Effect of NPK Fertilizer and the Treatment with Neutro-sol (CaO) in Some Chemical Growth traits of Two Olive Cultivars *Olea europaea* L.

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ABSTACT:-

This study was conducted in one of the private orchards in Al-Sanniyyah sub-district belonging to Al-Qadisiyah Governorate, south of Baghdad Governorate, during the agricultural season 2021, with the aim of studying the effect of spraying levels of fertilizer, NPK compound, and ground addition of Ultrasol on some traits of olive cultivars Manzilillo and Bashiqi. Factorial experiment (3 × 3 × 2) according to the completely random block design CRBD, with duplicate seedlings, at the rate of 4 seedlings per observation, and the treatments included cultivar (V1: Manzilillo cultivar, V2: Baashiqi cultivar, and three levels of spraying NPK (N0: 0, N1 = 1, N2 = 2) gm - liter and the ground addition of ultrasol fertilizer (C0: 0, C1 = 1, C2 = 2) gm - liter, the results were analyzed using niaine analysis for the lowest level difference between the treatments and using the lowest level difference Lsd at the level of 0.05, and the results can be analyzed as follows. Differences were found in the triple overlap VNC treatments with V2N2C2 overlapping, the seedling height was 18.07 cm, while the treatment V2N2C2 excelled with the number of branches 9.87, the leaf area 2.733 cm. The triple overlap of V1N1C0 with a branch length of 12.57 cm . The wet weight of the roots and the wet weight of the shoot were 33.0 g and 120.3 g, respectively:

introduction-:

Olives are evergreen trees that have been cultivated since antiquity and have lived for more than a thousand years. Its cultivation is widespread in the warm temperate regions of the world (Agha and Dawood, 1991).It belongs to the olive, Oleaceae family, and the cultivation of commercial olive varieties is now widespread in the Mediterranean basin, and for this reason, it is called the Mediterranean tree (Agha and Daoud, 1990). Olive cultivation is concentrated in semi-arid areas located between latitudes (30-45 degrees) north of the equator, where rainfall ranges between 200-600 mm annually (Ibrahim and Hajjaj, 2007). There is no doubt that the response of different olive varieties to fertilizer treatments depends on the cultivar, where studies have shown in this regard that the growth of different olive varieties varies in their response to different levels of chemical fertilizers, as well as differences in their tolerance to salt stress. The seedlings offered for sale do not exceed their length at best. Cases 30 cm tall and of limited growth. Therefore, it is necessary to work on producing olive seedlings that are characterized by strong growth, high performance, and the ability to overcome the stress they are exposed to during their transportation and cultivation. Among the Spanish varieties is the Manzilillo cultivar, whose cultivation is widespread in most countries of the world. Its fruit is medium in size, tends to be round, and weighs 4-6 g. The kernel is smooth and loose from the flesh, which constitutes 11% of the weight of the fruit, and the percentage of oil ranges from 16-20%. The fruits are used in green and black pickling, and the fruits are sensitive to the olive fly. And the Bashiqi cultivar is considered one of the most important local pickling varieties, and its cultivation is widespread in the Bashiqa district in Mosul. Its fruit is conical in shape with a tapering tip, the base of the fruit is round, the fruit is medium to large in size, and the oil content reaches 12-15% of its weight. (Mahdi and his group, 2011) .The NPK compound fertilizer is

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one of the most important types of fertilizers added to seedlings during the growing season because of its important and vital role in providing essential nutrients available for the plant, due to the importance of these elements in the stages of plant growth and development, which is reflected in the profitability of the nursery owners due to its rapid impact on vegetative growth rates, which is What the workers in this sector are targeting.., In order to reduce the loss of nutrients, the foliar nutrition method is adopted.As the readiness of most of the elements decreases for various reasons, such as losing an amount of semen by leaching and sedimentation, which often leads to large losses in the amount of added fertilizers. Therefore, trees can be fertilized by foliar spraying, which is considered highly efficient and its effectiveness lies quickly in the absorption of nutrients, especially when soil conditions are not suitable. As well as when there is a large variation in temperature or loss by washing, and this method supplies the plant with nutrients in a homogeneous manner (Lovatt, 2013)Therefore, NPK was used in our study as a spray on plants. Salinity is a constant threat to horticultural crops in arid and semi-arid regions of the world, where it inhibits plant growth and reduces the availability of nutrients and thus the growth and yield of agricultural crops to a large extent and the increase in soil salinity may result from natural processes or as a result of adding chemical fertilizers under poor drainage conditions, or from irrigation of crops with salty irrigation water. Although olive plants bear higher levels of salinity than other fruit trees, Ultrasol (calcium oxide) plays a key role in reducing the effect of salinity and greatly increasing the availability of nutrients because of its role in the possibility of replacing sodium and liberating chlorine, which are two of the most important elements. With a toxic effect on the plant .. Therefore, the study was carried out to find out the effect of spraying with different levels of compound fertilizer NPK and the addition of Ultrasol and their interactions on some growth characteristics of the olive cultivars Manzililo and Bashiqi.

