Effect of Root Enhancer and Cytoplus on Chemical Characteristics of Olive Sapling Cultivar Sourany.

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ABSTRACT:
A Factorial experiment within The randomized complete block design (RCBD) during the two season of growth 2016 -2017 In lath house was carried out to investigate the influence of adding organic fertilizers "Root Enhancer" and "Cytoplus" soil applied on chemical characteristics on one year old "Sourany" olive sapling . The soil-applied amounts of "Root Enhancer" (E) at four levels (0, 2, 3, 4 g. sapling $^{-1}$) and "Cytoplus" (C) at four level (0, 3, 5, 7 ml. sapling $^{-1}$).The adding of organic fertilizer E (4g. sapling $^{-1}$) gave significantly highest values of chlorophyll contents was 182.2 ,231.9 mg.100 g^{-1} F.W , vegetative dry matter was 48.63, 49.12 % , Leaf nitrogen concentration was 2.246 ,2.438 % , Leaf phosphor concentration was 0.372 ,0.376 % , Leaf potassium concentration was 2.658 ,2.669 % , Leaf calcium concentration was 2.582,2.425 %, Carbohydrate in shoot was 9.340,8.234 %, Nitrogen in shoot was 0.813, 0.804 % , Root uptake efficiency 34.24, 36.33% . The adding of organic fertilizer C (7ml. sapling $^{-1}$) gave significantly highest values of chlorophyll content at 171.6 , 163.6 mg.100 g^{-1} F.W , vegetative dry matter of 51.57 ,52.63 g , Leaf nitrogen concentration of 2.426 , 2.615% , Leaf potassium concentration of 2.482 ,2.420 % , Leaf calcium concentration of 2.112 ,2.082 % Carbohydrate in shoot 8.637,8.544% , Nitrogen in shoot 0.772 ,0.763 % , Root dry matter 34.73,40.24 g % , Root uptake efficiency 37.96 , 38.77 % . The interaction between experimental factors significantly increased most Characters.

Key words: olive, Humic acid, seaweed extracts , amino acid

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تأثير اضافة Root enhancer و Cytoplus على صفات الكيميائية لشتلات الزيتون صنف صوراني.

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الخلاصة:
أجريت تجربة عاملية بتصميم القطاعات العشوائية الكاملة (RCBD) خلال موسمي النمو 2016 -2017 في الظلة الخشبية لمعرفة تأثير الاضافة الارضية للأسمدة العضوية Root enhancer و Cytoplus على الصفات الكيميائية لشتلات الزيتون صنف صوراني بعمر سنة واحدة . تم اضافة "Root enhancer " بأربعة مستويات (0 و2 و 3 و 4 غم . شتلة $^{-1}$) ورمز له بالحرف (E) و Cytoplus (0 و 3 و 5 و7 مل .شتلة $^{-1}$) ورمز له بالحرف 2.2(C). اعطت المعاملة E4 (4 غم .شتلة $^{-1}$) اعلى فرق معنوي لمحتوى الكلوروفيل بلغ 182.2 ,231.9 ملغم لكل 100 غم $^{-1}$ وزن طري ,والمادة الجافة للمجموع الخضري 48.63, 49.12% ,والنتروجين في الاوراق 2.246, 2.438 % ,و الفسفور في الاوراق0.372, 0.376%, والبوتاسيوم في الاوراق 2.658, 2.669 % ,والكالسيوم في الاوراق 2.582, 2.425 % , والكربوهيدرات في الافرع 9.340, 8.234 %,والنتروجين في الافرع 0.813, 0.804 % ,و كفاءة امتصاص الجذور 36.33,34.24 %, وكان لأضافة المعاملة C7 (7 مل .شتلة$^{-1}$) اعطاء اعلى محتوى للكلوروفيل 171.6 , 163.6 ملغم لكل 100 غم $^{-1}$ وزن طري , و والمادة الجافة للمجموع الخضري 51.57 , 52.63%,والنتروجين في الاوراق 2.426, 2.615%, والبوتاسيوم في الاوراق 2.482, 2.420%, والكالسيوم في الاوراق 2.112, 2.082 %, والكربوهيدرات في الافرع8.637,8.544% ,والنتروجين في الافرع 0.772 , 0.763% ,و الوزن الجاف للجذور34.73, 40.24 %,وكفاءة امتصاص الجذور 38.77,37.96 %.التداخل بين المعاملات ادى الى زيادة اغلب الصفات

