



ORIGINAL ARTICLE

EFFECT OF IRRIGATION PERIODS, ADDING ORGANIC FERTILIZERS AND SPRAYING WITH POTASSIUM ON THE GROWTH OF MANDARIN SEEDLINGS USING IRRIGATION WATER AFFECTED BY SALINITY

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Abstract: The study was conducted in one of the private nurseries in Al6-Yusufiyah region belonging to Al-Mahmoudiyah district, to study the effect of the irrigation periods at two levels (irrigation every 3 days, irrigation every 6 days) and two levels of organic matter with a concentrations of (5, 10 g.seedlings⁻¹) and three levels of fractionation of fertilizer addition Potassium at a concentration of (120 kg K₂O.ha⁻¹), which was added in three batches, including 30 days in the growth of seedlings Mandarin grafting on the origin of Sour Orange. The experiment was conducted according to a Completely randomized design with three replicates and the results were summarized as follows: The treatment of irrigation after every 6 days significantly excelled in all vegetative growth traits, which included the seedlings length, number of leaves, leaf area, dry matter of the plant and leaf content of chlorophyll, nitrogen, phosphorus and potassium and gave the highest averages amounted to 55.06 cm, 32.01 leaf, 20.32 cm², 36.41 g, 34.44 spad, 1.60%, 0.31% and 1.33%, respectively, compared to the irrigation treatment after every 3 days. Where the addition of the organic matter treatment (10 g.seedlings⁻¹) significantly excelled for the above traits and gave the highest averages amounted to 53.29 cm, 31.76 leaves, 20.36 cm², 36.62 g, 34.06 spad, 1.58%, 0.31% and 1.28%, respectively compared to the treatment 5g.seedlings⁻¹, where the addition of potassium fertilizer treatment was significantly excelled by giving the highest values for all studied vegetative traits amounting to 65.71 cm, 8.51 mm, 6.12 branches, 37.25 leaves, 21.53 cm², 39.43 g, 38.50 spad, 1.77%, 0.35% and 1.81%, respectively.

Key word: Irrigation periods, Organic fertilizers, Potassium, Mandarin, Irrigation water.

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1. Introduction

The worsening water crisis poses a great risk to progress towards achieving sustainable development in arid and semi-arid regions, especially in the Middle East region and the increasing pressure on the freshwater resources generated through irrigated agriculture will generate the need of agricultural producers to adopt agricultural technologies that increase both the productivity of water resources and crop productivity [Tolk *et al.* (2016)]. Irrigation agriculture is still the main user of water on a global scale, which consumes more than 70-80% of water and both scarcity and wastefulness bring problems of

soil erosion and increase its salinity [Patil *et al.* (2013)]. The most important problem experienced by potassium fertilizers added to the soil is fixation and among the factors that affect the fixation, process are the tissues, calcium carbonate, type of minerals, the original amount of potassium, the amount of added potassium, the degree of moisture and drying, moisture content, cationic exchange capacity and the degree of soil interaction [Tisdale (1997)]. One of the methods used to overcome the effect of using saltwater in agriculture is the use of organic acids, including humic acid and added to the soil or sprayed directly on the vegetative part of the plant, where this leads to these acids working on the

formation of adsorption surfaces on the surfaces of vegetable membranes in order to contain them. It has two types of substances, one of which is hydrophilic and the other, as the acid affects photosynthesis and respiration, as it activates some enzymes and inhibits other enzymes, as it increases the permeability of cell membranes and stimulates a portion of biological processes, which is reflected in the traits of growth for plants [Judy (2013), AbdAL-Hseen and Manea (2020)]. The study aims to know the effect of the irrigation separator, the addition of organic matter and the addition of Potassium fractionation in the growth of Mandarin seedlings grafted on the origin of Sour Orange and mitigate the harmful effect of using saline irrigation water.