Materials and methods:

The study was conducted in one of the private orchards in Al-Sunniyyah sub-district belonging to Al-Qadisiyah province for the growing season 2021 in order to know the effect of the interaction of different levels of compound fertilizer NPK and ultrasol CaO on some growth characteristics of young olive seedlings of two cultivars Manzilillo and Bashiqi. The young seedlings of one year of age for both cultivars (Manzilillo and Bashiqi) were brought from the horticultural station of the Directorate of Agriculture in Diwaniyah province for the reliability of the studied varieties at the station. for each cultivar .The planting medium was prepared in proportions (1:2) (Peat moss: river sand), and seedlings were planted in 20 cm diameter poles. Agricultural service operations for seedlings of both cultivars were coundected in an integrated manner. A factorial experiment was coundected with three factors (3×3×2), which includes the first factor, the cultivars, and it included Manzilillo cultivar (V1), Baashiqi cultivar (V2),The second factor is Ultrasol levels (includes 0:0, C1:1 (C2:2, C) ml.L^{-1} (the weight of a gram of the material was dissolved in water and added with irrigation water) and the third factor is the levels of NPK fertilization (it includes 0:0 , N1:1 (N2:2, N g.L^{-1} for each supplement. (Muhammad et al., 2013)The experiment was conducted using a randomized complete block design (CRBD). With three replicates for each treatment, the results were analyzed using analysis of variance, then the differences between the averages were compared using the least significant difference L.sd. At a probability level of 5%, Al-Rawi and Khalaf Allah (1980). The analyzes were coundected in the laboratories of the College of Agriculture / Al-Qasim Green University, where the nitrogen content of the leaves was estimated according to the method of Macrokejeldahl (1970, A.O.A.C) reported. 1965), Black) and

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potassium according to the method mentioned by (Richards, 1954) using a flamephotometer. And phosphorus by the colorimetric method and reading the light absorption at a wavelength of 882 nm using a spectrometer (Pilbeam and Barkeer 2007) according to a spectrophotometer (type 303 - PD - APPL). In addition to estimating the carbohydrate content of the leaves according to the method described by Dobois et al. (1956a) and protein: the percentage of protein in the leaves was calculated according to the equation: - Protein percentage (%) = nitrogen concentration in leaves (%) x 6.25. The relative chlorophyll was also estimated using the Chlorophyll meter The SPAD-502Plus of origin, and the chlorophyll was estimated in the SPAD unit. The percentage of dry matter was estimated in the leaves, the vegetative set, and the root set, where the total weights of the tender parts were calculated for each of the leaves, the shoot set, and the root set, then the samples were dried and dry weights were taken. For each of them, the percentage of dry matter was found by dividing the product, the dry weights, by the total weights of each of the leaves, vegetative set, and root set.

Results and discussion:-

The results showed in Table (1) that there was a significant difference between the two studied cultivars in the sodium content of the leaves, where the cultivar Manzilillo 1V excelled at an average of 13.45, and the lowest value was for the cultivar Baashiki V2 with an average of 8.34, while the levels of fertilization did not affect the sodium content of the leaves, and no treatments appeared. The addition of Ultrasol had a significant effect on the sodium content of leaves.The results also showed that there was a significant difference between the interaction between the treatment of the cultivar and the NPK, as the treatment V1N2 excelled at an average of 15.05%, and the lowest value was the treatment V2N1 at an average of 7.48. Also, the interaction between cultivar and Ultrasol indicated that there were significant differences. The V1C2 treatment excelled with a rate of 15.19, and the lowest value for the two-cultivars and Ultrasol interaction was for the V2C0 treatment with a rate of 7.45. The results also indicate that there is a significant difference between the level of NPK fertilization and Ultrasol, where the treatment N2C2 excelled at an average of 13.21, and the lowest value was the treatment N0C0 at an average of 8.98. The triple overlap coefficients indicated that there were significant differences, as the V1N2C0 interaction treatment excelled over the rest of the treatments with an average power of 17.99, and the lowest value was for the triple interaction treatment of cultivar, NPK and Ultrasol for the treatment V2N1C2 with an average power of 6.98.

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Table 1: Effect of compound fertilizer NPK and Ultrasol and their interaction on the leaf sodium content of the two studied olive cultivars

interaction cultivar x x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
11.51	9.82	12.17	12.55	N0	Manzilo V_1
13.80	12.62	13.73	15.05	N1	
15.05	11.04	16.12	17.99	N2	
9.59	8.13	8.92	11.72	N0	Baashiqui V2
7.48	6.98	7.30	8.16	N1	
7.94	7.25	8.14	8.44	N2	
2.984	5.168			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
13.45	15.19	14.01	11.16	Manzilo V_1	
8.34	9.44	8.12	7.45	Baashiqui V2	
	6.234			LSD0.05	
average NPK	interaction NPK x Ultrasol			NPK	
10.55	12.13	10.54	8.98	N0	
10.64	11.60	10.51	9.80	N1	
11.50	13.21	12.13	9.14	N2	
N.S	7.635			LSD 0.05	
L.S.D.0.05 N.S	12.32	11.06	9.31	average Ultrasol	

The results in Table (2) indicate that there is no significant difference between the two studied cultivars in the nitrogen content of the leaves, and the levels of fertilization did not affect the nitrogen content of the leaves, while Ultrasol was superior in the nitrogen content of the leaves. The C2 treatment was excelled on the rest of the treatments at an average of 2.350%, and it was the lowest value in the nitrogen content of the leaves of treatment C0 at an average of 1.408%.The results also indicated that there was a significant difference between the bi-interaction between the cultivar and NPK treatment, as the V2N2 treatment was excelled at an average of 1.963% and the lowest value was for the V1N0 treatment at an average of 1.751%. While the cultivar and Ultrasol interaction showed significant difference. As the two treatments V2C2 and V1C2 excelled on the rest of the treatments at an average of 2.407 and 2.294%, respectively. The results also indicate that there is a significant difference between the level of NPK fertilization and Ultrasol. As the treatment N2C0 excelled at an average of 2.450%, and the lowest value was transaction N0C0 at an average of 1.323%. The triple interaction treatment indicates that there are significant differences, as the interaction treatment V2N2C2 excelled on the rest of the treatments with an average 2.623%, and the lowest value was for the triple interaction treatment V1N0C0 with an average of 1.187%.

