Effect of Clean Salt on some chemical traits of *Ficus carica* L. Aswad Diyala and White Adriatic fig seedlings under salt stress conditions.

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Abstract

This study was conducted in one of the unheated greenhouses of the Agricultural Research Station at the College of Agriculture - the University of Basra during the 2020 growing season. In order to improve the salt tolerance of two cultivars of fig seedlings (*Ficus carica* L.) by treating them with Clean Salt treatment. The experiment included 18 factorial treatments with three replications, where the number of experimental units reached 54 units, with four seedlings for each experimental unit, according to randomized complete block designs(R.C.B.D).The experiment included three factors, the first factor represented the salinity treatment Clean Salt at three concentrations (0, 0.2, 0.4) ml.L^{-1}, the second factor represented the salinity levels of the irrigation water with three concentrations (0, 3, 6) dSm^{-1},The third factor represents the cultivar (Aswad Diyala and White Adriatic), as the number of experimental units reached 54 experimental units, with four seedlings for each experimental unit. The averages were compared according to the least significant difference (L.S.D) test at a probability level of 0.05.The aforementioned treatments and their interactions in some chemical traits (total chlorophyll g.100 g^{-1}, carbohydrates in leaves gm.100gm^{-1}, nitrogen %, phosphorous %, potassium %) of fig seedlings were studied. The following results were obtained:The treatment of saline treatment at a concentration of 0.4 ml L^{-1} significantly excelled on most of the studied chemical characteristics (chlorophyll content of 51.69 mg 100 g^{-1}, carbohydrate content of leaves 393.47 mg 100 g^{-1}, nitrogen content of leaves 4.31%, phosphorous 0.60%, potassium 5.08%) compared to control treatment,The treatment at the saline level of 6 dSm m^{-1} also gave a significant decrease in all the studied traits, which are (chlorophyll content of 33.41 mg 100 g^{-1}, carbohydrate content of leaves 278.94 mg 100 g^{-1}, nitrogen content of leaves 2.98%, phosphorous 0.34% , potassium 3.69%) compared to seedlings irrigated with RO water.The cultivar Aswad Diyala showed significantly excelled in all chemical traits (46.08 mg, 321.21 mg, 179.84 mg, 3.79%, 0.54%, 4.55%) for each of (total chlorophyll g.100 gm^{-1}, carbohydrates in leaves gm.100gm^{-1}, nitrogen%, Phosphorous %, potassium %) respectively compared to the White Adriatic cultivar.

Keywords: figs, salt processor, clean salt, sodium chloride, NaCl

Introduction :-

Figs (*Ficus carica* L.) are deciduous fruit trees belonging to the Moraceae family, which contain more than 2000 species of trees and shrubs (24) (23). It is an important crop worldwide for fresh and dried consumption (16).It is believed that the original home of the fig is in the south of the Arabian Peninsula and spread quickly to the area around the Mediterranean Sea (11). The global production of figs is 131,588 tons, and the cultivated area in the world is about 289,818 hectares. As for Iraq, the total production amounted to about 9265 tons for the year 2019, and the fig crop constituted a percentage of (1.11% of the total production of summer fruit trees in Iraq (18). Figs are used in the manufacture of many processed food products such as jam, tea, wine, canned food and pastries (20). Due to the chemical composition of figs, it was found that it contains many essential nutrients, as it contains 79% water, 16% sugars, 56% of which are fructose sugar, then Followed by glucose (43% of the total sugars), in addition to a small amount of