2. Materials and Methods

The study was conducted in one of the private nurseries in the Al- Yusufiyah region belonging to Al-Mahmoudiyah district for the spring season 2018, to study the effect of two periods of irrigation separator (3, 6 days) and two levels of organic matter with a concentrations of (5, 10 g.seedlings⁻¹) and three levels of addition fractionation Potassium fertilizer (potassium sulfate) with a concentration of (120 kg K₂O.ha⁻¹) which was added to (one batch, two batches, 3 batches), the period between 30 days and the first batch was added a month after the start of the experiment and its effect on the growth of Mandarin seedlings cultivar Clementine *Citrus reticulata* L. on the origin of sour Orange (age of 6 months) and the average diameter of

its stem 4-3 mm and an average length of 20-25 cm and cultivated in plastic pots capacity 15 kg of soil. Random samples were taken from soils and analyzed to estimate their physicochemical properties and the irrigation water and organic matter were analyzed (Table 1). The treatments were randomly distributed and organic fertilizers representing a mixture of cows and sheep residues were added on 1/3/2018 and at the required levels. Potassium fertilizer was added to the form of potassium sulfate. Urea fertilizer was added at 10 g.seedling⁻¹ and in two batches the first at the beginning of the experiment and the second 30 days after the first batch while adding phosphate fertilizer by 15 g.seedling⁻¹ before transferring the seedlings to the pots and used for saline irrigation water at a concentration of 5.4 dsm.m⁻¹ brought from the drainage water and reduced to the level the required. A factorial experiment was conducted in a completely randomized design with three replicates, the total number of seedlings was 180 seedlings (5 seedlings per treatment) and the results were analyzed according to Al-Sahuki and Waheeb (1990) and the averages were compared using the least significant difference test at the level of 5%.

The studied traits: The studied traits are the average length of the main vegetative branch (cm), Number of leaves (leaf/seedlings), Average leaf area (cm²), Chlorophyll leaf average (SPAD), Average dry weight of the vegetative growth (g), Nitrogen, phosphorous and potassium leaves (%)

Table 1: Some physical and chemical properties of soil, irrigation water and organic matter used in the study.

Traits	Units	Soil	Irrigation water	Organic matter
Soil Texture		clay loam		
pH		7.6	7.3	6.4
Ec	dsm.m ⁻¹	3.08	5.4	6.2
Organic matter	g.kg ⁻¹	14.8	Dissolved ionsmmol	543.4
Bulk density	g.cm ⁻³	1.51		C/N=17:1
Calcium carbonate	g.kg ⁻¹	236.7	Ca=2.8	
Clay		370	Mg=2.8	
Silt		359	K=0.15	
Sand		271	Na=38.7	
Total nitrogen	mg.kg ⁻¹	13.1	SO4=42.5	
phosphorous availability		6.7	CL=0.6	
potassium availability		23.8	HCO3=0.8	
			SAR=2.82	

3. Results and Discussion

3.1 Effect of irrigation separator, adding organic fertilizer and potassium fractionation on the height of Mandarin seedlings (cm)

Table 2 indicates that there were significant differences between the levels of the study factors in the effect the Mandarin seedlings height of grafted on the origin of Sour Orange. where the irrigation treatment after every 6 days significantly excelled and gave the highest average seedlings length amounted to 55.06 cm compared to the irrigation treatment after every 3 days, which gave the lowest average amounted to 47.68 cm. As for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹, it significantly excelled and gave the highest average amounted to 53.29 cm compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to 49.45 cm. Where, the treatment of potassium fertilizer fractionation (3 batches) significantly increased and gave the highest average amounted to 65.71 cm compared to the added treatment in one batch, which gave the lowest average length of the seedlings stem reached (37.08 cm). As for interaction treatments, the treatment (irrigation every 6 days + organic matter 10 g.seedlings⁻¹) was significantly excelled and gave the highest average for this trait amounted to 57.94 cm where, the treatment of potassium fertilizer fractionation (3 batches) significantly increased and gave the highest average amounted to 65.71 cm compared to the added treatment

in one batch, which gave the lowest average length of the seedlings stem reached (37.08 cm). As for interaction treatments, the treatment (irrigation every 6 days + organic matter 10 g.seedlings⁻¹) was significantly excelled and gave the highest average for this trait was 57.94 cm. The treatment (irrigation every 6 days + potassium 3 batches) was significantly excelled and gave the highest average amounted to 70.08 cm and the treatment (organic matter 10 g.seedling⁻¹ + potassium fractionation of 3 batches) was significant and gave the highest average amounted to 68.83 cm, while the treatment of triple interaction (irrigation every 6 days + organic matter 10 g.Seedlings⁻¹ + potassium fractionation 3 batches) gave the highest average amounted to 76.20 cm.