الكلمات المفتاحية : زيتون ,حامض الهيومك ,مستخلصات الاعشاب البحرية , إضافة ارضية.

INTRODUCTION

The cultivated olive (*Olea europaea L.*) is an evergreen tree belonging to the family *Oleaceae*, The olive is native to the Mediterranean region, tropical and central Asia and to various parts of Africa(22). It's use for dual purposes . Humic acid is a bio-stimulant, which acts as a growth booster by inflicting positive effects on soil and plant characteristics. It is a complex mixture of many nutrient element that are very important to plants (8). Amino acids increase different physiological activities directly and indirectly in plants and enter organic nitrogenous compounds they are the building blocks in the synthesis of proteins and a number of co- enzymes and play a role in stress resistance (11) ,(20) . Algae extract is a new bio-fertilizer containing macronutrients as well as micronutrients, some growth regulators, polyamines, natural enzymes carbohydrates , proteins and vitamins, It's applied to improve vegetative growth and yield (1).The target of this study was to evaluate vegetative and root growth of " Sourany" olive cultivar using Root enhancer and Cytoplus under Iraq conditions .

materials and methods:

This study was conducted in College of Agriculture - Baghdad University during the growing season 2016 and 2017 to investigate the influence of adding Root enhancer and Cytoplus on Vegetative and Root growth of Olive saplings c.v " Sourany" 1 year old cultivated in lath house . the saplings cultivated in black polyethylene bags with 35× 40 cm dimension filled with washed sand mixed well with decomposable organic fertilizer with volumetric percentage 1:15 .A factorial experiment with two treatment and three replicates was applied in a randomized complete block design (R.C.B.D) the first factor "Root enhancer" at four levels(E) (0,2,3, 4 g.sapling^{-1}) ,the second factor "Cytoplus" was four levels (C) (0,3,5 ,7 ml.sapling^{-1}), each experimental unit included three saplings, the total number became 48 saplings. The Root enhancer contains Free amino acids 38,0 %, Humic extract 14.0%, Vitamins 3.9 %,and ,N, P ,K, Ca, while Cytoplus contains Seaweed Extract with NPK. The treatments were applied during early morning to each treatment. The period between each application was 20 days and between the Cytoplus 72 hours . The data was analyzed using Genstat program, the mean was compared using least significant differences of L.S.D at a probability level of 0.05 . The following parameters were measured for both seasons:

1-Chlorophyll contents (mg.100 g^{-1} f. w)

Chlorophyll contents were estimated according to the method by Goodwin (10). Fresh leaves were cut into 0.5 cm segments and extracted overnight with 80% acetone at - 40°C. The extract was centrifuged at 14000 × g for 5 min and absorbance of the supernatant was taken at 645 and 663 nm. Total chlorophyll contents were calculated using the following formula: Total chlorophyll (mg/L) = 20.2 D(645) + 8.02D(663).

2- leaf and shoot dry matter (%):

At the end of each season a known wet of leaf and shoot were taken and washed several times with tap water then rinsed with distilled water and measured fresh wet for it , dried at 70^{o} C in an electric oven and take dray wet, using an electric sensitive balance than Percentage of dry matter measured was according to the equation :

$$\text{Percentage of dry matter} = \frac{\text{dry wet}}{\text{fresh wet}} \times 100 \quad .(1)$$

3-Leaf nitrogen concentration (%) :

Nitrogen analyses were determined by Micro Kjeldahl method (15). Determined for the two studied seasons.

