Plant Archives Vol. 20, Supplement 1, 2020 pp. 178-180 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF BREEDING METHODS AND NITROGEN FERTILIZATION ON GROWTH TRAITS AND TOMATO YIELD (*SOLANUM LYCOPERSICUM* L.) UNDER PROTECTED CONDITIONS

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Abstract

The experiment conducted in green house a (plastic house) in Diwaniya governorate - Hamza district for the autumn season (2016-2017) in order to study the effect of breeding methods and nitrogen fertilization on the growth and yield characteristics of tomatoes. The first factor is the method of breeding (breeding on one leg, breeding on two stems, breeding on three stems). The second factor is three levels of nitrogen fertilization (100, 150, 200 N kg E^{-1}). The results showed that the cultivation methods had no significant effect on plant height, stem girth and fruit size and had a significant effect on root length in the plant. The method of planting on two stems and three stems gave the highest rate of root length (36.67 and 37.56 cm respectively). Recipe of average weight of fruits per plant in the plant where the method of breeding on one leg and three stems gave the highest rate of average weight of fruits, reaching (142.22g) and (142.33g) respectively. The level of nitrogen added significantly exceeded the height of the Tomato plant, where the level exceeded 150 kg N/h^{-1} 238.8 cm and the size of the fruit (118 g) and the level exceeded (100 kg N/h^{-1}) weight of Tomato fruits (150.33g) plant, while the level of nitrogen added and the interaction between the treatments did not show any significant superiority in Root length, stem girth and size of the tomato plant. Also, the interaction between planting treatments and nitrogen levels significantly affected plant height.

Key word: tomato, breeding, plastic house, traits, yield.

Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most common vegetable crops of the eggplant family that is widely grown in the world, grown either in open fields or in protected agriculture. The cultivated area is about 5.2 million hectares with a productivity of 130 million tons in the world (FAO, 2008). The cultivated area is 1,000 hectares and one million tons in Iraq (Anonymous 2008-2009). Tomato is one of the preferred crops for production inside the greenhouses because of its relatively easy to grow compared to cucumbers and lettuce, for example, in addition to the possibility of producing crops with large quantities of tomato. Demand for tomato is usually high because of its nature and is highly suitable for consumption in various ways, but the production of tomato is not without its challenges and serious difficulties.

Selection of suitable varieties is a prerequisite for successful tomato cultivation in Florida. Tomato producers must take into account the types of tomatoes required by buyers (ie the end consumer, brokers, traders, etc.). Important considerations include the size, shape and color of the fruit (whether red, pink, yellow or one of many other colors found in the non-hybrid tomato category. Important characteristics include taste, high yield, crack-free, disease resistance, and high percentage of healthy fruits. However, it should be noted that the use of certain production practices or systems for the cultivation of tomatoes belonging to cultivars with specific growth times for shorter seasons, for example during the two seasons of the Lord, has recently been introduced. Due to the nature of its infinite growth, tomato implants within the greenhouses require continuous trimming and directing their growth path to follow the structure of the pergola system inside the greenhouse. The columns shall be made of metal material and fixed on the floor of the greenhouse by cement, with the columns on both ends supported by other supporting columns. Medium cable tensioning tool. The downward pull force on the cable from a single tomato plant of six fully-grown fruit bunches is about 10 to 12 lbs, so an additional support shaft must be installed after every 20 to 30 feet.

The tomato crop is highly responsive to nitrogen fertilizer fertilization (N) where nitrogen availability may be limited and critical in the soil. (Taber, 2001). Nitrogen is one of the key elements of plant growth and development that has an important role in plant nutrition, and is therefore a factor that limits the growth of plants and occurs in many areas, especially in poor organic soil. Nitrogen fertilizers are often mobile in the soil and they can contaminate the soil and groundwater. Therefore, the management of nitrogenous fertilizers such as the rate and type of fertilizer and the time of addition is very important (De Pascale *et al*., 2006). Nitrogen fertilizers are reported to affect the number of leaves per plant, plant height, number of fruits per plant, average fruit weight and total yield per plant in tomato crops (Akanbi *et al.,* 2003). The aim of this study is to investigate the response of tomato varieties to nitrogen fertilization and breeding methods under protected cultivation conditions.