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Table 2: Effect of compound fertilizer NPK and Ultrasol and their interactions on the leaf nitrogen content of the two studied olive cultivars

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
1.751	2.433	1.633	1.187	N0	Manzilo V_1
1.758	2.173	1.700	1.400	N1	
1.830	2.276	1.733	1.480	N2	
1.827	2.167	1.853	1.460	N0	Baashiqui V2
1.933	2.430	1.913	1.456	N1	
1.963	2.623	1.800	1.465	N2	
0.3477	0.6023			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
1.780	2.294	1.689	1.356	Manzilo V_1	
1.908	2.407	1.856	1.460	Baashiqui V2	
N.S	0.3477			LSD0.05	
average NPK	interaction NPK x Ultrasol			NPK	
1.789	2.300	1.743	1.323	N0	
1.845	2.302	1.807	1.428	N1	
1.896	2.450	1.767	1.473	N2	
N.S	0.4259			LSD 0.05	
L.S.D.0.05 0.2459	2.350	1.772	1.408	average Ultrasol	

The results also indicated in Table (3) that there was no significant difference between the two studied cultivars in the potassium content of the leaves, and the levels of NPK fertilization did not affect the potassium content of the leaves, while Ultrasol excelled in the potassium content of the leaves, where treatment C2 excelled on the rest of the treatments with an average 2.109% was the lowest value in the potassium content of the leaves for the C0 treatment, at an average of 1.333%.The results also showed that there was no significant difference between the treatment of the cultivar and NPK, while the interaction of the cultivar and Ultrasol showed significant differences, where the two treatments V2C2 and V1C2 excelled on the rest of the treatments at an average of 2.162% and an average of 2.056%, respectively.The lowest value of treatment V1C0 at an average of 1.244%. The results also indicate that there is a significant difference for the overlap of the level of NPK fertilization with Ultrasol. As the N2C2 treatment excelled at an average of 2.333%, it was the lowest value for the N2C0 transaction at an average of 1.267%.

ISSN 2072-3857

Table 3: The effect of the compound fertilizer NPK and Ultrasol and their interactions on the potassium content of the leaves of the two studied olive cultivars

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
1.589	1.967	1.567	1.233	N0	Manzilo V_1
1.611	1.967	1.600	1.267	N1	
1.622	2.233	1.400	1.233	N2	
1.796	2.053	1.767	1.567	N0	Baashiqui V2
1.633	2.000	1.500	1.400	N1	
1.678	2.433	1.300	1.300	N2	
N.S	0.5434			LSD 0.05	
average cultivar	interaction cultivar x x Ultrasol			cultivar	
1.607	2.056	1.522	1.244	Manzilo V_1	
1.702	2.162	1.522	1.422	Baashiqui V2	
N.S	0.3138			LSD0.05	
average NPK	interaction x NPK Ultrasol			NPK	
1.692	2.010	1.667	1.400	N0	
1.622	1.983	1.550	1.333	N1	
1.650	2.333	1.350	1.267	N2	
N.S	0.3843			LSD 0.05	
L.S.D.0.05 0.2219	2.109	1.522	1.333	average Ultrasol	

The results in Table (4) indicated that there was no significant difference between the two studied cultivars in the phosphorus content of the leaves. The NPK fertilization levels did not affect the phosphorous content of the leaves, while the treatment with Ultrasol affected the phosphorous content of the leaves. As the C2 treatment excelled with an average of 0.4392%, and the average was lower for the C0 treatment with an average of 0.3169%. The results also showed that there were no significant differences for the treatment of the bi-interaction of the cultivar and the levels of NPK fertilization. While the results showed that there was a significant difference for the interaction cultivar and the Ultrasol addition average, where the interaction V2C2 and V1C2 treatment excelled on the rest of the treatments with an average of 0.4393% and an average of 0.4391, respectively, as it was the lowest value for the interaction in the treatment V1C0 has an average of 0.3161%. The results indicated that there were significant differences for bi- interaction of the NPK spray treatment and the Ultrasol treatment, where the treatment N1C2 and N2C2 excelled with an average of 0.4347% and an average of 0.4490%, respectively, and the lowest value was for the interaction treatment N0C0 and an average of 0.3118%. The results of the table show that there are significant differences for the bi- interaction treatments in NPK in Ultrasol, where the treatment was excelled V2N2C2 with an average value of 0.4493%, and the lowest value was for the interaction treatment V1N0C0 with an average value of 0.3040%..

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Table 4: Effect of compound fertilizer NPK and Ultrasol and their interactions on the leaf phosphorus content of the two studied olive cultivars.