3.2 Effect of irrigation separator, organic fertilizer and potassium fractionation on leaves number of seedlings

Table 3 indicates that there were significant differences between the levels of the study factors in the effect on the leaves number of the Mandarin seedlings of grafted on the origin of Sour Orange, the irrigation treatment after every 6 days significantly excelled and gave the highest average leave number reached (32.01 leaves) compared to the irrigation treatment after every 3 days that gave the lowest average amounted to (28.90 leaves). As for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹, it significantly excelled and gave the

Table 2: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on seedlings height (cm).

Irrigation periods(day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	31.97	47.00	61.20	46.72
	10	34.03	50.43	61.47	48.64
6	5	40.20	52.37	63.97	52.18
	10	42.10	55.53	76.20	57.94
LSD		2.96			1.71
Irrigation periods* potassium fractionation					
3		33.00	48.72	61.33	47.68
6		41.15	53.95	70.08	55.06
LSD		2.09			1.21
Organic matter * potassium fractionation					
	5	36.08	49.68	62.58	49.45
	10	38.07	52.98	68.83	53.29
LSD		2.09			1.21
average		37.08	51.33	65.71	
LSD		1.48			

highest average amounted to (31.76 leaves) compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to (29.14 leaves). While the treatment of potassium fertilizer fractionation (3 batches) significantly excelled and gave the highest average amounted to (37.25 leaves) compared to the added treatment in one batch which gave the lowest average leaves number of seedlings amounted to (24.33 leaves). As for the interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average for this trait reached (33.67 leaves) and the treatment (irrigation after every 6 days + potassium fractionation 3 batches) significantly excelled and gave the highest average amounted to (39.42 leaves). The treatment (organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) significantly excelled and gave the highest average amounted to (39.77 leaves), while triple interaction treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹ + potassium fragmentation 3 batches) the highest average amounted to (43.03 leaves).

3.3 Effect of irrigation separator, adding of organic fertilizer and potassium fractionation in the leaf area of seedlings (cm²)

Table 4 indicates that there were significant differences between the levels of the study factors in the effect on the leaf area of Mandarin seedlings grafted on the origin of Sour Orange, the irrigation treatment

after every 6 days was excelled and gave the highest average seedling leaf area amounted to 20.32 cm² compared to the irrigation treatment after every 3 days, which gave the lowest average amounted to 19.09 cm². As for the treatment of adding organic matter at the level of 10 g. seedlings⁻¹, it significantly excelled and gave the highest average amounted to 20.36 cm² compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to 19.05 cm². Whereas the treatment of potassium fertilizer fractionation (3 batches) significantly increased and gave the highest average reached (21.53 cm²) compared to the added treatment in one batch, which gave the lowest average reached (18.06 cm²). As for the interaction treatments, where the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average for this trait amounted to 21.14 cm² and the treatment (irrigation after every 6 days + potassium fractionation 3 batches) was significantly excelled and gave the highest average. It reached (22.53 cm²) and the treatment (organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) significantly excelled and gave the highest average amounted to 22.65 cm², while the triple interaction treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) the highest average amounted to 24.30 cm².

3.4 Effect of irrigation separator, adding of organic fertilizer and potassium fractionation In

Table 3: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the number of seedlings leaves.

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	22.47	27.70	33.67	27.94
	10	24.10	28.97	36.50	29.86
6	5	24.70	30.53	35.80	30.34
	10	26.07	31.90	43.03	33.67
LSD		1.41			0.82
Irrigation periods* potassium fractionation					
3		23.28	28.33	35.08	28.90
6		25.38	31.22	39.42	32.01
LSD		1.00			0.58
Organic matter * potassium fractionation					
5		23.58	29.12	34.73	29.14
10		25.08	30.43	39.77	31.76
LSD		1.00			0.58
average		24.33	29.78	37.25	
LSD		0.71			

Table 4: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the leaf area (cm²).