4-Leaf phosphor concentration (%): Phosphorus was determined by the method of (23) determined for the two studied seasons**.**

5- Leaf potassium concentration (%): Potassium was determined by the flame

photometer according to the method of (6) for the two studied seasons **.**

6-Leaf calcium concentration (%):
Calcium Potassium was determined by the flame photometer according to the method of (6) during the two studied seasons **.**

7- Root dry matter (%): At the end of each season a known wet of Root was taken and washed several times with tap water then rinsed with distilled water and was measured fresh wet for it , dried at 70^{o} C in an electric oven dray wet was taken using, in electric sensitive balance than Percentage of dry matter was measured according to the equation :Percentage of root dry matter $= \frac{\text{dry wet}}{\text{fresh wet}} \times 100$.(1)

8-Carbohydrate in shoot (%) Carbohydrate in shoot were determined by Joslyn method (16). determined through the two studied seasons.

9- Nitrogen in shoot:

Measured similarly to the analysis of Leaf nitrogen concentration.

10- C / N Ratio:

Measured by division of the Carbohydrate in shoot on Nitrogen in shoot.

11-Root uptake efficiency (%)
At the end of both seasons plants were harvested and leaves, stems and roots were removed separately from each plant, washed with distilled water, dried at 80 ˚C for 72 h, ground and stored in an oven at 60 ˚C until analysis. Nitrogen uptake efficiency (NUE) was estimated according to the following formula :

$$\text{NUE} = \frac{\text{(N) uptake}}{\text{(N) applied}} \times 100 \quad (9)$$

Rustles and Discussion:
Effects of soil application of Cytoplus and root enhancer on Leaf chemical composition and vegetative dry matter :Concerning the result in table (1) Chlorophyll contents, vegetative dry matter, Leaf nitrogen concentration, Leaf phosphor concentration , Leaf potassium concentration, Leaf calcium concentration , were significantly affected by all treatments ,the soil application for Root enhancer with 4 g. sapling $^{-1}$ and Cytoplus with 7 ml. sapling $^{-1}$ gave the best results ,the Increase in dry matter and chlorophyll content can explain the positive role of the fertilizer Root enhancer due to its amino acid content which supplies the plant with vital energy to compensate for lost energy as result of biological processes of plant and its essential component for vital matter (protoplasm) (3) , amino acids direct or indirect effect on enzyme activity which speeds up absorption and transition of nutrients inside the plant (7) , (12b) .These result are in agreement with those obtained by Al-Obaidi ,(4) and AL-Zubaidi,(5). Humic acid contributes to the composition of chlorophyll pigment (7)**.**

Table(1) : Effects of soil application of Cytoplus and Root enhancer on leaf chemical characters and vegetative dry matter .