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
0.3737	0.4500	0.3670	0.3040	N0	Manzilo V_1
0.3668	0.4187	0.3590	0.3227	N1	
0.3779	0.4487	0.3633	0.3217	N2	
0.3666	0.4193	0.3607	0.3197	N0	Baashiqui V2
0.3796	0.4493	0.3717	0.3177	N1	
0.3756	0.4493	0.3617	0.3157	N2	
N.S	0.05225			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
0.3728	0.4391	0.3631	0.3161	Manzilo V_1	
0.3739	0.4393	0.3647	0.3177	Baashiqui V2	
N.S	0.03017			LSD0.05	
average NPK	interaction NPK ١ x Ultrasol			NPK	
0.3701	0.4347	0.3638	0.3118	N0	
0.3732	0.4340	0.3653	0.3202	N1	
0.3767	0.4490	0.3625	0.3187	N2	
N.S	0.03695			LSD 0.05	
L.S.D.0.05 0.02133	0.4392	0.3639	0.3169	average Ultrasol	

The results in Table (5) showed that there was a significant difference between the two cultures studied in the carbohydrate content of the leaves, as the cultivar V2 had an average value of 4.217, while the carbohydrate content of the cultivar V1 leaves was less, with an average value of 3.643.The levels of fertilization also affected the carbohydrate content of the leaves, where treatment N2 excelled at an average of 4.127, and the lowest value of average carbohydrates was for treatment N1, at an average of 3.747%. Ultrasol also affected the carbohydrate content of the leaves, where treatment C2 excelled on the rest of the treatments and averaged 5.151, and was the lowest value for the carbohydrate content of the leaves for treatments C0, the average is 2.971.The results also showed that there was a significant difference between the interaction between cultivar and NPK treatment, where the treatment V2N1 was excelled on average 4.381 and had the lowest value for interaction V1N1 and average 3.112, while the interaction cultivar and Ultrasol showed significant differences with excelled of the two treatments V2C2 and V1C2 on the rest of the treatments with average 5.458 and average 4.843 respectively and had the lowest value for interaction V1 C0 and an average of 2,720. The results also indicate that there is a significant difference for the interaction level of NPK fertilization with Ultrasol, as the

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treatment N2C2 excelled with an average of 5.342 and the lowest value was for the treatment N1C0 with an average of 2.853.

Table 5: Effect of compound fertilizer NPK and Ultrasol and their interaction on the carbohydrate content of the leaves of the two studied olive cultivars.

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
3.711	4.983	3.280	2.870	N0	Manzilo V_1
3.112	4.347	2.653	2.337	N1	
4.107	5.200	4.167	2.953	N2	
4.122	5.350	4.043	2.973	N0	Baashiqui V2
4.381	5.540	4.233	3.370	N1	
4.148	5.483	3.637	3.323	N2	
0.4647	0.8049			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
3.643	4.843	3.367	2.720	Manzilo V_1	
4.217	5.458	3.971	3.222	Baashiqui V2	
0.2683	0.4647			LSD0.05	
average NPK	interaction NPK x Ultrasol			NPK	
3.917	5.167	3.662	2.922	N0	
3.747	4.943	3.443	2.853	N1	
4.127	5.342	3.902	3.138	N2	
0.3286	0.5692			LSD 0.05	
L.S.D.0.05 0.3286	5.151	3.669	2.971	average Ultrasol	

The results of Table (6) showed that there was a significant difference between the two studied cultivars in the leaf content of chlorophyll, where the treatment was excelled on the Baashiqui V2 cultivar with an average value of 54.84 spade, and the lowest value was for the Manzilo V1 cultivar with an average value of 51.21 spade. While the fertilization levels did not show a significant effect on the chlorophyll content, nor did the Ultrasol addition treatments affect the chlorophyll content.

The results also showed that there was a significant difference for the interaction between cultivar and NPK treatment, where the V2N2 treatment excelled with an average value of 53.90, and the lowest value was for the V1N0 treatment with an average value of 48.96.While the interaction cultivar and Ultrasol showed significant differences, as the two treatments V2C2 and V1C2 excelled on the rest of the treatments with an average of 56.70 and an average of 53.06, respectively, and the lowest value was for the treatment

V1C0 and an average of 49.09.The results also showed that there was a significant difference for the interaction level of NPK fertilization with Ultrasol, as the treatment N2C2 excelled with an average of 56.1%, and the lowest value was for the treatment N1C0 with an average of 50.02. The triple interaction coefficients showed that there were significant differences, as the V2N1C2 interaction was excelled on the rest of the coefficients, with an average value of 59.07, and the lowest value was for the triple interaction V1N1C0, with an average value of 46.73 SPAD.

Table 6: Effect of compound fertilizer NPK and Ultrasol and their interaction on leaves content of chlorophyll and SPAD of the two studied olive cultivars.

