## SUMMARY

Four field experiments were performed in each year at the Agricultural Experimental Station of the National Research Center at Shalakan, Kalubia Governorate during 1988, 1989 and 1990 seasons to study productive efficiency of some soybean cultivars in relation to sowing dates.Four field experiments were sowing at four dates at fifteen day intervals,starting on 1st May. This means that sowing date were 1st May, middle of May, 1st June, and middle of June. Every experiment included nine soybean cultivars. The experimental design was complete randomized blocks design with six replications in each planting date under study.

Ten plants were taken at random from three replications at 54,82 and 110 days after sowing to determine the growth measurements.

**I) Source capacity studies :**

**1- Growth measurements :**

1- Plant height (cm).

2- Number of branches/plant.

3- Number of leaves/plant.

4- Number of pods/plant.

5- Dry weight of pods (g)/plant.

6- Dry weight of leaves (g)/plant.

7- Dry weight of stems (g)/plant.

8- Leaf area (L.A.)/plant ($cm^2$).

9- Leaf area index (L.A.I) "$cm^2/cm^2$".

**2- Physiological parameters :**

1- Net assimilation rate (NAR) "mg/cm$^2$/day".

2- Crop growth rate (CGR) "mg/cm$^2$/day".

3- Relative growth rate (RGR) for the leaves "mg/mg/day".

4- Relative growth rate (RGR) for the pods "mg/mg/day".

5- Relative growth rate (RGR) for the whole plant "mg/mg/day".

## II- Sink capacity studies :

**1- Seed filling studies :**

1- Seed filling rate "g/day".

2- Effective filling period.

At maturity, ten plants were taken at random from the three middle ridges to take the data of yield components, whereas the seed and straw yield were calculated from the yield of whole plots.

**2- Yield and yield components :**

1- Plant height (cm).

2- Number of pods/plant.

3- Number of seeds/pod.

4- Number of seeds/plant.

5- Weight of pods (g)/plant.

6- Weight of seeds (g)/pod.

7- Weight of seeds (g)/plant.

8- Weight of 100 seeds (g).

9- Oil percentage.

10- Protein percentage.

11- Seed yield "ton/feddan".

12- Straw yield "ton/feddan".

13- Oil yield "kg/feddan".

14- Protein yield "kg/feddan".

**III- Correlation coefficient, path coefficient.**

**IV- Stability analysis.**

The important results were summarized as follows.

**I- Source capacity :**

**1- Growth measurements :**

**A- Effect of years:**

1- The first season gave the highest values for number of leaves/plant, dry weight of pods/plant, leaf area/plant and leaf area index at 54,82 and 110 days after sowing. It is clear that the first season gave the highest values for dry weight of leaves/plant at 82 days after sowing, whereas the number of pods/plant, dry weight of leaves/plant and dry weight of stems/plant gave the highest averages at 110 days after sowing. On the other hand, the highest values of number of branches/plant and plant height at 82 days after sowing, plant height at 110 days after sowing time in the second season.

**B- Effect of sowing dates :**

1- The differences between the average values of number of branches/plant and dry weight of stems/plant were not significant at 82 days after sowing due to the sowing dates.

2- The number of leaves/plant, plant height, number of pods/plant, dry weight of pods, leaves and stems/plant, leaf area/plant and leaf area index at 54 days after

sowing significantly affected when soybean was planted in mid-June (very late sowing date).

3- The number of pods/plant,dry weight of pods and leaves/ plant, leaf area/plant and leaf area index were significantly affected when soybean was planted in early June,whereas, the highest value for number of leaves/ plant and plant height were obtained from the early May and mid-May sowing dates at 82 days from sowing, respectively.

4- The highest values of all investigated characters at 110 days after sowing were obtained from the mid-May sowing date.

**C- Varietal differences :**

1- Clark variety gave the highest values for number of branches and leaves/plant at 54 and 82 days after sowing,as well as leaf area/plant and leaf area index at 54 days after sowing time.

2- McCall variety gave the highest values for number of pods/plant, dry weight of pods/plant at 54 days after sowing. On the other hand, Clark variety gave the highest values for dry weight of leaves and stems/plant and number of leaves/plant at 54 and 110 days after sowing time, respectively.

3- Columbus variety gave the highest values for plant height, dry weight of leaves/plant, leaf area/plant and leaf area index at 82 days after sowing, and for the number of branches/plant, dry weight of leaves/plant,

leaf area/plant and leaf area index at 110 days after sowing time.