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	16.80	18.97	20.07	18.61
	10	18.40	19.33	21.00	19.58
6	5	18.03	19.67	20.77	19.49
	10	19.00	20.13	24.30	21.14
LSD		0.85			0.49
irrigation periods * potassium fractionation					
3		17.60	19.15	20.53	19.09
6		18.52	19.90	22.53	20.32
LSD		0.60			0.35
Organic matter * potassium fractionation					
5		17.42	19.32	20.42	19.05
10		18.70	19.73	22.65	20.36
LSD		0.60			0.35
Average		18.06	19.53	21.53	
LSD		0.43			

Table 5: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the content of chlorophyll leaves (spad).

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	27.83	30.73	35.67	31.41
	10	28.00	31.57	36.63	32.07
6	5	28.73	32.23	37.57	32.84
	10	30.10	33.90	44.13	36.04
LSD		2.25			1.30
irrigation periods * potassium fractionation					
3		27.92	31.15	36.15	31.74
6		29.42	33.07	40.85	34.44
LSD		1.59			0.92
Organic matter * potassium fractionation					
5		28.28	31.48	36.62	32.13
10		29.05	32.73	40.38	34.06
LSD		1.59			0.92
average		28.67	32.11	38.50	
LSD		1.12			

chlorophyll leaves of seedlings (spad)

Table 5 indicates that there were significant differences between the levels of the study factors in effect the content of chlorophyll in the leaves of Mandarin seedlings grafted on the origin of Sour Orange. In comparison to the irrigation treatment after every 3 days, which gave the lowest average of (31.74 spad), as for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹ it significantly outperformed and gave the highest average of (34.06 spad) compared

to the treatment of 5 g.seedlings⁻¹ which gave the lowest average of (32.13spad). Where, the treatment of potassium fertilizer fractionation (3 batches) significantly increased and gave the highest average amounted to 38.50 spad compared to the added treatment in one batch, which gave the lowest average of the leaves content of chlorophyll reached (28.67 spad). As for interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest

average for this trait amounted to (36.04 spad). The treatment (irrigation after every 6 days + potassium 3 batches) significantly excelled and gave the highest average amounted to (40.85 spad) and the treatment (organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) was significant and gave the highest average amounted to (40.38 spad), while the triple interaction treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) gave the highest average amounted to (44.13 spad).

3.5 Effect of irrigation separator, adding organic fertilizer and potassium fractionation on the dry matter weight for Mandarin seedlings (g)

Table 6 indicates that there were significant differences between the levels of the study factors in the effect on the dry matter weight for the Mandarin seedlings grafted on the origin of Sour Orange. Irrigation after every 3 days, which gave the lowest average amounted to (34.31 g). As for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹ it significantly excelled and gave the highest average amounted to (36.62 g) compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to (34.09 g). Where the treatment of potassium fertilizer fractionation (3 batches) significantly excelled and gave the highest average amounted to (39.43 g) compared to the added treatment in one batch which gave the lowest average of the dry matter to the seedlings

amounted to (32.08 g). As for interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average for this trait reached (38.21 g) and the treatment (irrigation after every 6 days + potassium fractionation 3 batches) significantly excelled and gave the highest average. It reached (40.97 g) and the treatment (organic matter 10 g.Seedlings⁻¹ + potassium fractionation 3 batches) was significantly significant and gave the highest average amounted to (41.52 g), while for triple interaction treatment (irrigation after every 6 days + organic matter 10 g.Seedlings⁻¹ + potassium fractionation 3 batches) the highest average was 44.03 g.

3.6 Effect of irrigation separator, adding organic fertilizer and potassium fractionation on nitrogen percentage of Mandarin seedlings leaves (%)

Table 7 indicates that there were significant differences between the levels of the study factors in the effect on the nitrogen percentage of the leaves of the Mandarin seedlings of grafted on the origin of Sour Orange, the irrigation treatment after every 6 days excelled and gave the highest average leaf content of nitrogen reached (1.60%) compared to the irrigation treatment after every 3 days, which gave the lowest average amounted to (1.47%). As for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹ it significantly excelled and gave the highest average

Table 6: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the dry weight of seedlings(g).

