

## Summary

This investigation was carried out during successive seasons of 2016 in the Experiment Station of Horticulture Department, Faculty of Agriculture, Benha University. The objective of this study was to examine the possibility of culturing gladiolus in different available techniques for soilless culture (hydroponic, aeroponic system and media culture) with integrated culture of tilapia fish comparison in with nutrient solution to increase the flower production in a limited space and determine the growth of gladiolus plants. Also, on open field, examine the possibility of culturing gladiolus and pot marigold with integrated culture of tilapia fish comparison in with nutrient solution, yeast extract, garlic extract and compost.

### The first experiment:-

Treatments:

- Two sources of solution were used:

A. Stock nutrient solution.

B. Water discharged from the fish farm.

Experiment was devoted to study the comparison between water discharged from the fish farm and stock nutrient solution and their effect on plant growth in hydroponic system, aeroponic system and soilless culture in bags with different flow rates on gladiolus plants production.

Three water flow rates of 1.0, 1.5 and 2.0 l plant<sup>-1</sup>h<sup>-1</sup> were used in hydroponic system (adjusted by calibration), three water flow rates of 0.5, 1.0 and 1.5 l plant<sup>-1</sup>h<sup>-1</sup> were used in aeroponic system and one flow rate of 2 l plant<sup>-1</sup> h<sup>-1</sup> was used in soilless

culture in bags . The treatments were arranged in a randomized complete block design in three replications.

Data recorded on gladiolus plants:-

Vegetative growth:-

Plant height (cm), number of leaves per plant, mean length of a leaf (cm), width of the 4<sup>th</sup> leaf (cm), fresh weight of leaves (g), dry weight of leaves (g).

Flowering growth:-

Number of florets per spike, number of days to first flower opening, mean length of a spike (cm), fresh weight of florets (g), dry weight of florets (g), fresh weight of a spike without florets (g), dry weight of a spike without florets (g).

Yield of corms:-

Mean fresh weight of a corm (g) and diameter of the corm (cm).

Total nutrients uptake:-

N – P – K – Ca – Mg %.

Nitrate uptake - NO<sub>3</sub>/Protein ratio - Nutrient consumption

The results can be summarized as follows:

A) Hydroponic system:-

Effect on vegetative growth:

**Plant height:** the highest value of 91.33 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The number of leaves per plant:** the highest value of 6.33 was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The length of a leaf:** the highest value of 51.67 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The width of the 4<sup>th</sup> leaf:** the highest value of 2.80 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The fresh weight of leaves:** the highest value of 26.33 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The dry weight of leaves:** the highest value of 5.83 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

Flowering characters:-

**Number of florets per spike:** the highest value of 12.67 was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**Number of days to first flower opening:** the highest value of 68.00 was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The mean length of a spike:** the highest value of 64.00 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The fresh weight of florets:** the highest value of 12.20 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The dry weight of florets:** the highest value of 2.90 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The fresh weight of a spike without florets:** the highest value of 17.90 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The dry weight of a spike without florets:** the highest value of 3.17 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

Yield of corms:

**The mean fresh weight of corm:** the highest value of 16.93 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The diameter of corm:** the highest value of 3.77 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

Chemical composition:-

**The total nitrogen percentage:** the highest value of 2.25 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The total phosphorus percentage:** the highest value of 0.453 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The potassium percentage:** the highest value of 2.49 % was found at a flow rate of 2.0 L/h in water discharged from the fish farm.

**The total calcium percentage:** the highest value of 0.72 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The total magnesium percentage:** the highest value of 0.82% was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**Nitrate content in plant:** The rate of nitrate content was more in water discharged from the fish farm (118.22 mg/plant) than in nutrient solution (110.44 mg/plant)

**Nitrate / protein ratio in plant:** The rate of nitrate / protein ratio was more in water discharged from the fish farm (8.78%) than in nutrient solution (8.61%).

**The rate of nutrients consumption:** The rate of nutrients consumption in treatment of nutrient solution increases slowly with plant age. With enhanced the nutrients from water discharged from the fish farm consumption tends to increase more with plant age at different treatments.

B) Aeroponic system:-

Effect on vegetative growth:

**Plant height:** the highest value of 93.00 cm was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The number of leaves per plant:** the highest value of 7.67 was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The length of a leaf:** the highest value of 56.00 cm was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The width of the 4<sup>th</sup> leaf:** the highest value of 3.10 cm was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The fresh weight of leaves:** the highest value of 28.67 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The dry weight of leaves:** the highest value of 6.33 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

Flowering characters:-

**Number of florets per spike:** the highest value of 8.00 was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**Number of days to first flower opening:** the highest value of 68.33 was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The mean length of a spike:** the highest value of 66.33 cm was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The fresh weight of florets:** the highest value of 12.47 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The dry weight of florets:** the highest value of 3.17 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The fresh weight of a spike without florets:** the highest value of 17.90 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The dry weight of a spike without florets:** the highest value of 3.57 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

Yield of corms :

**The mean fresh weight of corm:** the highest value of 17.27 gm. was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

**The diameter of corm:** the highest value of 4.00 cm was found at a flow rate of 1.5 l/h in water discharged from the fish farm .