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
48.96	49.97	48.80	48.10	N0	Manzilo V_1
50.74	53.97	51.53	46.73	N1	
53.93	55.23	54.13	52.43	N2	
53.96	54.03	54.00	53.83	N0	Baashiqui V2
56.66	53.30	57.60	59.07	N1	
53.90	50.77	53.93	57.00	N2	
6.234	10.798			LSD 0.05	
average cultivar	interaction cultivar x x Ultrasol			cultivar	
51.21	53.06	51.49	49.09	Manzilo V_1	
54.84	56.70	55.18	52.63	Baashiqui V2	
3.599	6.234			LSD0.05	
average NPK	interaction NPK x Ultrasol			NPK	
51.46	52.00	51.40	50.97	N0	
53.70	56.52	54.57	50.02	N1	
53.92	56.12	54.03	51.60	N2	
N.S	7.635			LSD 0.05	
N.S	54.88	53.33	50.86	average Ultrasol	

The results in Table (7) indicate that there was no significant difference between the two cultures studied in the protein content of the leaves, while the levels of fertilization affected the protein content of the leaves, as the N2 treatment was excelled on an average of 11.85%, and the lowest protein value of the treatment was N0 and an average of 11.18%. Ultrasol also affected the protein content of the leaves, where treatment C2 excelled on the rest of the treatments with an average of 14.69%, and the lowest value was for the protein content of the leaves of treatment C0 with an average of 8.80%.The results also showed that there was no significant difference for the interaction between cultivar

and NPK treatment, while the interaction cultivar and Ultrasol showed significant differences, as the two treatments V2C2 and V1C2 excelled on the rest of the treatments with an average of 15.04% and 14.34%, respectively.The results also indicate that there is a significant difference for the interaction of the level of fertilization NPK with Ultrasol, where the treatment N2C2 excelled with an average of 15.31%, and the lowest value was for the treatment N0C0 with an average of 8.27%.. The triple interaction treatments indicated that there were significant differences, where the interaction of V2N2C2 was excelled on the rest of the treatments with an average of 16.40 % and the lowest value for the triple interaction treatments was V1N0C0 with an average value of 7.42%.

Table 7: Effect of compound fertilizer NPK and Ultrasol and their interactions on the leaf protein content of two olive cultivars

interaction cultivar x x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
10.94	15.21	10.21	7.42	N0	Manzilo V_1
10.99	13.58	10.63	8.75	N1	
11.44	14.23	10.83	9.25	N2	
11.42	13.54	11.58	9.12	N0	Baashiqui V2
12.08	15.19	11.96	9.10	N1	
12.27	16.40	11.25	9.16	N2	
N.S	3.764			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
11.12	14.34	10.56	8.47	Manzilo V_1	
11.92	15.04	11.60	9.13	Baashiqui V2	
N.S	2.173			LSD0.05	
average NPK	interaction NPK x Ultrasol			NPK	
11.18	14.38	10.90	8.27	N0	
11.53	14.39	11.29	8.93	N1	
11.85	15.31	11.04	9.20	N2	
1.537	2.662			LSD 0.05	
L.S.D.0.05 1.537	14.69	11.08	8.80	average Ultrasol	

The results showed in Table (8) that there was no significant difference between the two studied cultivars in the ratio of the leaf content of protein: carbohydrates%, while the levels of fertilization affected the leaf content of protein: carbohydrates, where treatment N0 gave 0.363%, and the lowest value was protein: carbohydrates For treatment N1 with an average of 0.320%, Ultrasol did not record a significant difference in the leaf content of protein: carbohydrates. The results also indicate that there is no significant difference for the interaction between cultivar and NPK treatment, while the interaction cultivar and Ultrasol showed significant differences with the superiority of the two treatments V2C0 and V2C2 over the rest of the treatments with an average of 0.365% and an average of 0.368%, respectively, and the lowest value of the bilateral interaction of the treatment V1C0

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and an average of 0.307% The results also indicate that there is a significant difference for the interaction level of NPK fertilization with Ultrasol, as the treatment N0C0 was excelled on the average value of 0.370%, and the lowest value was for the treatment N1C0 with an average value of 0.294%... The triple interaction treatments indicated that there were significant differences, as the interaction treatment V2N0C2 excelled on the rest of the treatments with an average value of 0.406% The lowest value for the triple interaction treatment was V1N1C0 with an average value of 0.200%.

Table 8: Effect of compound fertilizer NPK and Ultrasol and their interaction on the ratio of leaf content of protein: carbohydrates % for the two olive cultivars

interaction cultivar x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
0.359	0.399	0.348	0.329	N0	
0.267	0.323	0.277	0.200	N1	Manzilo V_1
0.369	0.385	0.399	0.322	N2	
0.368	0.406	0.358	0.341	N0	
0.373	0.388	0.365	0.365	N1	Baashiqui V2
0.344	0.366	0.331	0.334	N2	
N.S	0.1685			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
0.331	0.346	0.342	0.307	Manzilo V_1	
0.362	0.368	0.351	0.365	Baashiqui V2	
N.S	0.0973			LSD0.05	
average NPK	interaction NPK ا x Ultrasol			NPK	
0.363	0.368	0.353	0.370	N0	
0.320	0.344	0.321	0.294	N1	
0.356	0.359	0.365	0.344	N2	
0.0688	0.1192			LSD 0.05	
N.S	0.357	0.346	0.336	average Ultrasol	

The results indicated in Table (9) that there was a significant difference between the two studied cultivars in the average percentage of dry matter of the roots, where cultivar V2 was excelled on cultivar V2 with an average of 27.7%, and the lowest value was for cultivar V1 with an average of 24.22% While the levels of fertilization affected the average percentage of dry matter of the roots, as the N2 treatment excelled with an average of 26.61%, and the lowest value was for the percentage of the N1 treatment with an average of 24.83%.Ultrasol also affected the average dry matter percentage of the roots, as the C2 treatment was excelled on the rest of the treatments with an average of 26.89%, and the lowest value for average was the dry matter percentage of the roots for the C0 treatment, with an average of 24.67%.The results also showed that there was no significant difference for the interaction between cultivar and NPK treatment, while the interaction cultivar and Ultrasol showed significant differences with excelled of the V2C1 treatment with an average of 30.33%, and the lowest value for the interaction of V1C1 with an average of 23.44%. The results also indicate that there is a significant difference for the interaction level of NPK fertilization with Ultrasol, as the treatment

