

## SUMMARY

Two field experiments were conducted during 1991, 1992 and 1993 seasons at the Agricultural Research and Experiment Center of the Faculty of Agriculture at Moshtohor, Zagazig University, Egypt. The aims of this study were to determine the effect of some irrigation treatments, bacteria inoculation and nitrogen fertilizer on soybean productivity "Clark" variety. Clover was preceding winter crop in the three seasons.

### **First experiment:**

To study the effect of some irrigation treatments and nitrogen fertilizer rates on growth, yield, yield components and chemical contents of soybean plants. It included 35 treatments which were the combinations of seven irrigation treatments (normal irrigation, skipping 3<sup>rd</sup>+4<sup>th</sup> or 3<sup>rd</sup>+5<sup>th</sup> or 3<sup>rd</sup>+6<sup>th</sup> or 4<sup>th</sup>+5<sup>th</sup> or 4<sup>th</sup>+6<sup>th</sup> or 5<sup>th</sup>+6<sup>th</sup> irrigations) and five rates of nitrogen fertilizer (zero, 15, 30, 45 and 60 kg N/feddan) as a urea fertilizer. The experiment was designed in a split plot design with four replications. The seven irrigation treatments were arranged at random in the main plots, whereas the five nitrogen fertilizer rates were allotted randomly in the sub plots. The sub plots area was 1/400 fed. (10.5 m<sup>2</sup> ).

The most important results could be summarized as follows:-

## **I- Effect of irrigation treatments.**

### **A- Growth characters**

- 1- Plant height and number of pods per plant decreased significantly by skipping 3rd+4th or 3rd+5th or 3rd+6th irrigations as compared by normal irrigation.
- 2- The maximum number of branches of soybean plant was obtained by skipping 4th+5th irrigation, without any significant difference with normal irrigation and skipping 4th+6th irrigations.
- 3- Irrigation treatments did not affect significantly number of leaves per soybean plant.
- 4- Leaf area and leaf area index of soybean plant decreased significantly by skipping 3rd+5th or 3rd+6th irrigations as compared with the other treatments.
- 5- Fresh weight of leaves, stems and pods per soybean plant increased significantly by normal irrigation and skipping 4th+6th or 5th+6th irrigations than the other treatments. Whereas, total fresh weight of soybean plant decreased significantly by skipping 3rd+4th or 3rd+5th or 3rd+6th irrigations than the other treatments.
- 6- Dry weight of leaves, pods and total dry weight of soybean plant decreased significantly by skipping 3rd+4th irrigations, whereas dry weight of stems per plant decreased significantly by skipping 3rd+5th irrigations.

- 4- Protein yield (kg/feddan) decreased significantly by skipping 3rd+4th or 3rd+5th irrigations as compared with normal irrigation and skipping 5th+6th irrigations.

## **II- Effect of nitrogen fertilizer:**

### **A- Growth characters:**

- 1- Plant height and number of branches per soybean plant were not affected significantly by nitrogen fertilizer rates as compared with control (without fertilizer).
- 2- Number of leaves and pods as well as leaf area and leaf area index of soybean plant increased significantly by increasing nitrogen fertilizer rates up to 15 kg N/feddan. Further increase in nitrogen rates up to 60 kg N/feddan decreased these characters.
- 3- Fresh weight of leaves, stems and pods per soybean plant increased significantly by adding nitrogen fertilizer up to 15 kg N/feddan. Further increase in nitrogen rates did not affect these characters, whereas total fresh weight per plant increased significantly by applying nitrogen up to 30 kg N/feddan.
- 4- Leaves and stems dry weight increased significantly by increasing nitrogen fertilizer up to 15 kg N/feddan, whereas dry weight of pods and total dry weight per soybean plant increased up to 30 kg N/feddan.

### **B- Yield and yield components:**

- 1- Number and weight of pods per soybean plant increased significantly by applying nitrogen fertilizer up to 30 and 15 kg N/feddan, respectively.

- 2- Nitrogen fertilizer rates did not affect significantly number of seeds per pod and weight of 100-seed.
- 3- Yield of plant (g) and biological yield (kg/feddan) increased significantly by adding nitrogen fertilizer up to 15 kg N/feddan, whereas seed yield (kg/feddan) increased significantly by increasing nitrogen fertilizer up to 45 kg N/feddan.

### **C- Chemical contents:**

- 1- Chlorophyll "a", "b", total chlorophyll "a+b" and carotenoides increased significantly as nitrogen rates increased up to 15 kg N/feddan.
- 2- Nitrogen fertilizer rates did not affect significantly oil, carbohydrate, phosphorus and potassium percentages.
- 3- Protein and nitrogen percentages increased significantly by increasing nitrogen fertilizer up to 15 kg N/feddan. Further increase in nitrogen fertilizer rates up to 45 kg N/feddan did not affect protein and nitrogen percentages.
- 4- Oil yield and protein yield (kg/feddan) increased significantly by nitrogen fertilizer rates up to 15 and 30 kg N/feddan, respectively.

### **III- Effect of the interaction between irrigation treatments and nitrogen fertilizer rates:**

#### **A- Growth characters of soybean plants:**

All growth characters were not significantly affected by the interaction, except, plant height, fresh and dry weight of pods per plant.

