence of potassium and boron fertilizations. however, the 1000–grain weight decreased when the nitrogen level was increased from 60 to 90 and or 120 kg N/feddan.

The number of spikes/m^2:

The number of spikes/m^2 was increased significantly with increasing nitrogen levels. The number of spikes/m^2 also, increased significantly by potassium fertilization. The highest number of spikes/m^2 (359.25 in first season and 375.5 in second season) were obtained with 90 kg N/fed and in the presence of 50 kg K_2O and boron fertilization.

The number of Kernels/spike:

The number of Kernels/spike increased significantly by increasing nitrogen levels. The number of kernels/spike also, increased significantly by application of potassium and boron fertilization. The maximum number of kernels/spike (47.25 in first season and 50.00 in second season) were obtained with 90 kg N/fed, and in the presence of potassium and spraying with boron.

The harvest index (grain: total dry matter ratio):

The maximum harvest index (0.38 in first season and 0.42 in second season) was obtained with 60 kg N/fed and in the presence of potassium and boron fertilization.The harvest index decreased when nitrogen levels increased from 60 to 90 or 120 kg N/feddan.

Effect of N level, K fertilization and spraying with boron on yield of wheat:

The results showed that, the grain yield of wheat increased significantly with increasing nitrogen levels up to 90 kg N/feddan. The highest grain yield (17.98 ardab/fed in first season and 18.26 ardab/fed in second season) were obtained with 90 kg N/fed and in the presence of potassium and boron fertilization.

The results showed that, the straw yield of wheat increased significantly with increasing nitrogen levels up to 90 kg N/feddan. The highest straw yield (4.75 ton/fed in first season) was obtained with 120 kg N/fed and (4.32 ton/fed in second season) was obtained with 90 kg N/fed in the presence of potassium and boron fertilization.

Effect of N level, K fertilization and spraying with boron on the chemical composition of grain and straw of wheat:

The nitrogen uptake:

The highest nitrogen content in wheat grains (49.08 kg N/fed in first season and 51.50kg N/fed in second season) was obtained with 90 kg N/feddan, and in the presence of potassium and boron fertilization. The highest nitrogen content in straw of wheat (22.32 kg N/fed in first season and 22.03 kg N/fed in second season) was obtained with (120 and 90 kg N/fed), and in the presence of potassium and boron fertilization.

The potassium uptake:

The highest potassium content in grains of wheat (16.99 kg K/fed in first season and 15.61 kg K/fed in second season) was obtained with 90 kg N/fed and in the presence of potassium and boron fertilization

The highest potassium content in straw of wheat (68.87 kg K/fed in first season and 66.52 kg K/fed in second season) was obtained with 120 and 90 kg N/fed, and in the presence of potassium and boron fertilization.

The phosphorus uptake:

The highest phosphorus content in grains of wheat (9.45 kg P/fed in first season and 11.77 P/fed in second season) was obtained with 90 kg N/feddan and in the presence of potassium and boron fertilization.The highest phosphorus uptake by the straw of wheat (3.30 kg P/fed in first season and 3.46 kg P/fed in second season) was obtained with 90 kg N and in the presence of potassium boron fertilization.

1) The quantitative relationships:

Four polynomial equations were established to evaluate the wheat yield response to rates of nitrogen application. Under fertilization of potassium and foliar spraying of boron treatments.

The results showed that, the B0 value (intercept) which is the calculated grain yield when no fertilizer added, increased by application of potassium and spraying of boron treatment.

2) The maximum and the economic optimum yield (Ym, Yo):

The maximum and optimum yield increased with potassium fertilization and spraying of boron according to the following

Order: D treatment (N + K + B) > C (N + K) > B (N + B) > A (N only).

The values of Ym were higher than the values of Yo at all treatments.

The efficiency of soil N (exs):

The results showed that, the efficiency of soil N is greater than the corresponding value of the fertilizer N efficiency.

The relative efficiency of the fertilizer (EX):

The efficiency of N fertilizer was as follows:

The efficiency of N under D treatment > C > B > A treatments.

Contribution of soil N and fertilizer added in grain yield:

Contribution of N fertilizer in grain yield increased with increasing nitrogen levels, contribution of soil N decreased with increasing nitrogen levels. Generally, as the contribution fraction of nitrogen fertilizer increased the contribution fraction of soil nitrogen decreased at the same ratio.

The net returns of N fertilization

The net returns of N fertilization were 1446.2, 1533, 1679.5 and 1901.1 (L.E.) for A, B, C and D treatments, respectively.

CONCLUSION

From the present study it could be concluded that increasing nitrogen level up to 90 kg N/feddan increased the grain and straw yield of wheat and its components; this increase was more pronounced in the presence of potassium and spraying with boron.

- The highest concentration of nitrogen in both wheat grains and straw was obtained at 120kg N/feddan in the presence of potassium and spraying with boron.
- Increasing nitrogen levels increased the amount of nitrogen uptake by both grains and straw of wheat. Also the crude protein% in grains increased gradually with increasing nitrogen level in the presence of potassium and spraying with boron.
- The highest concentration of P and K in both grains and straw of wheat was obtained with the high levels of nitrogen in the presence of potassium and spraying with boron.
- Also the highest amounts of P and K uptake by both the grains and straw of wheat were recorded by the high levels of nitrogen in the presence of potassium and spraying of boron. In conclusion, increasing nitrogen levels up to 90 kg/fed increased the grain and straw yield of wheat and its components in two seasons. It is clear that, great beneficial effect of splitting nitrogen fertilizer into four doses, potassium fertilization and foliar spraying with boron increased yield and protein content of wheat. The highest grain yield was obtained with 90 kg N, 50 kg K_2O, 15 kg P_2O_5/fed and foliar spraying with boron after 80 days from sowing at concentration 0.1%. It could be recommended that using balanced fertilization increase the yield of wheat.