ISSN 2072-3857

N0C1 was superior with an average of 31.00%, and the lowest value was for the treatment N1C1 with an average of 21.67%.The triple interaction coefficients indicate that there are significant differences, as the V2N0C1 interaction was excelled on the rest of the coefficients, with an average value of 38.00%, and the lowest value was for the triple interaction V2N0C0, with an average value of 19.33%.

Table 9: Effect of compound fertilizer NPK and Ultrasol and their interaction on the percentage of dry matter of the root total of the two olive cultivars

interaction cultivar NPK x	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
25.00	25.67	24.00	25.33	N0	Manzilo V_1
21.33	23.67	20.67	19.67	N1	
26.33	27.33	25.67	26.00	N2	
27.89	26.33	38.00	19.33	N0	Baashiqui V2
28.33	31.67	22.67	30.67	N1	
26.89	26.00	30.33	24.33	N2	
N.S	8.483			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
24.22	23.67	23.44	25.56	Manzilo V_1	
27.70	25.67	30.33	27.11	Baashiqui V2	
2.828	4.898			LSD0.05	
average NPK	interaction x NPK Ultrasol			NPK	
26.44	22.33	31.00	26.00	N0	
24.83	25.67	21.67	27.17	N1	
26.61	26.00	28.00	25.83	N2	
3.463	5.998			LSD 0.05	
L.S.D.0.05 3.463	26.89	26.33	24.67	average Ultrasol	

The results in Table (10) indicated that there was no significant difference between the two studied cultivars in the average percentage of dry matter of the leaves (%), while the levels of fertilization affected the average dry percentage of the leaves, where the treatment N2 and average were excelled to 39.2% and had the lowest value for average percentage. Dry percentage of leaves for treatment N0 and average 36.1%. Ultrasol also affected the average dry percentage of leaves, where treatment C2 excelled on the rest of the treatments, average 40.2%, and the lowest value was for dry percentage of leaves for treatment C1, average 36.1%. The results also indicated that there was no significant difference For the bilateral interaction between cultivar and NPK treatment, while the interaction cultivar and Ultrasol showed significant differences with excelled of the two treatments V2C2 and V1C2 on the rest of the treatments with an average of 38.8% and 41.7%, respectively. It was also the lowest value for interaction V2C1 and average of 34.0%. The results also indicate that there are no significant differences for the interaction level of fertilization NPK is the dependent of transmission, as the N1C2 treatment was excelled with an average of 41.5%, and the lowest value was for the N0C1 treatment with

ISSN 2072-3857

an average of 32.5%. The triple interaction showed significant differences, as the V1N1C2 interaction was excelled on the rest of the treatments, with an average value of 44.3%, and the lowest value was for the triple interaction, V2N1C1, with an average value of 25.0%.

Table 10: Effect of compound fertilizer NPK and Ultrasol and their interaction on the percentage of leaf dry matter for the two studied olive cultivars.

interaction cultivar x x NPK	Ultrasol g.L-1			NPK g.L-1	cultivar
	C2	**C1**	**C0**		
37.4	42.0	29.0	41.3	N0	Manzilo V_1
41.6	44.3	46.7	33.7	N1	
39.6	40.3	39.0	39.3	N2	
34.7	39.0	36.0	29.0	N0	Baashiqui V2
35.3	42.3	25.0	38.7	N1	
38.8	38.7	41.0	36.7	N2	
N.S	14.68			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
39.5	41.7	38.2	38.7	Manzilo V_1	
36.3	38.8	34.0	36.0	Baashiqui V2	
N.S	8.47			LSD0.05	
average NPK	interaction NPK x x Ultrasol			NPK	
36.1	40.2	32.5	35.5	N0	
38.4	41.5	35.8	38.0	N1	
39.2	39.0	40.0	38.5	N2	
5.99	N.S			LSD 0.05	
L.S.D.0.05 5.99	40.2	36.1	37.3	average Ultrasol	

The results indicated in Table (11) that there was no significant difference between the two studied cultivars in the average percentage of dry matter in vegetative. While the levels of fertilization affected the average percentage of dry matter in the vegetative total, where the N2 treatment was excelled average 41.7%, and the average was lower in the percentage of dry matter in the vegetative total of the treatment N1, with average 31.6%, and Ultrasol was excelled in average percentage of dry matter in the vegetative total, where C2 treatment excelled on the rest of the treatments with an average of 40.4%, and the average was the lowest in the average percentage of dry matter in the vegetative total of treatment C0, with an average of 32.8%.The results also indicate that there is a significant difference between the interaction between cultivar and NPK treatment, where the treatment V2N2 was excelled on average 45.0% and the lowest value was for treatment V1N1 and average 25.8%, while the interaction cultivar and Ultrasol showed significant differences with excelled of the two treatments V2C2 and V1C2 on the rest of the treatments with average 38.8% and average 42.0%, respectively, as was The lowest value for interaction is V1C1, with an average value of 29.5%. The results also indicate that there is a significant difference for the interaction level of NPK fertilization with Ultrasol, as the

ISSN 2072-3857

treatment N2C2 excelled with an average of 57.5 and the mean was lower for the treatment N0C0 with an average of 27.2%.The triple interaction treatment indicate that there are significant differences, as the V2N2C2 interaction treatment was superior to the rest of treatment, with an average of 50.0%, and the average for the triple interaction V1N1C0 with an average of 18.5%..