**B- Yield and yield components:**

The effect of interaction on weight of pods, number of seeds per pod, weight of 100-seed and biological yield (kg/feddan) were not statistically significant. On the other hand, the effect of interaction on number of pods per plant, yield of plant and seed yield (kg/feddan) were significant.

**C- Chemical contents:**

Chemical contents of soybean plant were not significantly affected by the interaction, except, oil yield (kg/feddan) was significantly affected.

**Second experiment:**

To study the effect of bacterial inoculation and nitrogen fertilizer rates on growth, yield, yield components and chemical contents of soybean plants. It included 10 treatments which were the combinations of two bacterial inoculation (uninoculation and inoculation) and five rates of nitrogen fertilizer (zero, 15, 30, 45 and 60 kg N/feddan) as a urea fertilizer. The experiment was designed in a split plot design with four replications. The two bacterial inoculation were arranged at random in the main plots, whereas the five nitrogen fertilizer rates were allotted randomly in the sub plots. The sub plot area was 1/400 feddan (10.5 m<sup>2</sup>). The most important results could be summarized as follows:-

**I- Effect of bacterial inoculation:****A- Growth characters:**

- 1- There was significant decrease in plant height, number of active, unactive and total number of nodules per soybean plant by uninoculation treatment as compared with inoculation one.
- 2- There were no significant differences in number of branches, number of leaves, leaf area, leaf area index, fresh and dry weight of leaves, stemes, roots and total fresh and dry weight of soybean plant as a result of bacterial inoculation .

**B- Yield and yield components.**

- 1- Number and weight of pods per plant, yield of plant, seed yield (kg/feddan) and biological yield (kg/feddan) increased significantly by inoculation treatment than that of uninoculation one.
- 2- There were no significant differences in number of seeds per pod and weight of 100-seed as a result of bacterial inoculation.

**C- Chemical contents:**

- 1- There was a significant decrease in chlorophyll "b" and total chlorophyll "a+b" in soybean leaves in uninoculation treatment as compared with inoculation one. Whereas there was no significant difference in chlorophyll "a" and carotenoides in soybean leaves as a result of bacterial inoculation.
- 2- There were no significant differences in oil, protein, carbohydrate, nitrogen, phosphorus and potassium percentages in soybean seeds as a result of bacterial inoculation. Whereas there was a significant increase in oil yield and protein yield

(kg/feddan) by inoculation treatment as compared with un inoculation one.

## **II- Effect of nitrogen fertilizer:**

### **A-Growth characters:**

- 1- There were no significant differences in plant height, number of branches per plant, number of leaves per plant, leaf area and leaf area index of soybean plant as a result of nitrogen fertilizer rates.
- 2- Nitrogen fertilizer rates did not affect significantly difference active and total number of nodules per soybean plant, whereas there was a significant decrease in number of unactive nodules per plant by increasing nitrogen fertilizer rate up to 45 kg N/feddan.
- 3- Nitrogen fertilizer rates had no significant effect on fresh and dry weight of leaves, stems, total fresh and dry weight of soybean plant. Whereas there were significant differences in fresh and dry weight of roots per soybean plant among nitrogen fertilizer rates.

### **B- Yield and yield components:**

- 1- Number and weight of pods per soybean plant increased significantly by increasing nitrogen fertilizer up to 45 and 15 kg N/feddan, respectively.
- 2- There were no significant differences in number of seeds per pod and weight of 100-seed as a result of nitrogen fertilizer rates.

- 3- Yield of soybean plant increased significantly by increasing nitrogen fertilizer rate up to 15 kg N/feddan, whereas seed yield and biological yield (kg/feddan) increased by increasing nitrogen fertilizer up to 30 kg N/feddan. Further increase in nitrogen fertilizer up to 60 kg N/feddan decreased yield of plant, seed yield and biological yield.

#### **C- Chemical contents:**

- 1- Chlorophyll "a", "b", total chlorophyll "a+b" and carotenoides in soybean leaves increased significantly by nitrogen fertilizer rates up to 30 kg N/feddan. Further increase in nitrogen rates up to 60 kg N/feddan decreased these characters.
- 2- There were no significant differences in oil, protein, carbohydrate, nitrogen, phosphorus and potassium percentages in soybean seeds as a result of nitrogen fertilizer rates.
- 3- Oil yield and protein yield (kg/feddan) increased significantly by increasing nitrogen rates up to 45 and 30 kg N/feddan, respectively.

### **III- Effect of interaction between bacterial inoculation and nitrogen fertilizer rates:**

#### **A- Growth characters of soybean plant:**

All growth characters were not significantly affected by the interaction.

#### **B- Yield and yield components:**

The effect of interaction on weight of pods per soybean plant, number of seeds per pod and biological yield (kg/feddan)

was not significant. On the other hand, the effect of interaction on number of pods per plant, weight of 100-seed, yield of plant (g) and seed yield (kg/feddan) of soybean were significant.

### **C- Chemical contents:**

The effect of interaction on carotenoides in soybean leaves, oil, protein, carbohydrate, nitrogen, phosphorus and potassium percentages in soybean seeds was not significant. On the other hand, chlorophyll "a", "b" in soybean leaves, oil yield and protein yield (kg/feddan) were affected significantly by the interaction.