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Effect of the Physicochemical Water Quality on The Development and Growth of the Tomato Plants (Study Case of the Variety: ISMA F_1)

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ABSTRACT

This current study was focused on the effect of waste water used to irrigate tomato plantation (Lycopersicom lycopersicum, ISMA F_1 variety) and its relationship with a morphological, flowering and productivity parameters of these plants. The study was carried out during vegetative cycle of this plant at different levels according to four water categories used in irrigation (T0, T1, T2 and T3). All biometric variables were measured and correlated. Our results show a significant effect of water reused (after treatment) on the growth of plants. This water used had high level of fertilizers, elements which allow all plants to growth normally. According to all data obtained from this study, we suggest that this method to be used in order to manage these resources positively and reduce the cost of different fertilizers.

Keywords: *Tomato, ISMA F^1 Variety, Waste Water, Fertilizers Elements, Manage.*

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1. INTRODUCTION

Pollution and scarcity are the two main causes of the global water deficiency. This water crisis can be controlled because the quantities available on earth are sufficient for all needs. In addition, the water resources, unlike the others mineral resources, are renewable at various levels. Actually, the hydric situation in Algeria, mainly in arid and semi-arid area, is characterized by multiple cases of pollution, which primarily affected all watercourses and groundwater (Catroux et al., 1974). Thus, Algeria is threatened by a serious environmental problem which tends to increase over the days in many parts of this country (Boubakeur, 1998).
The aim of our study was to test the effect of the quality of water (mainly the physicochemical quality) used to irrigate the tomato plantation on the morphological, flowering and productivity parameters of this plants.

2. MATERIAL AND METHODS

2.1. Biological material:

The tests are appliqued on a hybrid tomato (Lycopersicom lycopersicum, ISMA F_1 variety) from industrial crop native from tropical America. This plant is characterized by its high requirement in water and fertilizing elements and by its tolerance to Verticilium, Fusarium and nematodes (Lakrouf, 1993). It is a vigorous plant with a determinate port and characterized by a high level of productivity (Bouzou & Djoudi, 2007).

2.2. Edaphic and climatic requirement of Tomato

According to Gorini (1997), the tomato adapts to all diversify soils; with a good result on deep, fresh, well-drained, rich in humus and fertilizer sols. Seed germination is practically impossible below 10 ° C and above 30 ° C. This germination is optimal when daily temperatures varies between 18 and 24 ° C (Amman, 1992). Above and beyond these values, the reduction of the absorbent surface limits the growth of the aerial part. Also, the tomato is not very sensitive to salinity given its extension around the Mediterranean basin (Amman, 1992).

2.3. Experimental layout

Tomato plantations used in our tests are irrigated by four categories of water: 1) potable water (T0), 2) waste water (T1), 3) a mixture 50% potable water and 50% waste water (T2), 4) a mixture 75% potable water and 25% waste water (T3). Irrigation is taken place according to different steps of the vegetative cycle of the tomato (Plantation, vegetative growth, flower step, fruit step). We have measured nine physicochemical parameters from these four water categories: pH, conductivity and temperature (in situ), biochemical oxygen demand and chemical oxygen demand (using DbometerOxi), suspended matter by centrifugation and the concentration of nitrite, nitrate and ammonium by spectrophotometer of the laboratory. Also, we have measured three parameters from tomato plantations: morphological parameters (length of stems LT, diameter of stems DT and length of roots LR), flowering parameters (number of leaf NF, number of flower NF1), and productivity parameters (mean number of fruits per plant, mean weight of fruits per plant) (Bouzou & Djoudi, 2007). The abortion rate was calculated at the end of the experience by dividing the mean number of flowers per the mean number of fruits (Bouzou & Djoudi, 2007).

2.4. Statistical analysis

The matrix of the measured data was analyzed using software Xlstat based on the analysis of the variance with one criterion (VI) for each morphological, flowering and productivity parameters and those for each treatment (T0, T1, T2, T3). The level of significance represents α which is 5%.

3. RESULTS AND DISCUSSION

The physicochemical parameters measured from the four categories of water (potable water, waste water and dilutions 50% and 25%), are summarized in the following table (Table 1):

Table 1. Values of the physicochemical parameters measured from water categories

Treatments	TQ	T1	T2%	T3%
pH	7,6	7,75	7,4	7,86
Temperature (°C)	24	23,8	23,9	23,8
Conductivity (mmhos)	-20	-30	-23	-25
DCO (mg/ml)	165	28	21	50
DB05 (mg/ml)	99	16,8	12,6	30
MES (mg/ml)	1	56	15	6
Nitrites (mg/1)	0,005	Trace	Trace	Trace
Nitrates (mg/l)	2,2	1,5	1,5	1,3
Ammonium (mg/1)	High value	Trace	Trace	2,18

The analysis of the variance shows that there was a highly significant differences of biometric parameters for the waste water (T1) treatment, as well as the two other treatments (T3 and T2) as compared to the control treatment (T0).
The biometric measures of plants (stem length and breadth, leaf and flower number, root length) have shown that the maximum values were noted in using of mixture (potable and waste water) (Figure 1, 2, 3, 4 and 5).