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protein less than 1% and fats 0.3% (28) (21). Figs have been widely studied for medicinal uses, which justifies their therapeutic potential ((27). It contains a large number of useful natural chemical compounds, and the fruits are rich in vitamins A and B. The fruits are also a source of potassium, which plays an important role in reducing the risk of arterial hypertension. They contain both types of carbohydrates and fibers, which play an important role in revitalizing the digestive system and contribute to reducing the risk of some cancerous diseases. Fruits are useful in treating gout (6). The problem of salinity and saline soils is one of the main problems that hinder agriculture in most countries of the world, where the problem of salinity has become a global problem, where the lands affected by salinity are spread all over the world and are constantly increasing (5). The location of Iraq in the arid and semi-arid areas, which are characterized by high temperatures and little rainfall, made it one of the countries most affected by salinity, where 70-80% of its central and southern lands are located within medium to highly salinity soils (10). The figs are considered a moderately salt tolerant plant, as the critical limit for the salinity tolerance of figs is 8 $ds.m^{-1}$ (15). Many studies indicate that the addition of chemical fertilizers leads to many negative effects on human and animal health (3). Therefore, some companies have produced organic compounds that improve amelioration and reduce the negative effects of salinity, including the Clean Salt compound (2). The soil conditioner contains calcium and organic matter in its composition and contributes to the replacement of calcium instead of sodium (30). The Clean Salt also contains the organic matter that preserves the nutrients of the plant and microorganisms and increases the exchange capacity of positive ions such as calcium and potassium, and it is an important source of carbon supply for microorganisms in the soil and regulates the interaction of soil PH in addition to increasing the percentage of nitrogen and phosphorous that the plant needs (29).In view of the absence of any study on the use of the Clean Salt treatment in improving the salt tolerance of young fig seedlings, the study aimed to know the effect of adding a Clean Salt treatment on some growth traits of the fig seedlings of the studied cultivars.

Materials and methods

The experiment was conducted during the season 2019-2020 in one of the unheated greenhouses of the Department of Horticulture and Landscaping, College of Agriculture / University of Basra. The fig seedlings of the studied varieties were brought from one of the private nurseries in the province of Baghdad and shipped to the province of Basra by one of the well-known nurseries in the province by special order, knowing that the seedlings are marked with semantics to distinguish between the cultivars used. The planting medium consisting of corn and peat moss in a ratio of 1:3 was prepared with the addition of the fungicide benlite to the agricultural medium. The plants were transferred from the commercial bags to anvils with a size of (10 kg) and then the treatments were arranged on the seedlings inside the plastic house with three lines, each line representing a sector containing All treatments are factorial (3×3×2×3) according to Randomized Complete Block Design (R.C.B.D), The experiment included three factors, the first factor represents the clean salt treatment at three concentrations (0, 0.2, 0.4) ml L^{-1}, the second factor represents the salinity levels of the irrigation water at three concentrations (0, 3, 6 dSm^{-1}, and the third factor represents the cultivar Aswad Diyala and White Adriatic) The number of experimental units in the experiment was 54 experimental units, with four seedlings for each experimental unit. The data of the experiment were analyzed using analysis of variance according to the statistical program Genstat var 2012) and the averages were compared according to the least significant difference (L.S.D) test at the probability level of 0.05. The following measurements were taken for several plants from each experimental unit:

1- Total chlorophyll content in leaves (mg $100gm^{-1}$ fresh weight) The total chlorophyll in

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fresh leaves was estimated according to method (19).

2- Leaves content of total carbohydrates of leaves (mg 100g $^{1-}$ dry weight): they were estimated by the Modification of phenol - Sulphur acid Colorimetric Method described before (17).

3- Determination of nitrogen in leaves (%): The nitrogen concentration in the digested samples was estimated using the Micro Kjeldhal device as described in (31).

4- Determination of the phosphorous in leaves (%): It was determined by the yellow colour method and according to the method described by (25).

5- Determination of potassium in leaves (%):

The percentage of potassium in the digested samples was estimated using a flame photometer according to the method described before (31).

