SUMMARY

Two field experiments were carried out at Sids Agriculture Research Station, Beni-Suef Governorate in 2005 and 2006 seasons, to study the physiological effects of potassium and boron fertilization under two planting dates on productivity of Egyptian cotton cultivar Giza 80 *(Gossypium barbadense L)*. This work aims to study the effect of two planting dates (early planting at 15 March and late planting date at 15 April), three potassium fertilization treatment (24 kg K_2O / fed as soil application after thinning, 24 kg K_2O / fed after thinning as soil application + 2.4 kg K_2O / fed spraying at flowering stage and 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages) and three boron fertilization rates (zero boron, 700 and 1400 g boric acid / fed spraying at the start of flowering stage) on growth, yield, yield components, fiber properties and some chemical contents. Each experiment included 18 treatments which were the combinations of the three factors studied, in a split-split plot design with four replications. The main plot were devoted to planting dates, sub-plot were assigned to potassium fertilizer treatments and sub-sub plots were occupied by boron fertilizer levels. Each experimental unit consisted of five ridges, 4 m long spaced 60 cm apart, occupying an area of 12 m^2 ($\frac{1}{350}$ feddan).

The results obtained could be summarized as follows:

I. Effect of planting dates:

1. Planting dates did not affected all studied growth characters in both seasons, except leaf area / plant and leaf area index where late planting improved the two parameters.
2. Both seed cotton yield / plant and earliness percentage not affected by planting dates. While, seed cotton yield/fed were responded significantly to planting date, where late planting increased seed cotton yield / fed in the two growing seasons as compared to the early planting. Also, late planting surpassed early planting in No. of open bolls / plant. On the other hand, boll setting percentage, boll weight, lint percentage and seed index were significantly increased due to the early planting (15 March) in the second season only.
3. The results showed that the early planting caused slightly insignificant increases in the fiber properties, except Pressley index, which was significantly improved by the early planting in both seasons.
4. Late planting significantly increased plant content of chlorophyll A, chlorophyll B, total chlorophyll, carotenoids, total soluble sugars, reducing sugars, potassium and boron in leaves. As for mature seed contents, oil percentage significantly increased in the early planting, while protein percentage was unsignificant affected by planting date.

II. Effect of potassium fertilization:

1. Addition of 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages to cotton plant significantly increased plant height and No. of fruiting branches / plant in the first season, while leaf area and leaf area index responded

significantly to 24 kg K_2O / fed as soil application after thinning in both seasons. The position of first fruiting node was not affected by potassium treatments in both seasons.

2. Using 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages significantly increased seed index in the first season and boll setting %, No. of open bolls / plant, seed cotton yield / fed, and lint % in the second season, while boll weight and seed cotton yield / plant did not respond to potassium fertilization in both seasons.
3. Supplying cotton plant with 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages produced significantly increases in 2.5 % span length in the two growing seasons as well as the 50 % span length, Pressley index and micronaire reading in the first season only. However, uniformity ratio was not affected by potassium fertilization.
4. Fertilizing cotton plants with 24 kg K_2O / fed after thinning as soil application + 2.4 kg K_2O / fed spraying at flowering stage induced significant increases in the chemical contents of plant and seeds, except carotenoids and boron contents, which responded to 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages. However, chlorophyll B was not affected by potassium fertilization. Protein and oil percentages of mature seeds increased significantly by using 24 kg K_2O / fed as soil application + 2.4 kg K_2O / fed sprayed at the flowering stage.

III. <u>Effect of boron fertilization</u>:

1. Boron fertilization had a significant effect on plant height, leaf area and leaf area index in both seasons and No. of fruiting

branches / plant in the second season only, where spraying 700 gm boric acid / fed, at flowering stage, surpassed the two other boron treatments. On the other hand, position of first node did not respond to boron fertilization.

2. Using 700 gm boric acid / fed significantly increased seed cotton yield / fed in both seasons and No. of open bolls / plant and seed cotton yield / plant in the first season only. However, 1400 gm boric acid / fed significantly increased seed index in the first season and boll weight in the second one.
3. All fiber properties were not affected by boron fertilizer treatments except the Pressley index, where this trait significantly responded to the addition of 1400 g boric acid / fed in the first season only.
4. All studied chemical contents of cotton plant and seeds significantly increased by adding 700 gm boric acid / fed, except chlorophyll A and boron content, where 1400 gm boric acid / fed produced the highest effects. However, oil percentage of seeds was insignificantly affected by boron treatments.

IV. Effect of the interactions

1. *The interaction between planting dates and potassium fertilization (A x B)*:

- The interaction between planting dates and potassium fertilization significantly affected growth characters in both seasons, except plant height and no. of fruiting branches / plant in the second season. The late planting and 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages

gave the highest values of plant height in the first season and the position of first fruiting node in both seasons. However, early planting with 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages enhanced no of fruiting branches / plant in both seasons. Leaf area and leaf area index responded positively to A_2 x B_2 interaction in the two growing seasons.

- The interaction between planting dates and potassium fertilization had a significant effect on percent boll setting, No. of open bolls / plant, boll weight, lint % and seed index in both seasons and seed cotton yield / plant or fed and earliness percentage in one season only. The late planting and spraying cotton plants twice at squaring and flowering stages surpassed the other potassium fertilizer treatments.
- Early planting and 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages produced significant increases in all fiber properties in both seasons, except uniformity ratio in the second season.
- The late planting at 15 April with potassium fertilization 24 kg K_2O / fed as soil application after thinning + 2.4 kg K_2O / fed spray at flowering stage significantly increased chemical contents, of leares except carotenoids, reducing sugars, potassium and boron content, which were significantly affected by late planting and using 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages.