Materials and Methods

Study area: The experiment was conducted in Diwaniya province - Hamza district for the autumn season (2016-2017) and in a plastic house (400 m^2). Two experiments were used in the experiment, the first factor was the method of breeding (one-leg culture, two-leg culture, three-leg breeding), which is symbolized by T_1, T_2, and T_3, respectively. (N_1, N_2, N_3) levels (100, 150, 200 N kg E^{-1}) respectively. The first batch was given 45 days after germination and the second batch was given a month after the first batch. The network of irrigation pipes was extended to the terraces where the distance between the terrace and the other (80 cm) and between the drippers (40 cm) Irrigation was given before planting for the purpose of stabilizing the soil. Tomato seedlings were cultivated (Wijdan cv) and were three weeks old. All agricultural operations (fertilization, weeding,

pruning, control ....) were carried out according to the programs and recommendations.

No	Adjective	the value
1	Electrical conductivity (EC) DC Siemens/m	2.1
2	pH (degree of permeation)	7.8
3	Organic matter	0.6
4	the sand (%)	30
5	Silty (%)	35
7	Clay (%)	35

It was carried out as a global experiment with two factors according to the complete random sector design (R.C.B.D) and with three replications. The Statistical Analysis System (Genstat) was used for statistical analysis. The mean was compared using the Least Significant Different Test (LSD) at a probability level of 0.05 to test the significant differences between the mean.

- **Plant height (cm):** The final height of the plant was measured using a tape measure from the level of the soil surface to the highest peak of the plant.
- **Leg girth :** Measure the circumference of the leg and that of the mid-leg area and then extract the girth of the equation: leg girth = leg circumference / fixed ratio. The girths of the experimental units were measured in three stages of growth and the average for the three readings was found.
- **Total output per transaction:** The weight of each pound per transaction was calculated and after the end of the experiment the final product was divided by the number of pound and extracted the rate of each transaction.
- **Root Length Measurement:** The root length was measured at the end of the experiment by a tape measure.

Average weight of each fruit: The weight of the fruit was randomly selected from each fairy and then extracted the final rate per fruit.

Results and Discussion

Plant Height (cm) :

Table 2 : Effect of Nitrogen Fertilization Methods on Tomato Plant Height (cm)

Treatments / Varieties	T_1	T_2	T_3	N mean
N 1	261.0	276.0	250.0	262.3
N 2	238.7	239.0	238.7	238.8
N 3	236.0	220.0	235.7	230.6
T Level	245.2	245.0	241.4	
$L.S.D_{0.05}$	T	N	N* T	
	NS	5.77	10.00	

From Table (2), it was found that the treatments of rearing methods did not have any significant effect on plant height, whereas the added nitrogen level was significantly higher in tomato plant, where the level exceeded 150 N kg/ ha $^{-1}$ on 100 levels 200 kg N/ ha $^{-1}$. These levels are 238.8, 230.6 and 262.3 cm high for levels 150, 100 and 200 N kg /ha $^{-1}$. The addition of nitrogen leads to an increase in the tomato plant as a result of the vegetative vocabulary response to the addition of nitrogen fertilizers (Weston and Zandstra, 1989). Badr and Talaab (2008) pointed out that nitrogen has the main role in the growth and production of tomato crop, where the increased levels of nitrogen fertilization increases the plant's resistance to climatic conditions and high salinity. This finding is consistent with what Kutuk *et al*. (2004) in their study on the tomato crop, noting that the increase in nitrogen levels added increased the height of the tomato plant. The interaction between the rearing methods and the nitrogen levels significantly affected plant height. The interaction between the two treatments N1x T_2 gave the highest value of the plant height 276.0 cm while the interference gave the lowest value N_3 x T_2 220 cm.

Stem girth : From Table (3), it was found that the coefficients of rearing methods and nitrogen levels and their interaction did not have any significant effect on tomato stalk girth.

Table 3 : Effect of Nitrogen Fertilization and Rearing Methods on Tomato Stalk Girth (mm)

Treatments / Varieties	T_1	T_2	T_3	N mean
N 1	1.400	1.433	1.400	1.411
N 2	1.333	1.433	1.367	1.378
N 3	1.333	1.433	1.300	1.356
T Level	1.356	1.433	1.356	
$L.S.D_{0.05}$	T	N	N* T	
	NS	NS	NS	

Root Length: From Table (4) it was found that the treatments of rearing methods had a significant effect on the root length attribute of the plant cm. This may be due to the large vegetative total and the increase in the number of leaves and vegetative vegetation above the soil surface led to the ability of the roots to grow and absorb nutrients necessary for growth. The nitrogen level added and the interaction between the treatments did not have any significant superiority in root length.