4- Crawford variety gave the highest values for plant height at 54 days from sowing,dry weight of stems/plant at 82 days after sowing, plant height and dry weight of stems/plant at 110 days after sowing time.

**2- Physiological parameters :**

**A- Effect of years :**

1- The first season gave the highest values for crop growth rate (CGR) at 54-82 and 82-110 days after sowing and relative growth rate (RGR) for leaves at 82-110 days and relative growth rate (RGR) for the whole plant at 54-82 days after sowing time.

2- There was insignificant differences between two seasons for net assimilation rate (NAR), relative growth rate (RGR) for leaves and pods at 54-82 days after sowing time, also NAR, RGR for pods and whole plant at 82-110 days after sowing time were significant.

**B- Effect of sowing dates :**

1- Highly significant differences between the mean values of NAR, CGR, RGR for leaves, RGR for pods and RGR for whole plant at 54-82 days from sowing were obtained from the early June i.e late sowing date.

2- Highly significant differences between the mean values for NAR, CGR, RGR for pods and RGR for whole plant at 82-110 days from sowing, resulted from sowing soybean in mid-May.However,RGR for leaves,was not significantly affected by the sowing dates.

**C- Varietal differences :**

1- Evans and Hardin varieties gave the highest mean values for NAR at 54-82 and 82-110 days after sowing. Mead variety gave the highest mean values for RGR for pods and RGR for whole plant at 54-82 days after sowing time.

2- Clark variety gave the highest mean values for CGR at 54-82 and 82-110 days after sowing and RGR for leaves at 82-110 days after sowing time.

3- Columbus variety gave the highest values of RGR for leaves at 54-82 days after sowing and RGR for pods at 82-110 days after sowing time.

**II- Sink capacity :**

**1- Seed filling studies :**

**A- Effect of years :**

1- The second season gave the highest values for seed filling rate at 54-61 68-75, 82-89, 96-103 and 110-117 days after sowing time. On the other hand, there was insignificant differences between two seasons for effective filling period.

**B- Effect of sowing dates:**

1- Maximum seed filling rate i.e.0.086 and 0.212 g/day was achieved at 54-61 and 68-75 days from sowing, respectively at mid-June (very late sowing date).Also, maximum seed filling rate i.e.0.265 g/day was achieved at 82-89 days after sowing time at first June (late sowing date)

2- The great values of seed filling rate were 0.217 and 260 g/day at 96-103 and 110-117 days from sowing, resulted from sowing soybean in 15th May and 1st May date, respectively.

3- Sowing date in 15th May gave the maximum effective filling period (45.84 day).

**C- Varietal differences:**

1- The investigated varieties could be arranged in descending order as Crawford, Columbus, Clark, Williams 82, Mead, Hobbit, Hardin, Evans and McCall with regard to effective filling period.

2- Columbus variety gave the highest values for seed filling rate at 68-75 and 110-117 days after sowing time. Also, Crawford variety gave the highest values for seed filling rate at 96-103 days after sowing time.

3- McCall and Clark varieties gave the highest values for seed filling rate at 54-61 and 82-89 days after sowing time, respectively.

**2- Yield and yield components :**

**A- Effect of years :**

1- The third season gave the highest values for plant height, number of pods/plant, number of seeds/plant, weight of pods/plant, weight of seeds/pod, weight of seeds/plant and seed index. Whereas, the second season gave the highest values for number of seeds/pod.

2- The second season gave the highest values for protein percentage in soybean seeds. While, the first season

gave the highest value for oil percentage in soybean seeds than the second season.

3- The third season gave the highest values for seed yield and straw yield "ton/feddan" than the first and second seasons. However, the first season i.e. 1988 gave the highest value of oil yield kg/feddan. The protein yield kg/feddan, was not significantly affected by seasonal effect.

**B- Effect of sowing dates :**

1- Sowing date in 15th May gave the highest values for plant height, number of pods/plant, number of seeds/pod, number of seeds/plant, weight of pods/plant, weight of seeds/plant and oil percentage in seeds, while protein percentages was not affected by sowing dates.

2- Sowing date in 15th June gave the highest average values for weight of seeds/pod and seed index.