Results and discussion :-

The data in Table (1) show that the highest average content of leaves of total chlorophyll 51.69 mg 100 g^{-1} was when the saline treatment was added at a concentration of 0.4 ml L^{-1} compared to the no-addition treatment, which gave the lowest value of 32.05 mg 100 g^{-1}. It was noted that the addition of the salt level 6 dSm m^{-1} caused a significant decrease in the chlorophyll content of the leaves, where it gave the lowest value of 33.41 mg 100 g^{-1} compared to the comparison treatment, which gave the highest value of 49.65 mg 100 g^{-1}. Aswad Diyala cultivar was significantly excelled in chlorophyll content of leaves by giving the highest average of 46.08 mg 100 gm^{-1} compared to White Adriatic cultivar, which gave the lowest value of 37.47 mg 100gm^{-1}.The results show that the bi-interaction between the cultivars and the salinity treatment had a significant effect, where the Aswad Diyala cultivar treated with a concentration of 0.4 ml L^{-1} gave the highest value of 55.59 mg 100 g^{-1} compared to the white Adriatic cultivar that was not treated with the salinity treatment, which gave the lowest value of 28.77 mg 100 g $^{-1}$. The bi-interaction between cultivars and salinity levels had a "significant" effect on the chlorophyll content of leaves, as it (Aswad Diyala cultivar + control treatment of salinity levels) excelled by giving the highest percentage of 53.93 mg 100 gm^{-1} compared to "White Adriatic cultivar treated at the level 6 dSm m^{-1}". Of the salinity of irrigation water, it gave the lowest percentage of 30.14 mg 100 g^{-1}.The results of the table show that the bi-interaction between the salinity levels and the salinity treatment had a significant effect, as the treatment (the control of salinity levels + concentration of 0.4 ml L^{-1} of the salinity treatment) excelled by giving the highest value of 60.07 mg 100 gm^{-1} measured (at the level of 6 dSm m^{-1} of the salinity of irrigation water + the control treatment of the salinity treatment) which gave the lowest value of 26.71 mg 100 gm^{-1}.As for the triple interaction between the cultivar, the salinity levels and the salinity treatment, the treatment (Aswad Diyala cultivar + the control treatment of the salinity levels + concentration of 0.4 ml L^{-1} of the salinity treatment) was significantly excelled by giving the highest value of 65.32 mg 100 gm^{-1} compared to the treatment (the cultivars) White Adriatic + level 6 $ds.m^{-1}$ of irrigation water salinity + control treatment of salinity treatment) which gave the lowest value of 23.88 mg 100 g^{-1}.

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Table (1) Effect of Clean Salt treatment, irrigation water salinity and cultivar and their interactions on total chlorophyll content of leaves (mg 100gm^{-1} fresh weight)

Interaction between cultivars and salinity processor	(The salinity of the irrigation water (ds.m-1			Clean Salt ((ml.L-1	cultivars
	6	3	0		
35.32	29.54	33.83	42.59	0	Aswad Diyala
47.32	38.56	49.52	53.87	0.2	
55.59	41.91	59.53	65.32	0.4	
28.77	23.88	27.45	34.99	0	White Adriatic
35.84	29.45	31.76	46.32	0.2	
47.78	37.09	51.44	54.82	0.4	
1.208	2.092			L.S.D 0.05	
Cultivars average					
46.08	36.67	47.63	53.93	Aswad Diyala	Effect of interaction between cultivars and salinity of irrigation water
37.47	30.14	36.88	45.38	White Adriatic	
0.697	1.208			L.S.D 0.05	
salinity processor					
32.05	26.71	30.64	38.79	0	The effect of the interaction between the salinity treatment and the salinity of the irrigation water
41.58	34.01	40.64	50.10	0.2	
51.69	39.50	55.49	60.07	0.4	
0.854	1.480			L.S.D 0.05	
	33.41	42.26	49.65	Average salinity of irrigation water	
	0.854			L.S.D 0.05	

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Carbohydrate content of leaves (mg.100gm^{-1}):-