Treatment	Chlorophyll contents (mg.100 g^{-1} F .W)		vegetative dry matter (%)		Leaf nitrogen concentration (%)		Leaf phosphor concentration (%)		Leaf potassium concentration (%)		Leaf calcium concentration (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
E_0	108.4	105.7	40.91	40.57	0.698	0.692	0.263	0.252	0.982	1.187	1.151	1.121
E_2	162.1	153.8	45.27	44.82	1.585	1.861	0.305	0.313	2.135	1.812	1.615	1.541
E_3	180.0	194.4	47.00	46.96	1.972	1.717	0.286	0.332	2.447	1.676	1.881	1.875
E_4	182.2	231.9	48.63	49.12	2.522	2.438	0.372	0.376	2.658	2.669	2.582	2.425
L.S.D 5%	1.520	2.713	0.744	0.911	0.168	0.058	0.018	0.015	0.195	0.150	0.067	0.056
C_0	127.3	130.5	38.87	38.07	0.520	0.523	0.279	0.298	1.315	1.301	1.543	1.408
C_3	163.2	180.5	44.21	43.69	1.507	1.717	0.299	0.288	2.019	1.750	1.744	1.648
C_5	170.6	203.2	47.17	47.07	2.093	1.853	0.329	0.338	2.404	1.875	1.830	1.824
C_7	171.6	171.8	51.57	52.63	2.656	2.615	0.320	0.348	2.482	2.420	2.112	2.082
L.S.D 5%	1.520	2.713	0.744	0.911	0.168	0.058	0.018	0.015	0.195	0.150	0.067	0.056
E_0 C_0	85.01	81.94	36.87	35.84	0.317	0.306	0.197	0.186	0.641	0.540	0.695	0.576
E_0 C_3	95.88	88.70	39.10	38.07	0.489	0.498	0.240	0.313	0.899	1.153	1.224	1.118
E_0 C_5	117.4	133.9	41.95	41.60	0.707	0.722	0.278	0.256	1.106	1.335	1.289	1.342
E_0 C_7	135.2	118.4	45.73	46.75	1.277	1.241	0.338	0.252	1.281	1.721	1.397	1.450
E_2 C_0	117.8	117.6	38.40	38.05	0.416	0.403	0.285	0.300	1.446	1.403	1.508	1.403
E_2 C_3	140.5	140.8	44.68	43.65	1.515	2.480	0.233	0.244	2.091	1.676	1.580	1.498
E_2 C_5	189.0	171.3	47.24	46.21	1.679	1.688	0.348	0.357	2.579	1.880	1.643	1.589
E_2 C_7	201.0	185.4	50.74	51.36	2.730	2.872	0.355	0.350	2.422	2.289	1.729	1.675

E_3 C_0	144.7	154.0	40.41	39.38	0.814	0.708	0.357	0.407	1.510	1.244	1.795	1.639
E_3 C_3	201.5	233.0	46.45	45.42	1.392	1.235	0.321	0.252	2.580	1.471	1.811	1.843
E_3 C_5	202.8	203.8	49.12	49.67	2.413	1.611	0.238	0.261	2.681	1.926	1.863	1.928
E_3 C_7	170.9	186.9	52.02	53.35	3.270	3.314	0.229	0.409	3.015	2.062	2.054	2.089
E_4 C_0	161.6	168.4	39.79	39.01	0.533	0.673	0.277	0.300	1.664	2.016	2.174	2.012
E_4 C_3	214.8	259.4	46.59	47.62	2.633	2.655	0.402	0.344	2.507	2.698	2.361	2.135
E_4 C_5	173.0	303.6	50.36	50.80	3.573	3.390	0.453	0.479	3.251	2.357	2.524	2.438
E_4 C_7	179.4	196.3	57.79	59.05	3.347	3.034	0.356	0.379	3.209	3.606	3.268	3.115
L.S.D 5%	3.041	5.427	1.487	1.822	0.335	0.116	0.034	0.031	0.389	0.300	0.135	0.113

increase permeability of the cellular membrane and nutrient absorption (18), (17) these result are in agreement with those obtained by Yousef et al (24) which obtained an increase in leaf mineral content (N, P, K ,Ca). The effect of Seaweed Extract significantly increased chlorophyll content. This may be due to the role of Seaweed Extract in preventing chlorophyll from oxidation or increasing chlorophyll levels in leaf because the seaweed content on betaine which prevent chlorophyll decomposition (14) .

Effects of soil application of Cytoplus and root enhancer on shoot and Root chemical Characters : Concerning the result in table (2) Carbohydrate in shoot , Nitrogen in shoot , C / N Ratio , Root dry matter , Root uptake efficiency , were significantly affected by all treatments , the soil application for Root enhancer with 4 g.seedling^{-1} and Cytoplus with 7 ml. seedling $^{-1}$ gave the best result for the most of study parameter's the humic acid may be increase the efficiency of photosynthesis and carbohydrates manufacture and proteins and reduce the decomposition of amino acid (19). the Root uptake efficiency significantly increase may be due to the effect of amino acid because it increase the availably of nutrients in soil which is reflected on positive way to soil properties (21) ,these result are in agreement with those obtained by (9). Can be explain the positive role of nitrogen through contribution in the manufacture of chlorophyll pigment (13) . May be the increment in Carbohydrate and Nitrogen in shoot because the increase of nitrogen in leaf which have direct effect on efficiency of the carbon representation which is reflected positively to increase the and carbohydrates manufacture (21).