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	31.10	32.87	36.77	33.58
	10	31.90	34.20	39.00	35.03
6	5	32.00	33.90	37.90	34.60
	10	33.30	37.30	44.03	38.21
LSD		1.26			0.73
irrigation periods * potassium fractionation					
3		31.50	33.53	37.88	34.31
6		32.65	35.60	40.97	36.41
LSD		0.89			0.51
Organic matter * potassium fractionation					
5		31.55	33.38	37.33	34.09
10		32.60	35.75	41.52	36.62
LSD		0.89			0.51
Average		32.08	34.57	39.43	
LSD		0.63			

amounted to 1.58% compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to 1.49%. Where, the treatment of potassium fertilizer fractionation (3 batches) significantly increased and gave the highest average amounted to 1.77% compared to the added treatment in one batch, which gave the lowest average of nitrogen leaf content reached (1.36%). As for interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average for this trait reached (1.66%) and the treatment (irrigation after every 6 days + potassium fractionation 3 batches) significantly excelled and gave the highest average amounted to 1.91%. The treatment (organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) significantly increased and gave the highest average amounted to 1.85%, while for the triple interaction treatment (irrigation after every 6 days + organic matter 10 g + potassium fractionation 3 batches), the highest average amounted to 2.04%.

3.7 Effect of irrigation separator, adding organic fertilizer and potassium fractionation on the phosphorous percentage of Mandarin seedlings leaves (%)

Table 8 indicates a significant difference between the levels of the study factors in the effect on the percentage of leaf content of phosphorus of Mandarin seedlings of grafted on the origin of Sour Orange, the

irrigation treatment after every 6 days excelled and gave the highest average leaf content of phosphorus reached (0.31%) compared to the irrigation treatment after every 3 days, which gave the lowest average, was 0.29%. As for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹ it significantly excelled and gave the highest average amounted to 0.31% compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average amounted to 0.29%. Where the treatment of potassium fertilizer fragmentation (3 batches) significantly excelled and gave the highest average amounted to 0.35% compared to the added treatment in one batch which gave the lowest average of the leaf content of phosphorus reached (0.25%). As for interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average value for this trait amounted to 0.33%. The treatment (irrigation after every 6 days + potassium 3 batches) significantly excelled and gave the highest average amounted to 0.37% and the treatment (organic matter 10 g.seedling⁻¹ + potassium fractionation of 3 batches) was significant and gave the highest average amounted to 0.37%, while the triple interaction treatment (irrigation after every 6 days + organic matter 10 g. seedlings⁻¹ + potassium fractionation 3 batches) gave the highest average amounted to 0.40%.

3.8 Effect of irrigation separator, adding organic

Table 7: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the Nitrogen percentage in seedlings.

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	1.33	1.40	1.61	1.45
	10	1.36	1.46	1.65	1.49
6	5	1.36	1.48	1.77	1.54
	10	1.40	1.55	2.04	1.66
LSD		0.05			0.03
irrigation periods * potassium fractionation					
3		1.34	1.43	1.63	1.47
6		1.38	1.52	1.91	1.60
LSD		0.04			0.02
Organic matter * potassium fractionation					
5		1.34	1.44	1.69	1.49
10		1.38	1.51	1.85	1.58
LSD		0.04			0.02
Average		1.36	1.47	1.77	
LSD		0.03			

fertilizer and potassium fractionation on the potassium percentage of Mandarin seedlings leaves (%)

Table 9 indicates that there were significant differences between the levels of the study factors in the effect on the potassium content in leaves of the Mandarin seedlings of grafted on the origin of Sour Orange, the irrigation treatment after every 6 days excelled and gave the highest average leaf content of

potassium was 1.33% in comparison to the irrigation treatment after every 3 days, which gave the lowest average reached (1.05%), as for the treatment of adding organic matter at the level of 10 g.seedlings⁻¹ it significantly excelled and gave the highest average amounted to 1.28% compared to the treatment of 5 g.seedlings⁻¹ which gave the lowest average of (1.10%). Where, the treatment of potassium fertilizer fragmentation (3 batches) significantly increased and

Table 8: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the Phosphorus percentage in seedlings.