The results in Table (2) show that the addition of saline treatment at a concentration of 0.4 ml L^{-1} gave the highest average carbohydrate content of leaves, which amounted to 393.47 mg 100 g^{-1}, compared to no addition, which gave the lowest average of 218.03 mg 100 g^{-1}.The results of the table indicate that the addition of the salt level of 6 dSm m^{-1} led to a significant decrease in the carbohydrate content of leaves, amounting to 278.94 mg 100 g^{-1}, compared to the control treatment irrigated with RO water, which gave the highest percentage of 346.75 mg 100 g^{-1}. The Aswad Diyala cultivar significantly excelled by giving the highest value of 321.21 mg 100gm^{-1} compared to White Adriatic, which gave the lowest value of 295.74 mg 100gm^{-1}. The results show that the bi-interaction between the cultivars and the Clean Salt treatment had a significant effect, as the "Aswad Diyala" cultivar with an added concentration of 0.4 ml L^{-1} of the salinity treatment gave the highest value of 404.68 mg.100g^{-1} compared to "White Adriatic" that was not added to the treatment Salinity where it gave the lowest value of 205.71 mg 100 g^{-1}.It is noted that the bi-interaction between the cultivars and the salinity levels had a significant effect, where (Aswad Diyala cultivar + the control treatment of salinity levels) excelled by giving the highest value compared to the rest of the treatments, which amounted to 361.09 mg 100 gm^{-1}, while the treatment of the White Adriatic cultivar gave the added salinity level of 6 dSs.m^{-1}, the lowest value was 265.51 mg 100 g^{-1}. As for the interaction between the salinity treatment and the salinity of the irrigation water, the plants treated with a concentration of 0.4 ml L^{-1} and irrigated with RO water gave the highest rate of 413.47 mg 100 g^{-1} compared to the plants not treated with the salinity treatment and irrigated with water with a saline level of 6 dSm m^{-1}, which gave the lowest A value of 172.04 mg 100 g^{-1}. As for the triple interaction between the cultivar and the salinity levels and the Clean Salt treatment, the treatment (Aswad Diyala cultivar irrigated with RO water + concentration 0.4 ml L^{-1} of the salinity treatment) excelled by giving the highest value of 428.50 mg 100 gm^{-1} compared to the rest of the treatments, while The treatment (White Adriatic cultivar + saline level 6 dSm^{-1} + control treatment from the salinity treatment) gave the lowest percentage of 154.67 mg 100 g^{-1}.

Table (2) Effect of Clean Salt, irrigation water salinity and cultivar and their interactions on carbohydrate content of leaves (mg 100gm^{-1} dry weight)

Interaction between cultivars and salinity ٭processor	(The salinity of the irrigation water (ds.m-1			Clean Salt ((ml.L-1	cultivars
	6	3	0		
230.35	189.41	201.43	300.22	0	Aswad Diyala
328.59	302.45	328.79	354.54	0.2	
404.68	385.21	400.33	428.50	0.4	
205.71	154.67	185.34	277.12	0	White Adriatic
299.24	276.10	299.97	321.66	0.2	

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382.26	**365.76**	**382.58**	**398.43**	**0.4**	
2.592	**4.489**			**L.S.D 0.05**	
cultivars average					
321.21	**292.35**	**310.18**	**361.09**	**Aswad Diyala**	**Effect of interaction between cultivars and salinity of irrigation water**
295.74	**265.51**	**289.30**	**332.40**	**White Adriatic**	
1.496	**2.592**			**L.S.D 0.05**	
salinity processor					
218.03	**172.04**	**193.39**	**288.67**	**0**	**The effect of the interaction between the salinity treatment and the salinity of the irrigation water**
313.92	**289.28**	**314.38**	**338.10**	**0.2**	
393.47	**375.49**	**391.46**	**413.47**	**0.4**	
1.833	**3.174**			**L.S.D 0.05**	
	278.94	**299.74**	**346.75**	**Average salinity of irrigation water**	
	1.833			**L.S.D 0.05**	

Nitrogen content of leaves (%):