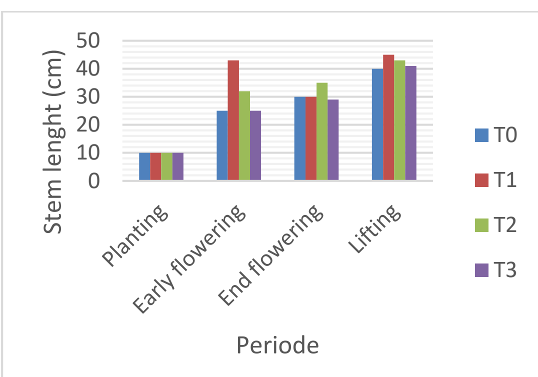

Figure 1. Evolution of Stem length during vegetative cycle for the fourth treatments

Our results show that there was a significant effect concerning each treatment on the vegetative development cycle of the tomato plantations, which shows differences for each of the parameters studied according to the control treatment (T0) (Table 2).

Table 2. morphological and flowering values of the tomato plantation according to four water categories

Treatments		T0	T1	T2	T3
Planting	LT	11,6	11,4	10,8	11,6
	DT	0,4	0,4	0,3	0,35
	NF	4	4	3	4
	LR	6,3	6,3	6,5	7,2
	NFl	Abs	Abs	Abs	Abs
Earlyflowering	LT	26,2	35,1	33,6	26,7
	DT	0,6	1,1	0,7	0,6
	NF	16	28	25	18
	LR	Abs	Abs	Abs	Abs
	NFl	23	41	35	29
End flowering	LT	31,3	42,3	38	30,1
	DT	0,8	1,4	0,92	0,8
	NF	31	62	56	37
	LR	Abs	Abs	Abs	Abs
	NFl	34	82	70	38
Lifting	LT	42,5	49,2	46,3	44,4
	DT	1,3	1,9	1,8	1,5
	NF	22	39	35	25
	LR	15,6	28,3	22,2	16,3
	NFl	Abs	Abs	Abs	Abs

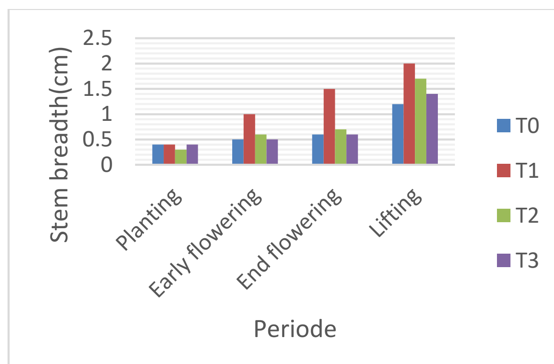

Figure 2. Evolution of Stem breadth during vegetative cycle for the fourth treatments

The abortion rate in this study was low with a value of 10%, indicating that the irrigation frequencies are well managed, which was probably due to the high organic nutrient content of these waters.

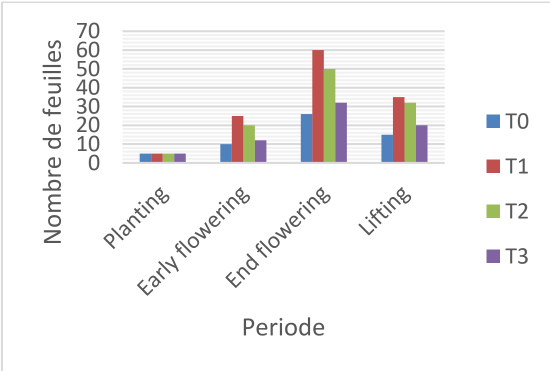

Figure 3. Evolution of leaf number during vegetative cycle for the fourth treatments

On the other hand, the length of the roots obtained from the irrigated plantations using waste water is significantly higher than the control treatment (T0). The following table presents biometric measurements of morphological and flowering parameters on tomato plantations.

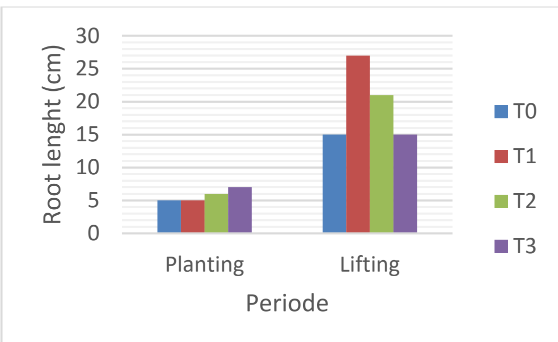

Figure 4. Evolution of root length during vegetative cycle for the fourth treatment

The regression shows that there was a positive significant relationship between number of flower in the plantation of tomato and values of physicochemical parameters of water categories (mainly the chemical and biochemical demand COD, BOD) and also the concentration of the nitrate in the water which influences the productivity of the plants (Table 3).