Chemical composition-:

**The total nitrogen percentage:** the highest value of 2.69 % was found at a flow rate of 1.5 l/h in water discharged from the fish farm.

**The total phosphorus percentage:** the highest value of 0.490 % was found at a flow rate of 1.5 l/h in water discharged from the fish farm.

**The potassium percentage:** the highest value of 2.53 % was found at a flow rate of 1.5 L/h in water discharged from the fish farm.

**The total calcium percentage:** the highest value of 0.78 % was found at a flow rate of 1.5 l/h in water discharged from the fish farm.

**The total magnesium percentage:** the highest value of 0.83% was found at a flow rate of 1.5 l/h in water discharged from the fish farm.

**Nitrate content in plant:** The rate of nitrate content was more in water discharged from the fish farm (155.79 mg/plant) than in nutrient solution (148.56 mg/plant)

**Nitrate / protein ratio in plant:** The rate of nitrate / protein ratio was more in water discharged from the fish farm (9.86%) than in nutrient solution (9.51%)

**The rate of nutrients consumption:** The rate of nutrients consumption in treatment of nutrient solution increases slowly with plant age. With enhanced the nutrients from water discharged from the fish farm consumption tends to increase more with plant age at different treatments.

C) Soilless culture in bags :-

Effect on vegetative growth:

**Plant height:** the highest value of 92.00 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The number of leaves per plant:** the highest value of 6.67 was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The length of a leaf:** the highest value of 49.33 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The width of the 4<sup>th</sup> leaf:** the highest value of 2.83 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The fresh weight of leaves:** the highest value of 28.00 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The dry weight of leaves:** the highest value of 6.20 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

Flowering characters-:

**Number of florets per spike:** the highest value of 13.67 was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**Number of days to first flower opening:** the highest value of 62.00 was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The mean length of a spike:** the highest value of 61.00 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The fresh weight of florets:** the highest value of 11.07 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The dry weight of florets:** the highest value of 2.07 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The fresh weight of a spike without florets:** the highest value of 15.23 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The dry weight of a spike without florets:** the highest value of 2.37 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

Yield of corms :

**The mean fresh weight of corm:** the highest value of 16.10 gm. was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

**The diameter of corm:** the highest value of 3.83 cm was found at a flow rate of 2.0 l/h in water discharged from the fish farm .

Chemical composition-:

**The total nitrogen percentage:** the highest value of 2.59 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The total phosphorus percentage:** the highest value of 0.484 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The potassium percentage:** the highest value of 2.49 % was found at a flow rate of 2.0 L/h in water discharged from the fish farm.

**The total calcium percentage:** the highest value of 0.787 % was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**The total magnesium percentage:** the highest value of 0.787% was found at a flow rate of 2.0 l/h in water discharged from the fish farm.

**Nitrate content in plant:** The rate of nitrate content was more in water discharged from the fish farm (111.00 mg/plant) than in nutrient solution (105.00 mg/plant)

**Nitrate / protein ratio in plant:** The rate of nitrate / protein ratio was more in water discharged from the fish farm (7.283%) than in nutrient solution (6.597%).

### The second experiment

#### Treatments:-

Control (without any addition), water discharged from the fish farm, yeast extract (100ml/l), garlic extract (100%), compost, compost + water discharged from the fish farm, compost + yeast extract (100ml/l) and compost + garlic extract (100%).

#### Data recorded:

##### Gladiolus plants:-

##### Vegetative growth:-

Plant height (cm), number of leaves per plant, mean length of a leaf (cm), width of the 4<sup>th</sup> leaf (cm), fresh weight of leaves (g) and dry weight of leaves (g).

##### Flowering growth:-

Number of florets per spike, number of days to first flower opening, mean length of a spike (cm), fresh weight of florets (g), dry weight of florets (g), fresh weight of a spike without florets (g) and dry weight of a spike without florets (g).

##### Yield of corms:-

Mean fresh weight of a corm (g) and diameter of the corm (cm).

##### Total nutrients uptake:-

N – P – K – Ca – Mg %

##### Pot marigold plants:-

##### Vegetative growth:-

Plant height (cm), number of branches/plant, number of leaves/plant, fresh weight of shoot (g/plant) and dry weight of shoot (g/plant).

Flowering growth:-

Number of inflorescences / plant, inflorescence diameter (cm), fresh weight of inflorescences (g/ inflorescence) and dry weight of inflorescences (g/ inflorescence).

Total nutrients uptake:-

N – P – K – Ca – Mg %

The results can be summarized as follows:

This data increased by using (the compost + water discharged from the fish farm) at the first and second seasons, followed (compost + yeast extract 100ml/l) as compared with control.