The results in Table (3) indicate that the highest value of 4.31% was obtained when seedlings were treated with a saline treatment with a concentration of 0.4 ml L^{-1}, compared with the no-addition treatment, which gave the lowest value of 2.74%.The results of the table show that the level of 6 dSm m^{-1} gave the lowest average of nitrogen content of leaves, which was 2.98%, compared to irrigation with RO water, which gave the highest value of 4.03%. The cultivar Aswad Diyala also significantly excelled in the nitrogen content of leaves, as it gave the highest average of 3.79% compared to White Adriatic, which gave the lowest average of 3.21% and that the bi-interaction between the cultivars and the salinity levels was significant, where(Aswad Diyala cultivar irrigated with RO water) excelled by giving the highest average of 4.33% compared to (White Adriatic cultivar irrigated with water with electrical conductivity 6 dSm^{-1}) which gave the lowest average It reached 2.75%. As for the interaction between the level of salinity of irrigation water and the salinity treatment .The treatment (control of salinity levels + concentration 0.4 ml L^{-1} of salinity treatment) excelled by giving the highest value of 4.71% compared to the treatment (saline level 6 dSm^{-1} + control treatment of salinity treatment),

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which gave the lowest value of 2.24% .As for the triple interaction between the cultivar and the salinity levels and the salinity treatment, the treatment of (Aswad Diyala cultivars irrigated with RO water + concentration of 0.4 ml L^{-1} of the salinity treatment) was excelled by giving the highest value of 5.11% compared to "B" (White Adriatic cultivar+ 6 dSm^{-1} + the control treatment from the salinity treatment), which gave the lowest percentage of 2.05%.

Table (3) The effect of the Clean Salt treatment, the salinity of irrigation water and the cultivar and their interactions on the nitrogen content of leaves (%)

Interaction between cultivars and salinity processor	(The salinity of the irrigation water (ds.m-1			Clean Salt ((ml.L-1	cultivars
	6	3	0		
3.03	2.42	3.00	3.67	0	Aswad Diyala
3.78	3.17	3.95	4.22	0.2	
4.56	4.01	4.56	5.11	0.4	
2.45	2.05	2.23	3.06	0	White Adriatic
3.14	2.46	3.18	3.78	0.2	
4.06	3.75	4.12	4.31	0.4	
N.S	0.123			L.S.D 0.05	
cultivars average					
3.79	3.20	3.83	4.33	Aswad Diyala	Effect of interaction between cultivars and salinity of irrigation water
3.21	2.75	3.17	3.71	White Adriatic	
0.041	0.071			L.S.D 0.05	
salinity processor					
2.74	2.24	2.62	3.37	0	The effect of the interaction between the salinity treatment and the salinity of the irrigation water
3.46	2.82	3.57	4.00	0.2	
4.31	3.88	4.34	4.71	0.4	
0.050	0.087			L.SD 0.05	
	2.98	3.51	4.03	Average salinity of irrigation water	
	0.050			L.S.D 0.05	

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leaves content of Phosphorous (%):

The results in Table (4) show that the salinity treatment with a concentration of 0.4 ml L^{-1} significantly excelled by giving the highest percentage of 0.60% compared to the no-addition treatment which gave the lowest percentage of 0.34%.The salinity level of 6 dSm^{-1} led to a decrease in the phosphorous content of the leaves, as it gave the lowest value of 0.34%.Compared to the control treatment, which gave the highest value of 0.69%. The Aswad Diyala cultivar also significantly excelled and gave the highest percentage of 0.54%, compared to the White Adriatic cultivar , which gave the lowest percentage of 0.42%. It was noted that the bilateral interaction between the cultivars and the salinity treatment had a "significant" effect, as the "Aswad Diyala" cultivar treated with a concentration of 0.4 ml L^{-1} of the Clean Salt treatment gave the highest percentage of 0.68% compared to the "White Adriatic" cultivar that was not treated with the salinity treatment, which gave the lowest rate of 0.30 % and that the bi-interaction between the cultivars and the level of salinity of irrigation water was significant, as (Aswad Diyala cultivar irrigated with RO water) excelled by giving the highest average of 0.75% compared to (White Adriatic cultivar irrigated with water with electrical conductivity 6 dSm^{-1}) which gave the lowest cultivar 0.29%.As for the interaction between the salinity levels and the salinity treatment, the treatment (the control of salinity levels + concentration 0.4 ml L^{-1} of the salinity treatment) excelled by giving the highest value of 0.87% compared to the treatment of (the salinity level 6 dSm^{-1} + the control treatment of the salinity treatment). Which gave the lowest value of 0.25%.As for the triple interaction between the cultivar and the level of salinity of irrigation water and the salinity treatment, the treatment of (Aswad Diyala cultivar irrigated with RO water + concentration of 0.4 ml L^{-1} of the salinity treatment) was excelled by giving the highest value of 0.95% compared to "B" (White Adriatic cultivar + level 6 $ds.m^{-1}$ + control treatment from the salinity treatment), which gave the lowest value of 0.20%.