Table 11: Effect of compound fertilizer NPK and Ultrasol and their interactions on the percentage of dry matter dry vegetative total (%) of the two olive cultivars

interaction cultivar x x NPK	**Ultrasol g.L-1**			**NPK g.L-1**	**cultivar**
	C2	**C1**	**C0**		
38.2	43.5	41.5	29.5	N0	Manzilo V_1
25.8	31.5	27.5	18.5	N1	
28.3	35.7	19.5	30.5	N2	
28.7	29.0	32.0	25.0	N0	Baashiqui V2
37.3	41.5	32.5	38.0	N1	
45.0	50.0	47.5	37.5	N2	
12.48	21.62			LSD 0.05	
average cultivar	interaction cultivar x Ultrasol			cultivar	
32.3	36.7	29.5	30.8	Manzilo V_1	
37.0	38.8	37.3	34.8	Baashiqui V2	
N.S	12.48			LSD0.05	
average NPK	interaction NPK ا x Ultrasol			NPK	
33.4	36.3	36.8	27.2	N0	
31.6	36.5	30.0	28.3	N1	
41.7	57.5	33.5	34.0	N2	
8.83	15.29			LSD 0.05	
L.S.D.0.05 8.83	40.4	33.4	32.8	average Ultrasol	

The excelled of Baashiqi cultivar in leaves content of chlorophyll table (8) and carbohydrates table (12), while it did not show excelled in the rest of the studied traits, perhaps due to the genetic trait of cultivar.The excelled of the third level of spraying with NPK in the carbohydrate content of leaves Table (12) may be due to the increase in the average concentrations used in the fertilizer f spraying with NPK and the role played by the nutrients N, P and K, as nitrogen works to provide what the plant needs in the processes of cell division and elongation as well as its importance in the production of auxin media This leads to an increase in the carbohydrate content of leaves (Al-Rikabi, 2014). The growth of the cells of the various tissues increases in the plant body, including the increase in the activity of the cambium tissue, which when divided gives an increase in the characteristics of growth. This result was consistent with what was stated by (Fernández and Eichert, 2009) on olives.The reason excelled of the third level of Ultrasol addition in the leaf content of potassium (table 10), phosphorus (table 11), carbohydrates (12), nitrogen (13), protein (14) and ClN ratio (table 15) is due to the effect of Ultrasol. And its effectiveness in increasing the availability of plant nutrients, especially N, P, and K, and

ISSN 2072-3857

this is due to the roles that calcium plays in the added levels. Its ability to retain water and nutrients and to reduce the phenomenon of opposition between the nutrients in the soil solution.Perhaps the reason is due to its effect on increasing the effectiveness of microorganisms that improve the physical properties of the soil and works to create the appropriate conditions for the growth of plant roots and increase the ability to absorb nutrients, including the element P and increase its absorption, which enters into the formation of protein and other vital processes in the plant, including the activity of enzymes and increased movement Carbohydrates, increasing their accumulation in plant tissues, regulating and increasing the average photosynthesis or appendage, are important in building the plant body, and this is consistent with what Muhammad (1984) mentioned. Perhaps Ultrasol levels did not show a significant effect on some of the studied traits due to the relatively low level of salts in the soil used in the study, as indicated by the soil analysis table, Table (1).The presence of significant differences in the interaction between cultivar treatment and spraying levels of NPK and the results of the bilateral interaction between cultivar and Ultrasol for most of the studied traits may be attributed to the growth rate of cultivar, which is a genetic characteristic on the one hand, and to the effect of adding fertilizer in increasing the plant's absorption of nutrients and its reflection on the physiological processes that contributed to it. In the height of the average growth and accumulation of nutrients as it affected the plant height, the number of branches and their lengths, and the leaf area. Whereas, the superiority of the interaction treatment of the second level of spraying NPK and the second level of ground addition of Ultrasol for most of the chemical properties studied is attributed to the joint effect of each of the compound fertilizer and Ultrasol, as The coincidence of the effectiveness of Ultrasol at the effective level by improving soil properties and increasing the cationic exchange capacity with repeated spraying with NPK increased the availability of nutrients and had a greater effect on the studied traits. The increase in the root weight of the seedlings under study had an effect on increasing the number of root hairs within the effective root zone and thus increasing the absorption of nutrients due to the role of the element phosphorous in stimulating the formation and growth of the root system, particularly the meristematic cells (Tables 16, 17 and 18). And it was found that there were significant differences between the lengths of the roots due to the effect of spray concentrations NPK and the addition of Ultrasol each separately, as well as their interactions, so the weight of the root system was in the high concentrations (2.0 g.l-1 metallic and 4 g.l-1) compared to the low concentrations without treatment with either of them. This is because the fertilization treatments and their interactions led to the elongation of the divided cells at the origins of the roots and their dedifferentiation and then the emergence of new roots (Al-Sarih, 2009), and perhaps it is a direct reflection of the increase in the growth averages of the vegetative total (Tables (20 and 21).