Table(2) : Effects of soil application of Cytoplus and Root enhancer on shoot and Root chemical characters .

Treatment	Carbohydrate in shoot (%)		Nitrogen in shoot (%)		C / N Ratio		Root dry matter (%)		Root uptake efficiency (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
E_0	6.415	7.090	0.674	0.658	9.52	10.44	23.23	28.79	14.10	15.69
E_2	7.982	7.758	0.682	0.674	11.70	11.52	33.61	38.56	31.20	31.88
E_3	8.424	7.726	0.743	0.731	11.33	10.87	37.05	41.27	31.85	33.65
E_4	9.340	8.234	0.813	0.804	11.49	10.21	36.39	38.53	34.24	36.33
L.S.D 5%	0.028	0.112	0.009	0.014	0.140	0.271	1.58	1.59	1.02	0.89
C_0	7.130	6.898	0.680	0.666	10.48	10.36	28.41	30.46	13.15	13.23
C_3	8.169	7.403	0.712	0.706	11.42	10.52	33.51	37.70	27.41	28..52
C_5	8.225	7.963	0.748	0.732	10.95	10.94	33.64	38.75	32.87	37.04
C_7	8.637	8.544	0.772	0.763	11.19	11.22	34.73	40.24	37.96	38.77
L.S.D 5%	0.028	0.112	0.009	0.014	0.140	0.271	1.58	1.59	1.02	0.89
E_0 C_0	6.226	6.711	0.659	0.647	9.45	9.56	20.31	20.31	0.00	0.00
E_0 C_3	6.430	6.900	0.669	0.658	9.62	10.48	22.52	22.52	13.51	14.09
E_0 C_5	6.474	7.304	0.682	0.648	9.50	10.76	25.64	25.64	19.74	23.66
E_0 C_7	6.531	7.445	0.685	0.679	9.53	10.96	24.46	24.46	23.16	25.02
E_2 C_0	7.426	7.606	0.671	0.664	11.06	11.46	24.12	24.12	19.01	16.08
E_2 C_3	7.780	7.710	0.683	0.674	11.39	11.44	35.10	35.10	33.95	35.70
E_2 C_5	7.844	7.818	0.686	0.682	11.43	11.47	37.35	37.35	34.92	37.68
E_2 C_7	8.879	7.897	0.688	0.675	12.91	11.69	37.86	37.86	36.92	38.06
E_3 C_0	7.223	6.412	0.683	0.671	10.57	10.38	34.19	34.19	16.8	18.71
E_3 C_3	8.65	7.37	0.70	0.71	12.2	10.3	38.7	38.7	29.9	31.72

	4	8	7	1	4	8	3	3	7	
E_3 C_5	8.718	8.187	0.762	0.761	11.44	11.32	36.24	36.24	35.79	38.02
E_3 C_7	9.101	8.926	0.821	0.782	11.09	11.41	39.03	39.03	45.45	46.16
E_4 C_0	7.645	6.861	0.705	0.683	10.85	10.04	35.01	35.01	17.40	18.13
E_4 C_3	9.812	7.625	0.788	0.779	12.45	9.79	37.70	37.70	32.24	32.57
E_4 C_5	9.865	8.542	0.863	0.836	11.43	10.22	35.31	35.31	41.02	48.80
E_4 C_7	10.04	9.909	0.894	0.917	11.22	10.80	37.55	37.55	46.29	45.84
L.S.D 5%	0.056	0.225	0.018	0.028	0.280	0.542	3.16	3.18	2.03	1.77

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