2. ***The interaction between planting dates and boron fertilization (A x C)*:**

- The late planting and 700 gm boric acid / fed improved plant height in the first season and position of fruiting node in both seasons. However, late planting and 1400 gm boric acid / fed exhibited the highest values of leaf area and leaf area index in both seasons. On the other hand no. of fruiting branches / plant positively responded to early planting under 1400 gm boric acid / fed in the two growing seasons.
- The late planting at 15 April and received 700 gm boric acid / fed significantly increased the values of No. of open bolls / plant as well as seed cotton yield / plant and fed in both seasons and seed index in the first season. While, boll setting (%), boll weight, earliness (%) and lint percentage in one season only.
- The interaction between planting date and boron fertilization showed a significant effects on fiber length at 2.5 SL, Pressley index and micronaire reading in both seasons, while the other fiber properties not affected by this interaction.
- The late planting at 15 April in presence of 700 gm / fed boric acid significantly increased chlorophyll A and reducing sugars, while late planting under 1400 gm / fed boric acid produced the highest values of chlorophyll B, total chlorophyll (A + B) and potassium contents. On the other hand carotenoids and boron contents as well as seed protein and oil percentage significantly enhanced due to early planting under 1400 gm / fed boric acid, while the highest

value of total soluble sugars was recorded for early planting with 700 gm / fed boric acid.

3. The interaction between potassium and boron fertilization (B x C):

- The interaction between potassium and boron fertilization had significant effects on all growth characters in both seasons, except position of first fruiting node in the second season. In general, supplying cotton with 24 kg K_2O / fed as soil application after thinning and 700 gm / fed boric acid positively increased leaf area and leaf area index in both seasons.
- All yield and yield components were significantly affected by (B x C) interaction, except boll setting (%) in the first season and lint (%) in the second only. In general, No. of open bolls / plant, boll weight, seed cotton yield / plant and fed and lint percentage positively responded to applied 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages and 700 gm / fed boric acid.
- Potassium treatment 2.4 kg K_2O / fed foliar spraying twice at squaring and flowering stages in presence of 700 gm / fed boric acid significantly increased fiber properties, except uniformity ratio and Pressley index in the second season.
- All chemical contents were affected by (b x C) interaction, where using 24 kg K_2O / fed after thinning + 2.4 kg spray at flowering stage with boric acid at rate of 700 gm / fed improved these traits. On the other hand, the higher percentage of protein (29.69 %) was obtained from the interaction between 24 kg K_2O / fed as soil application and

zero boric acid, while higher percentage of oil (19.18 %) who produced from the interaction between 2.4 kg K2O / fed sprayed twice at squaring and flowering stages with 700 gm / fed boric acid.

4. The three way interaction (A x B x C):

- All growth characters were significantly affected by the three way interaction (A x B x C).Where, plant height increased due to (A_2 x B_3 x C_2) in the first season and (A_2 x B_2 x C_2) in the second season; position of first fruiting node due to (A_2 x B_3 x C_1) in the first season and (A_2 x B_1 x C_3) in the second one; No. of fruiting branches / plant due to (A_1 x B_3 x C_1) in the first season and (A_1 x B_3 x C_2) in the second season. However, (A_2 x B_2 x C_3) produced largest leaf area and leaf area index in both seasons.
- The three way interaction (A x B x C) had significant effect on all yield and yield components in the two studied seasons. Where, boll setting percentage was increased by (A_1 x B_3 x C_3), No. of open boll / plant and seed cotton yield / plant and fed were significantly increased due to (A_2 x B_3 x C_3) interactions in both seasons. The boll weight was positively affected by (A_2 x B_3 x C_3) in the first season and (A_1 x B_1 x C_2) in the second one. Earliness (%) was improved due to (A_1 x B_2 x C_1) in the first season and (A_2 x B_3 x C_3) in the second season, lint percentage increased by the interaction between (A_1 x B_3 x C_2) in the first season and (A_1 x B_2 x C_1) in the second season and seed index increased due to the effect of (A_2 x B_1 x C_2) in first season and (A_1 x B_1 x C_2) in the second one.

- All studied fiber properties were affected by the three way interaction in both seasons, except uniformity ratio in the both seasons. Where fiber length at 2.5 and 50 % SL were positively increased due to (A_2 x B_3 x C_2) in both seasons, while Pressley index affected by (A_2 x B_3 x C_3) in the first season and (A_2 x B_3 x C_1) in the second only. The micronaire reading increased due to (A_2 x B_3 x C_2) and (A_1 x B_3 x C_1) interactions in the two seasons, respectively.
- The three way interaction (A x B x C) had significant effect on the studied chemical contents. Where, chlorophyll A and total chlorophyll increased by (A_2 x B_2 x C_1) interaction, chlorophyll B by (A_2 x B_3 x C_2), carotenoids by (A_1 x B_1 x C_3), total soluble sugars by (A_2 x B_2 x C_2), reducing sugars by (A_2 x B_2 x C_2), potassium by (A_2 x B_1 x C_3), boron by (A_2 x B_3 x C_2), protein % by (A_2 x B_1 x C_1)seed oil percent by the interaction between (A_1 x B_3 x C_3).