Table (4) Effect of Clean Salt, irrigation water salinity and cultivar and their interactions on phosphorous content of leaves (%)

Interaction between cultivars and salinity ٥processor	(The salinity of the irrigation water ($ds.m^{-1}$			Clean Salt ((ml.L-1	cultivars
	6	3	0		
0.38	0.29	0.32	0.53	0	Aswad Diyala
0.55	0.39	0.50	0.77	0.2	
0.68	0.48	0.62	0.95	0.4	
0.30	0.20	0.25	0.44	0	White Adriatic
0.44	0.30	0.37	0.65	0.2	
0.52	0.36	0.41	0.79	0.4	
0.011	0.019			L.S.D 0.05	
cultivars average					

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0.54	0.39	0.48	0.75	**Aswad Diyala**	**Effect of interaction between cultivars and salinity of irrigation water**
0.42	0.29	0.34	0.63	**White Adriatic**	
0.006			0.011		**L.S.D 0.05**
salinity processor					
0.34	0.25	0.29	0.49	**0**	**The effect of the interaction between the salinity treatment and the salinity of the irrigation water**
0.50	0.35	0.44	0.71	**0.2**	
0.60	0.42	0.52	0.87	**0.4**	
0.008			0.013		**L.S.D 0.05**
	0.34	0.41	0.69		**Average salinity of irrigation water**
			0.008		**L.S.D 0.05**

leaves content of Potassium(%):

The results in Table (5) show that the concentration of 0.4 ml L^{-1} of the saline treatment significantly excelled by giving the highest percentage of potassium content in the leaves reaching 5.08% compared to the control treatment which gave the lowest percentage of 3.22%.While the addition of the level of 6 dsm^{-1} from the salinity of the irrigation water led to a decrease in the percentage of potassium in the leaves by 3.69% compared to the seedlings irrigated with RO water, which gave the highest percentage of 4.90%. Aswad Diyala cultivar gave the highest value of 4.55% compared to White Adriatic cultivar which gave the lowest value of 3.93%.It was noted that the bi-interaction between the cultivars and the salinity treatment had a "significant" effect, as the "Aswad Diyala" cultivar treated with a concentration of 0.4 ml L^{-1} of the Clean Salt treated gave the highest value of 5.36% compared to the "White Adriatic" cultivar that was not treated with the salinity treatment, which gave the lowest value of 2.81 % . The bi-interaction between the cultivars and the level of salinity of irrigation water was significant, where (Aswad Diyala cultivar + the control treatment of salinity levels) excelled by giving the highest value of 5.31% compared to (White Adriatic cultivars + 6 dSm^{-1} level), which gave the lowest average of 3.41%.As for the interaction between the salinity levels and the salinity treatment, (seedlings irrigated with RO water and treated with a concentration of 0.4 ml L-1 of the salinity treatment) excelled by giving the highest value of 5.50% compared to (with seedlings irrigated with water with electrical conductivity 6 dSm^{-1} and not treated with the salinity treatment). Which gave the lowest value of 2.52%.As for the triple interaction between the cultivar, the salinity levels and the salinity treatment, the treatment (Aswad Diyala cultivar + the comparison treatment of saline levels + concentration of 0.4 ml L-1 of the salinity treatment) excelled by giving the highest value of 5.87% compared to "B" (White Adriatic cultivar + Level 6DS. m^{-1} from the salinity of irrigation water + the

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control treatment from the salinity treatment), which gave the lowest value of 2.21%.