3- Sowing date in 15th May gave the highest values of seed yield "ton/feddan" which were (1.218, 1.202 and 1.191 ton/feddan in 1988,1989 seasons and the combined analysis, respectively. The highest average values of oil yield/feddan were 323.74, 302.94 and 313 kg/feddan as well as protein yield/feddan were 468.64, 486.57 and 477.61 kg/feddan, resulted from sowing soybean in 15th May in 1988,1989 and the combined analysis,respectively

4- Sowing date in 1st May gave the highest values of straw yield "ton/feddan"in the three seasons and the combined analysis.

**C- Varietal differences:**

1- Columbus variety gave the highest values for number of pods/plant,weight of pods/plant and the tallest plants.

2- Crawford variety gave the highest mean values for number of seeds/pod, number of seeds/plant, weight of seeds/plant and seed index.

3- Hobbit variety gave the highest significant values of oil percentage than the other tested varieties. Meanwhile, there was insignificant differences between varieties for protein percentage in soybean seeds.

4- Crawford variety gave the highest mean values for seed yield/feddan which equal to 1.636, 1.429 and 1.522 ton/feddan in 1988, 1989 and the combined analysis of the three seasons, respectively, whereas the oil and protein yield in the second year which were 334.84 and 583.17kg/feddan, respectively. Columbus variety gave the higher mean values for seed yield/feddan (1.503 ton/feddan) in 1990 season,oil and protein yield/feddan were 448.79, 383.06, 645.55 and 602.97 kg/feddan in 1988 and the combined analysis, respectively, than those obtained from the other varieties. Also, Columbus variety gave the highest mean values for straw yield "ton/feddan" in the three seasons and the combined analysis.

**C- Effect of interaction:**

1- The highest values for number of pods/plant, number of seeds/plant,weight of pods/plant,weight of seeds/plant and seed yield/feddan were obtained from Crawford

variety at sowing time in 15th May.On the other hand, the highest value for weight of seeds/pod and seed index were recorded by Crawford variety when sowing at 15th June.

2- The highest value for plant height was recorded by Columbus variety when sowing at 15th May. On the other hand, the highest value for straw yield/feddan was detected by Columbus variety in the 1st May sowing date.

**III-Correlation coefficient and path coefficient analysis:**

1- Significant positive phenotypic correlation coefficient were found between seed yield/plant and each of number of seeds/plant and weight of pods/plant for varieties and dates of planting (i.e. 1st May, 15th May, 1st June, 15th June).

2- Seed yield/plant was positively correlated with number of pods/plant in Hardin, Hobbit, Williams 82, Crawford and Columbus at four planting dates and Evans, Mead, Clark varieties at three planting dates. While, McCall variety gave highly significant positive correlation coefficients between seed yield/plant and number of pods/plant at the first and fourth planting dates.

3- Significant positive correlation coefficient was found between seed yield/plant and seed index at the second planting dates for Evans and Hobbit cultivars, fourth planting date for Hardin, Crawford and Columbus, and first planting date for McCall cultivar. On the other

hand,insignificant correlation coefficient was detected between seed yield/plant and seed index in Mead, Williams 82 and Clark at four planting dates.

4- Significant positive phenotypic correlations were found between seed yield/plant and number of seeds/pod at the first planting date for Evans variety and third planting date for Hobbit and Crawford varieties, and fourth planting date for Clark variety. On the other hand, insignificant correlation coefficients were detected between seed yield/plant and number of seeds/pod in McCall, Mead and Columbus varieties at four planting dates.

5- These parameters of weight of pods/plant and number of seeds/plant could contribute much of soybean seed yield in the all sowing dates, i.e. early May, mid-May, early June,and mid-June since weight of pods/plant contributing to soybean seed yield as percentage of variation 42.4%, 71.21%, 48.7% and 28.16% respectively.Whereas, number of seeds/plant contribute 9.05%, 1.83%, 11.2% and 16.26% of the total variation for the four sowing dates (i.e.Early, Medium, Late, Very late sowing dates) respectively, and $R^2$ was amounted to 99.91%, 99.94%, 99.85% and 99.991% and the residual effects contributing 0.09%, 0.06%, 0.149% and 0.009% of the variation between the respective four sowing dates.

**IV- Stability analysis :**

1- The results revealed that the two varieties (Williams 82 and Clark) were more stable than the Crawford and Columbus under the environments under study.

2- The unstable varieties i.e. (Crawford and Columbus) seemed to have high seed yields above grand mean. These varieties, however, could be over looked because their high potential was limited to particular environments. Crawford and Columbus varieties gave the highest yield when sowing in 15 th May.