Table 3. Values of the productivity parameters of tomato plantation according to water categories

Treatments	T0	T1	T2	T3
Number of fruits per plants	22	71	52	25
Mean weight of fruits per plants (g)	1210	4400	3120	1450

Furthermore, the fruit was influenced positively by the composition and nature of water used, the mean number of fruits and length and breadth of fruits were reached in the T1 and T2 treatments corresponding on the mixture of water (potable and waste water) (Figure 6, 7 & 8), then these values dropped subsequently.

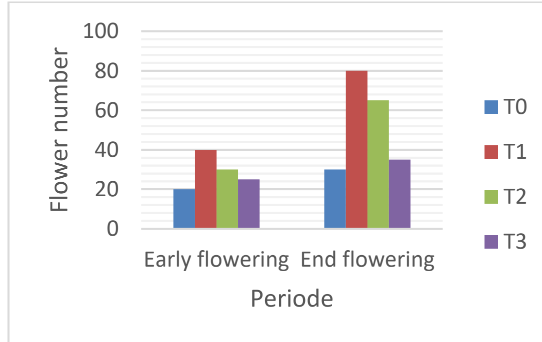

Figure 5. Evolution of flower number during vegetative cycle for the fourth treatments.

4. CONCLUSION

Our results were similar to those cited in previous studies: Hariri (2005) and Bouzou and Djoudi (2007). These topics show that irrigation with treated waste water has a positive and significant effect on the forage crop due to high level of fertilizer elements and this action was observed in improved plants growth. A high concentration of the nitrogen, phosphorus and potassium which were noted in the treatment, increased the germination of tomato.

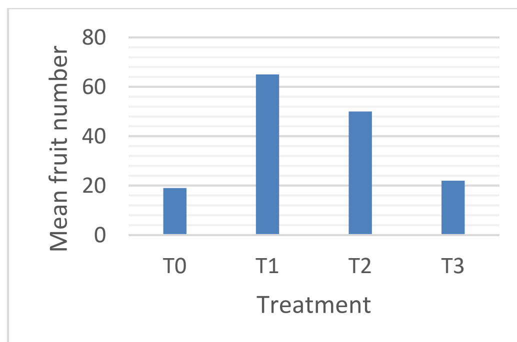

Figure 6. Mean number of fruits per plants during the fourth treatments

Globally, this industrial tomato crop (ISMA F1 variety) given significant results with the mixture of water using waste and potable with a rate of 50/50 and 25/75, can be advised to be followed by farmers in order to: manage the resources, reduce the cost of different fertilizers and ultimately encourage the use of varieties hybrids of industrial tomatoes to satisfy the food requirements in our country.

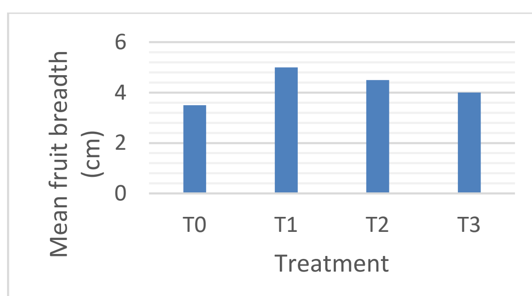

Figure 7. Mean fruit breadth per plants during the fourth treatments

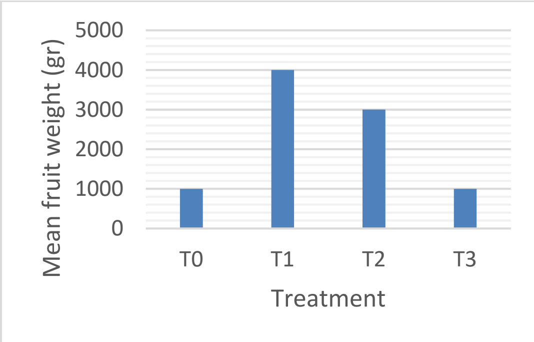

Figure 8. Mean fruits weight per plants during the fourth treatments

4.1. Acknowledgements
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4.2. Conflict of interest
No conflict of interest disclosed for this study

REFERENCES

1. Amman A (1992). Consumption in water of two varieties of industrial tomato (ELGON and NAPOLI) under localized irrigation. Engineering thesis, I.N.A. of Algiers, p. 79.
2. Boubakeur K (1998). Influence of the planting date on the behavior of some dry-grown industrial tomato varieties in the Annaba region. Engineering thesis, I.N.A of Algiers, p. 72.
3. Bouzou ML, Djoudi L (2007). Wastewater and fertilization. Thesis of State Engineer, IAV El Tarf, p. 66.
4. Catroux B, Germon S, Graffin F (1974). The use of the soil as a purification system 80, 184.
5. Gorini F (1997). Complete guide to tomato growing. Ed: Vecchi S.A. Paris, p. 120.
6. Hariri H (2005). Comparative study on agronomic and technological parameters between four IF hybrid varieties of industrial tomato, one of which is currently being approved, in the El Kala region. Engineering thesis, l.S.A. of El Tarf, p. 2.
7. Lakrouf F (1993). Technical itinerary of the cultivation of the industrial tomato and varietal choice. Day of study and reflection on the industrial tomato (Jijel).