

5. SUMMARY AND CONCLUSION

Two field experiments were carried out during the two successive winter seasons of 2006/2007 and 2007/2008 under net house conditions at the farm of the Arabian Agricultural Development company in El- Kilo 74 Cairo- Alex Desert Road, Giza governorate, to study the effect of irrigation regime and fertilization with organic and mineral nitrogen fertilizer on plant growth, fruit yield as well as chemical constituents of plant foliage and fruits of some sweet pepper cultivars (*Capsicum annuum* L).

This study was divided into two major experiments as follows:

I-First experiment:

It was conducted to study the effect of surface drip irrigation regime on growth, yield and quality of some sweet pepper cultivars. The soil of the experimental field was sandy in texture with pH 7.9. This experiment included 12 treatments which were the combination of 4 sweet pepper cultivars namely Zidenka, Hara, Flamenco and Inspiration and 3 irrigation water rates, i.e., 3000, 6000 and 9000 m³ water/ fed. Split- plot design with four replicates was adopted where the irrigation treatments were located in the main plots and the cultivars were distributed randomly in the sub- plots. Obtained results can be summarized as follows:

1- Vegetative growth aspects:

- a- Applying the highest irrigation level (9000 m³ water/ fed.) along the growing season significantly increased all the studied growth parameters, i.e., plant length, fresh and dry weight per plant as well as average leaf area compared with medium (6000 m³ water/ fed.) and low (3000 m³ water/ fed.) levels of irrigation.
- b- There were significant differences among the tested cultivars in all growth traits, i.e., plant length fresh and dry weight of plant as well as average leaf area. In this respect **cv. Hara** exhibited the highest values in all measured growth aspects.
- c- Using the highest irrigation level (9000 m³/ fed.) combined with **cv. Hara** reflected the highest values in all growth parameters during both seasons of growth.

2-Chemical composition of plant foliage.

- a- Increasing the level of irrigation water from 3000 m³ up to 9000 m³ water/ fed. significantly decreased the concentration of N, P and K in plant foliage.
- b- There were significant differences among the tested cultivars in the concentration of macro- nutrients in plant foliage, in this respect the lowest values were noticed in case of cvs. Flamenco and Inspiration.
- c- Application of the lowest irrigation level (3000 m³ water/ fed.) in case of cvs. Hara and Zidenka reflected the highest values of N, P and K concentration in plant foliage.

3- Fruits yield and its components.

- a- Increasing the level of irrigation water from 3000 m³ up to 9000 m³ increased number and weight of fruits per plant, early and total produced yield as well as yield per square meter under net house.
- b- The total fruit yield and its components differed among the tested cultivars. In this regard, cv. Inspiration exhibited the highest number of fruits per plant, while cv. Hara produced the highest early yield meanwhile, cv. Zidenka produced the highest total yield either per plant, feddan or square meter under net house conditions.
- c- Application the highest irrigation level (9000 m³ water/ fed.) in case of cv. Inspiration reflected the highest fruit number per plant, but under the same level cv. Hara produced the highest early yield while cv. Zidenka produced the highest total fruit yield per plant, feddan and square meter under net house.

4- Water use efficiency:

- 1. Application of the highest used levels of irrigation water i.e., 6000 and 9000 m³/fed. reflected the lowest values of water use efficiency compared with the lower rate of irrigation water.
- 2. There were differences in fruit yield per unit used of water among the studied cultivars. In this respect, cv. Zidenka was superior compared with other tested sweet pepper cultivars.

3. Using the lower level of irrigation water (3000 m³ water/fed.) combined with cv. Zidenka exhibited the higher value of water use efficiency during the two seasons of study.

5- Fruit quality

a- Physical fruit quality

- 1- Physical fruit indices (average fruit weight, length, diameter and pericarp thickness) were increased with increasing amount of irrigation water up to 9000 m³ /fed compared with using 3000 and 6000 m³ water/ fed. However, such treatment decreased the dry matter content of fruits.
- 2- The highest values of fruit parameters expressed as average fruit weight, length, diameter and dry matter content were noticed in case of cv. Hara followed by cv. Zidenka, Inspiration and flamenco.
- 3- The highest values for average fruit weight, length and diameter were recorded as a result of the interaction between the highest irrigation level (9000 m³ water/ fed.) and cv. Hara.

b- Chemical fruit quality.

- 1- Increasing the rate of irrigation water from 3000 up to 9000m³/ fed led to a decrease in assayed mineral (N, P, K and NO₃-N) and organic (TSS, total acidity, vitamin C., total sugars and carotenoides) concentration in fruits
- 2- There were significant differences among the tested cultivars in all determined mineral and organic constituents of produced fruits. In this connection, cv. Zidenka recorded the highest values in Total nitrogen, Vitamin C., total

acidity, total Sugars and Carotenoides content, while cv. Hara reflected the highest values of phosphorus, potassium and nitrate content, but, cvs. Inspiration and Flamenco reflected the highest values of total soluble solids.

- 3- Using the lowest rate of irrigation ($3000 \text{ m}^3/\text{fed.}$) combined with the different tested cultivars reflected the highest values in all assayed mineral and organic constituent.

It could be concluded that under such conditions, irrigation with 3000 m^3 water/feddán and using cvs. Zidenka or Hara was the best treatment for obtaining the highest yield with best quality per cubic meter of water and achieved the national goal which aims to rationalize the use of water.