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	0.24	0.28	0.32	0.28
	10	0.25	0.30	0.33	0.29
6	5	0.25	0.31	0.34	0.30
	10	0.26	0.32	0.40	0.33
LSD		0.021			0.012
Irrigation periods * potassium fractionation					
3		0.24	0.29	0.33	0.29
6		0.26	0.31	0.37	0.31
LSD		0.015			0.009
Organic matter * potassium fractionation					
5		0.25	0.29	0.33	0.29
10		0.26	0.31	0.37	0.31
LSD		0.015			0.009
Average		0.25	0.30	0.35	
LSD		0.011			

Table 9: Effect of irrigation periods, adding organic fertilizer and potassium fractionation on the Potassium percentage in seedlings.

Irrigation periods (day)	Organic matter (g.seedling ⁻¹)	Potassium fractionation			Average
		One batch	Two batches	Three batches	
3	5	0.45	0.84	1.54	0.94
	10	0.54	1.30	1.65	1.16
6	5	0.67	1.18	1.93	1.26
	10	0.63	1.44	2.11	1.39
LSD		0.094			0.054
Irrigation periods * potassium fractionation					
3		0.50	1.07	1.60	1.05
6		0.65	1.31	2.02	1.33
LSD		0.066			0.038
Organic matter * potassium fractionation					
5		0.56	1.01	1.73	1.10
10		0.59	1.37	1.88	1.28
LSD		0.066			0.038
Average		0.57	1.19	1.81	
LSD		0.047			

gave the highest average amounted to 1.81% compared to the added treatment in one batch, which gave the lowest average of the leaf content of potassium reached (0.57%). As for interaction treatments, the treatment (irrigation after every 6 days + organic matter 10 g.seedlings⁻¹) significantly excelled and gave the highest average for this trait of 1.39%. The treatment (irrigation after every 6 days + potassium 3 batches) significantly excelled and gave the highest average amounted to 2.02% and the treatment (organic matter 10 g.seedlings⁻¹ + potassium fractionation 3 batches) was significant and gave the highest average reached (1.88%), while the triple interaction treatment (irrigation after every 6 days + organic matter 10 g.seedling⁻¹ + potassium fractionation 3 batches) gave the highest average of 2.11%.

Tables 2-9 indicate a significant increase in the studied vegetative growth indicators for Mandarin seedlings grafted on the origin of Sour Orange where a result of adding organic matter and potassium fertilizer and this was reflected in the increase in the irrigation period. The treatment of adding compost (10 g.seedlings⁻¹) significantly excelled in increasing seedlings length, main diameter, number of leaves, leaf area, dry weight of the total vegetative of seedlings and their contents of chlorophyll, nitrogen, phosphorus and potassium. This was reflected in mitigating the harmful effect of using saline Irrigation water and this can be due to the addition of organic fertilizers and their residues to the soil or spraying directly using soaked or in the form of humic acid increases the availability of nutrients in the soil and increase the indicators of vegetative growth of plants, especially citrus fruits and increase susceptibility soil retains water for a longer period which increases the irrigation periods [Al-Abbasi *et al.* (2016)]. Also, the organic acids resulting from the decomposition of the organic matter can affect the formation of adsorbent surfaces on the surfaces of plants membranes, where the acid affects the photosynthesis and respiration processes where it activates some enzymes and inhibits other enzymes as it increases the permeability of the cell membranes and stimulates a section of biological processes, which is reflected so in the growth traits of plants [Judy (2013)]. Also, the fragmentation of potassium fertilizer gives an opportunity for the plant to benefit from it during the

different stages of growth than if adding potassium fertilizer at one time, which may lead to a loss in its quantity where a result of the stabilization process, especially since the soil used in the study is calcareous soil and the degree of its interaction tends to the basal and these factors help in the process of stabilization the element and potassium contributes to many biological processes in the plant, including activating or stimulating more than 60 enzymes within the plant and works to regulate the absorption of water and increase the tolerance of well-equipped plants to water deficiency through its role in controlling the mechanism of closing and opening the stomata [Ali and Aziz (2003)].

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