On the other hand, fertilization, with its increasing concentrations, led to an increase in enzymatic activity, and thus an increase in physiological processes such as photosynthesis and metabolism, which requires an increase in the absorption of nutrients, which results in an increase in the average leaf area carried by the seedlings, thus returning to the role of the mineral elements that make up this fertilizer. In addition, the fertilization with Ultrasol and the foliar spraying with NPK improved the indicators of vegetative growth, including the number of branches on the main stem, as this was the reason for increasing the number of leaves (Mengel et al., 2001), and thus the leaf area of the seedlings increased (Table 5), which is reflected in the content of Seedling leaves of total carbohydrates (Table 12), leading as a result to an increase in the fresh and dry

ISSN 2072-3857

weight of the vegetative total (Lam et al., 2017). This is what happened when it was dried at a temperature of 70 °C (Table 7). These results are in agreement with what was mentioned by Qureshi et al. (2020), especially when using nitrogen fertilizers, because it leads to an increase in its solubility in various solvents such as water, which increases the penetration of these particles to the surfaces in contact with them. Such as leaves because they provide a greater capacity for the different metabolic reactions in plants. The vital role played by the high absorption rate of macroelements by stimulating the enzymes related to the photosynthesis process that takes place in the leaves and activating them for the process of distributing photosynthetic products and using them in building indicators of the vegetative and root groups. This is what the study results indicated. The current one, which was in agreement with Elijah Al-Qatrani (2014) on the bitter orange plant and Al-Ta'i, 2018 on three citrus rootstocks..In addition, the increase in the average photosynthesis causes an increase in the production of dry matter, which is the most important measure of the effect of the study factors and their concentrations (Mohamed, 1995). These results agree with what was reached by (Al-Moereb, 2008) on orange plants.The reason for the superiority of the triple interaction V2N2C2 in traits of the study may be due to the growth capacity of the cultivar, which is a genetic trait as we mentioned on the one hand, and to the increase in the averages of spraying with NPK fertilizer, which led to an increase and ease of absorption of nutrients by the leaves, which led to the stimulation of vegetative and root growth, and what nitrogen plays It has a role in accelerating and stimulating the vegetative growth of plants, as it led to an increase in the average growth of the root system, and the roots of trees often absorb what they need of nitrogen in the form of ammonium ions or nitrates, and that nitrates may be lost by washing, so ammonium is the preferred source of nitrogen in autumn and winter fertilization, although Most fruit trees whose roots absorb nitrates are better than ammonium, knowing that both sources have equal effectiveness (Dawood et al., 2012).Nitrogen is one of the basic elements in plant nutrition, where it is included in the composition of most cell components such as amino acids, proteins, plant hormones, and chlorophyll (Pilbeam and Barker, 2015), in addition to the increase in the root weight of the seedlings under study led to an increase in the average absorption of the element phosphorus. It is necessary to stimulate the growth of the root system, especially the meristematic cells (Table 10). As it led to the elongation of the divided cells at the origins of the roots and their re-differentiation and then the emergence of new roots (Al-Sarih, 2009).. Macronutrients play an important role in improving and accelerating plant growth, especially when Adding nitrogen, phosphate and potassium fertilizers to fruit seedlings using foliar spray technology or ground application when they are at the beginning of their life due to their positive effect on their vegetative growth. (Obreza and Morgan, 2011).

Also, the phosphorus element has a direct role in most of the physiological processes that cannot be completed inside the plant without its presence, especially if fertilizer is sprayed at relatively close intervals. It comes in the second place among the compound fertilizer components and its quantity, as it enters into the formation of nucleic acids and energy compounds (Adenosin TriphosphateATP) and Adenosin DiphosphateADP)). It is involved in the synthesis of many organic compounds necessary for the formation of energy-rich compounds such as ATP, and it has a role in most of the processes of photosynthesis, respiration, and the metabolism of carbohydrates and fatty acids (Fraser et al., 1999 Sanchez; and others, 2007).

The role of the potassium element that fruit trees need in relatively large quantities may be a reason for the superiority of this interaction, as it is the catalyst for the photosynthesis

ISSN 2072-3857

process of the plant due to its effect on building the ATP compound, which is the main carrier of energy in the plant and a storehouse for it to represent CO2. Potassium affects the building of sugars and proteins and the reduction of nitrates, and increases plant resistance to pests, diseases and fungi (Marschner, 1995). Since this element is considered the catechin accompanying the negative nitrate anion when it is transferred from the root system to the vegetative system, which contributes to the reduction of nitrates to ammonia, which is the basis for the emergence of arginine and aspergine acids, and therefore it will be a reason for the formation of amino acids and proteins, which results in the movement of carbohydrates and their transition from their formation sites to Their storage locations (Havlin et al., 2005; Auerswald et al., 1996). Thus, the effect of the interaction of spraying with NPK and Ultrasol in reducing the phenomenon of antagonism between nutrients and increasing the absorption averages, which was reflected in the increase in the efficiency of the photosynthesis process and an increase in the average content of leaves of chlorophyll, and because of this dye in improving the nutritional status of the plant and increasing the content of the leaves of carbohydrates and the element nitrogen and phosphorus and Potassium and reduce the content of the leaves of the element sodium.

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