II. Second experiment.

Effect of organic and mineral nitrogen fertilizer on growth, chemical composition, yield and quality of two sweet pepper cultivars. This experiment was conducted to investigate the effect of partially replacement of organic manure in stead of mineral nitrogen fertilizer on growth, yield and fruit quality of sweet pepper plants grown under net- house conditions. This experiment included 16 treatments resulted from the combination of two sweet pepper cultivars (Zidenka and Inspiration) and eight fertilization treatment as follows:

- 1- Mineral nitrogen fertilizer at rate of $200 \text{ kg} - \text{N}/\text{fed}$ as a control.
- 2- compost manure at a rate of ($200 \text{ kg} - \text{N}/\text{fed.}$)
- 3- Poultry manure at a rate of ($200 \text{ kg} - \text{N}/\text{fed.}$)
- 4- Mineral fertilizer + compost manure ($1/2 + 1/2$)

- 5- Mineral fertilizer +poultry manure ($1/2 + 1/2$)
- 6- Mineral fertilizer + compost manure ($1/3 + 2/3$)
- 7- Mineral fertilizer + poultry manure ($1/3 + 2/3$)
- 8- Mineral fertilizer + compost + poultry manure ($1/3 + 1/3 + 1/3$)

A split plot design with four replicates was adopted where the tested cultivars were located in the main plots while the fertilization treatments were randomly distributed in the sub-plots. Obtained results could be summarized as follows:-

1-Vegetative growth

- a- The highest values in all measured growth traits i.e., plant length, fresh weight and dry matter content as well as average leaf area/plant were recorded in case of cv. Zidenka compared with cv. Inspiration during the two seasons of study.
- b- Application of nitrogen fertilizer at the recommended dose (200kg N/fed.) as a mixture of mineral nitrogen (ammonium nitrate) and organic nitrogen (compost and poultry manure) at a ratio 1:1:1 for each of them was the best effective treatment in increasing all measured growth traits compared with other tested fertilizer treatments.
- c- The highest values in all measured growth characters (plant height, fresh weight, dry matter content and average leaf area/plant) were obtained as a result of the interaction between cv. Zidenka and fertilizer treatment which contain nitrogen as a mixture of mineral nitrogen + compost + poultry manure at a ratio of ($1/3 + 1/3 + 1/3$)

2- Chemical composition of plant foliage.

- a- The highest macro-elements content (N, P and K) were recorded in case of cv. Zidenka compared with cv. Inspiration in both seasons of study.
- b- The highest total nitrogen, phosphorus and potassium concentrations were recorded in case of fertilizing pepper plants with nitrogen fertilizer at the recommended dose 200 kg-N/fed as a mixture of ammonium nitrate + compost + poultry manure at a ratio (1:1:1).
- c- Application of nitrogen fertilizer as a mixture of mineral nitrogen, compost and poultry manure in case of Zidenka cv. Recorded the highest content of all determined macro-elements (N, P and K).

3- Fruit yield and its components.

- a. There were significant differences in total produced yield and its components, i.e., number and weight of fruits per plant, early and total yield either per feddan or square meter among the tested cultivars. In this connection, cv. Zidenka was superior compared to cv. Inspiration.
- b. Application of nitrogen fertilizer at the recommended dose (200 kg-N/fed.) as a mixture of mineral nitrogen plus organic nitrogen (compost + poultry manure) at rate of (1/3 + 1/3 + 1/3) for each of them reflected the highest values in all studied yield constituents.
- c. The highest yield and its components were recorded as a result of the interaction between treatment containing nitrogen as

a mixture of mineral-N + compost + poultry at a ratio (1/3 + 1/3 + 1/3) for cv. Zidenka plants.

4. Fruit quality:

a- Physical fruit quality:

1. There were differences in fruit parameters (average fruit weight, length, diameter and pericarp thickness) among the tested cultivars. The highest values were recorded in case of cv. Zidenka.
2. Using nitrogen at the recommended dose as a mixture of mineral nitrogen plus compost plus poultry at rate of (1/3 + 1/3 + 1/3) for each of reflected the highest measurements of fruit parameters.
3. Fertilizing pepper plants of cv. Zidenka with nitrogen fertilizer in the form of ammonium nitrate + compost + poultry manure at a ratio 1 : 1 : 1 from the recommended dose (200 kg-N/fed.) led to the highest values in all measured physical fruit aspects.

b. Chemical quality:

1. The highest values in total nitrogen, phosphorus, nitrate-N, Vitamin C, total acidity, total Sugars and total Carotenoids were recorded in fruits of cv. Zidenka, while the highest values of potassium and TSS were recorded in case of cv. Inspiration.
2. Application of recommended dose of nitrogen fertilizer as mineral form only increased total nitrogen, nitrate-N, and total acidity. On the other hand, using the recommended dose of nitrogen as a mixture of mineral nitrogen plus

compost plus poultry manure at ratio $1/3 : 1/3 : 1/3$ reflected the highest fruit content of P, K, vitamin C, total sugars and carotenoids, while using the recommended dose of nitrogen as poultry manure only exhibited the highest values of TSS of produced fruits.

3. The interaction between cv. Zidenka and fertilization of pepper plants with nitrogen as a mineral form increased fruit content of total nitrogen, nitrate-N and total acidity, while application of nitrogen as a mixture of mineral nitrogen and compost at rate of $(1/2 + 1/2)$ increased phosphorus content. Moreover, application of nitrogen as poultry manure or poultry manure + mineral fertilizer at a ratio of $(2/3 + 1/3)$ of recommended dose increased potassium and TSS content of produced fruits.

It could be concluded that under such condition application of nitrogen fertilizer at the recommended dose (200 kg-N/fed) as a mixture of mineral nitrogen plus compost plus poultry manure at a ratio $1/3 + 1/3 + 1/3$ for each and using cv. Zidenka was the recommended treatment for obtaining good vegetative growth and higher fruit yield with best quality.