Table (5) Effect of Clean Salt, irrigation water salinity and cultivar and their interactions on potassium content of leaves (%)

Interaction between cultivars and salinity processor	(The salinity of the irrigation water (ds.m-1			Clean Salt ((ml.L-1	cultivars
	6	3	0		
3.62	2.82	3.29	4.76	0	Aswad Diyala
4.68	4.07	4.66	5.30	0.2	
5.36	5.00	5.21	5.87	0.4	
2.81	2.21	2.75	3.48	0	White Adriatic
4.20	3.51	4.21	4.87	0.2	
4.78	4.53	4.70	5.12	0.4	
0.009	0.015			L.S.D 0.05	
cultivars average					
4.55	3.96	4.39	5.31	Aswad Diyala	Effect of interaction between cultivars and salinity of irrigation water
3.93	3.41	3.89	4.49	White Adriatic	
0.005	0.009			L.S.D 0.05	
salinity processor					
3.22	2.52	3.02	4.12	0	The effect of the interaction between the salinity treatment and the salinity of the irrigation water
4.44	3.79	4.44	5.09	0.2	
5.08	4.77	4.96	5.50	0.4	
0.006	0.011			L.S.D 0.05	
	3.69	4.14	4.90	Average salinity of irrigation water	
	0.006			L.S.D 0.05	

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Discussion :-

The results in tables (1, 2, 3, 4, 5) show that there are significant differences between the two study cultivars, where the Aswad Diyala cultivar excelled in all chemical traits, and these differences between the cultivars may reflect their sensitivity to salinity, which may be due to the nature of the genetic structure of the cultivar. Chemical properties due to the effect of salinity. The decrease in chlorophyll may be due to the lack of the necessary elements in its construction such as magnesium, iron and nitrogen, as salt prevents the roots from absorbing these elements from the soil solution and the lack of carbohydrates and the increase of plant hormones that inhibit growth such as Abscisic acid, ABA)), which also accelerates From the decomposition of chlorophyll pigment (12). This result is consistent with what was stated (1) in his study on the Sidr plant, where it was found that high salt concentrations caused a decrease in the total chlorophyll content in the leaves.The decrease in carbohydrates is due to the fact that the sodium and chloride ions in the irrigation water led to a significant decrease in the level of total dissolved carbohydrates in the leaves. The activity of the enzyme responsible for reducing carbon dioxide, especially the enzyme RUBPcarboxylase (Rubisco) (26).This result is consistent with what was found by (9) that adding sodium chloride to irrigation water led to a decrease in the carbohydrate content of orange seedlings' leaves. As for the decrease in the percentage of nitrogen in the leaves, it may be due to the negative effect of salinity on nitrogen absorption through direct competition between chloride and nitrate and displacement of nitrate absorption or through indirect competition to change the permeability properties of plasma membranes (13) and these results are consistent with the results of (8). Who noticed a decrease in the content of citrus seedlings leaves of nitrogen, phosphorous and potassium with an increase in the salinity level of the irrigation water. The low content of phosphorous in leaves may be due to the high concentrations of salinity causing an increase in osmotic effort and the effect of chloride and sodium ions, which impede the movement of the necessary elements for the plant, including phosphorus (32) (4) and the low percentage of potassium in the leaves is due to the inverse relationship between potassium and sodium, because irrigation with saline water increases the sodium level in the soil solution, which leads to potassium moving out of the root absorption area and leading to nutritional imbalance and low absorption 22)) This result is consistent with the findings (7) of a decrease in the percentage of potassium in the leaves of olive plant with an increase in the levels of salt stress. The addition of salinity treatment at a concentration of 0.4 ml L^{-1} significantly affected all the studied traits and this may be attributed to the components contained in this compound as it contains 63% of the organic matter and 12% of calcium, which work to reduce salinity and improve growth traits.

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