Table 4 : Effect of Nitrogen Fertilization Methods on Tomato Root Length (cm)

Treatments / Varieties	T_1	T_2	T_3	N mean
N 1	33.00	38.67	40.00	37.22
N 2	35.00	33.67	39.33	36.00
N 3	32.67	37.67	33.33	34.56
T Level	33.56	36.67	37.56	
$L.S.D_{0.05}$	T	N	N* T	
	3.194	NS	NS	

Fruit Size: From Table (5), it was found that the treatments of rearing methods had no significant effect on fruit size, whereas the added nitrogen level was significantly higher than the size of the fruit of Tomato plant, where the level exceeded 150 N kg/ ha $^{-1}$ at 100 200 N kg/ ha^{-1}. These levels gave a weight of 118, 115.6 and 115.8 g for levels 150, 100 and 200 N kg/ ha $^{-1}$, respectively. The addition of nitrogen leads to an increase in the size of the fruit of the tomato plant due to the response of the vocabulary of vegetative growth to the addition of nitrogen fertilizers (Weston and Zandstra,

1989). This finding is consistent with what Kutuk *et. al* (2004) in their study on tomato yield, noting that increased nitrogen levels added to the size of the fruit of the tomato plant. There was no significant effect of the overlap between the treatments of the breeding methods and the nitrogen levels in the fruit size.

Table 5 : Effect of Nitrogen Fertilization Methods on Tomato Fruit Size (g)

Treatments / Varieties	T_1	T_2	T_3	N mean
N 1	124.67	124.67	119.67	123.00
N 2	114.33	115.00	116.33	115.22
N 3	108.00	114.33	111.67	111.33
T Level	115.67	118.00	115.89	
$L.S.D_{0.05}$	T	N	N* T	
	3.194	NS	NS	

Average weight of fruit / plant:

From the table (6), it was found that the treatments of the rearing methods had a significant effect on the mean weight of fruit per plant in the plant where the method of rearing on one stalk and three stems gave the highest rate of fruit weight rate of 142.22 and 142.33 g respectively. On the lower legs the average weight of the fruit is 134.56 g. This may be due to the large vegetative total and the increasing number of leaves and vegetative vegetation above the soil surface led to the ability of the roots to grow and absorb the nutrients necessary for growth and increase the dry matter in the plant. While the added nitrogen level had a significant superiority in the average weight of tomato fruits, where the level exceeded 100 N kg/ ha^{-1} on the levels 150 200 N kg/ ha^{-1} and these levels gave an average weight of 150.33 and 139.11, 134.56 g for levels 100, 150 and 200 N kg/ ha^{-1} respectively. The interaction between the culture methods and the nitrogen levels significantly affected the average fruit weight of the plant. The interaction between the two treatments N_1x T_2 gave the highest value of the average fruit weight in the plant 124.67 g, while the interference N_3 x T_1 gave the lowest value 108.00 g.

Table 6 : Effect of Nitrogen Fertilization and Fertilization Methods on Tomato Fruit Weight (g)

Treatments / Varieties	T_1	T_2	T_3	N mean
N 1	150.00	147.33	153.67	150.33
N 2	142.67	138.33	136.33	139.11
N 3	134.00	132.67	137.00	134.56
T Level	142.22	139.44	142.33	
$L.S.D_{0.05}$	T	N	N* T	
	3.194	NS	NS	

Conclusion

There is no significant effect with cultivation methods on plant height, stem girth and fruit size and the significant effect was on root length in the plant and the method of planting on two stems and three stems gave the highest rate of root length ,and average of weight of fruits per plant in the plant where the method of breeding on one stem and three stems gave the highest rate of average weight of fruits.

References

Akanbi, W.B.D. and Togun, A.O. (2003). Influence of compost and nitrogen fertilizer on growth, nutrient uptake and fruit yield of tomato (*Lycopersicon esculentum*). Crop Res., 26: P98-105.

Badr, M.A. and Talaab, A.S. (2008). Response of tomatoes to nitrogen supply through drip irrigation system under salt stress condition. Aust. J. Basic Appl . Sci., 2 (1) : 149 -156.

De Pascale, S.; Tamburrino, R.; Maggio, A.; Barbieri, G.; Fogliano, V. and Pernice, R. (2006). Effect of nitrogen fertilization on the nutritional value of organically and conventionally grown tomatoes. Acta Hort., 700: 107-110.

Kutuk, C.; Cayct, G. and Heng, L.K. (2004). Effects of increasing salinity and N-labelled urea levels on growth , N uptake , and water use efficiency of young tomato plants. Australian J. of Soil Res., 42 : 345-351.

Posted in Fungal Diseases in Tomato Crops, Greenhouse Crops February, 13: 2017.

Taber, H.G. (2001). Petiole sap nitrate sufficiency values for fresh market tomato production. J. Plant Nutr., 24: 945-959.

Weston, L.A. and Zandstra, B.H. (1989). Transplant age and N and P nutrition effect on growth and yield tomato. Hort. Sci., 24: 88-90.