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Ellevation of Uranium Stress on Olive Budlings by Organic Matter Amendment

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ABSTRACT

This study was carried out through two successive seasons of 2012&2013. A pot experiment was carried out on Kalamata Olive budlings to investigate effects of adding uranium to the nutrient solution at ٦ concentrations. The effect of organic matter amendment in the media to diminish the adverse effects was also assessed. The evaluated parameters were vegetative growth parameters, biomass, leaf total chlorophyll, leaf macro-nutrients and uranium accumulation. The attained data clarified clear adverse effects, which were in proportional to increasing the added uranium. Amending the growing media with farm manure showed significant palliative effects, which increased with increasing the application rate. It was concluded that the adverse effects related to uranium application in our opnion is basically due to decreasing the macro nutrients absorption and this is evident by its' decreasing concentration in the leaves. This was reflected on the decrease total chlorophyll in the leaves leading to lowering their photosynthetic activity. This resulted in decreasing the vegetative growth and thereby decreasing the biomass. The effect of adding organic matter might be attributed to their effect on adsorbing uranium which led to a decrease in its' accumulation and thus reducing its' adverse effects. In addition to the nutritive effects of the organic matter, which enhance growth parameters and biomass.

Keywords: olive – uranium- adverse effects- organic matter

INTRODUCTION

Recently, many scientists are interested in studying radio nuclides such as Uranium. This naturally accruing element is the principal precursor for the other naturally accruing radio nuclides in the earth’s crust. Contamination of such element in soils and plants is often associated with the effective presence of its sources. These sources are one or more of the following: some areas from black sand, areas in downwind from the industrial activate contaminated fertilizers and weathered tailings of uranium mining and milling. (Hassan,1993)

Dunn (2001) found that uranium levels in Spruce varied from 5 to 886ppm but in soil it was 2ppm. Mosquera *et a*l(2006) illustrate that uptake of radio nuclides from contaminated soil represents a significant pathway of human radiation exposure, either due to the direct consumption of cereals, fruits and vegetables or indirectly following consumption of milk and meat from animals feed.

Hegazy *et al* (2013) declared that radio nuclides content in crop plants cultivated in the coastal black sand soil revealed their ability to accumulate high concentration of uranium in the edible portions. Adverse effects attributed to uranium accumulations were demonstrated by Butink *et al*. (2002), who classified the highest U accumulation was particularly in the root system, greater mobility within the plant and accumulation of the element was generally greater in leaves and stems.

Arey and Jain (2003) in a study on the toxic effect of various doses of U on growth of young wheat *Triticum aestive* seedling found that root- shoots length, fresh and dry weight, and chlorophyll content decreased even at the lowest studied . Soluble proteins and phenols increased with increasing U. The severity of these effects was concentration dependent, (Jain and Aery, 2002) studied the toxic effect of different (1, 5, 25,125,625 and 919ppm) concentrations of radio nuclides uranium on growth of young wheat plants added to soil. They found that plant chlorophyll content was negatively correlated with uranium concentration, leaf soluble proteins increased as the concentration of applied uranium and Thorium was increased, roots accumulated most uranium and Thorium., Followed by shoot and seeds. A decrease in translocation ratio at higher Uranium and Thorium concentrations may have been due to reduced metabolic activity of roots.

EL-Fayoumy and Hammed (2001) mentioned the increasing rates of farmyard manure without mineral fertilizes significantly and progressively increased the P- concentrations, water and maximum total P-uptake. Also they found that the farmyard manure increased K-uptake and concentration.

Horikoshi *et al* (1979) reported that the soil samples that have highly organic fertilization contained less uranium. The present study aims to investigate the inhibitory effect of uranium on olive transplant growth, dry matter palliative effects, and the uranium uptake, accumulation, translocation in its organs, and of using organic manure.

MATERIALS AND METHODS

The present study was conducted in the greenhouse of the Nuclear Materials Authority, Cairo, Egypt for the two successive seasons of 2012&2013 .162 Kalamata on seedling rootstocks budling were considered for this investigation for each season of the study. Budlings were of nearly similar length, stem girth and had all of them lateral twigs were removed. The transplants were thoroughly washed with tape water and then planted in 5 Kg plastic pots full of well washed sand. Fifty four of the pots had farm yard manure at 1% mixed with the sand. Another 54 pots had farm yard manure at 2% mixed with the sand, while the remaining 54 pots had pure sand only. Chemical properties of the considered manure were as follows (8.3%O.M., 0.5%N, 0.41%P_2O_5, 1.2K_2O_5 and C/N 16.6).

Moisture was maintained at 60% of the soil water holding capacity by 1/4 Hoagland solution. After two months from planting, application of uranium (as Uranyal acetate 2 hydrate) to the Hogland solution started (each three plants acted as a replicates) Concentrations used were 0, 1,2,3,4, 8, 16ppm.

Assessments

Growth parameters: At the end of each of the growing seasons the following parameters were measured and tabulated presented: Average shoot length, average number of leaves /plant and the biomass in terms of average dry weight of shoot , leaves and roots

Chemical analysis: Total chlorophyll was measured in the leaves according to the method described by Westtein, (1957) In addition to N% (Pregl,1945), P% (Jackson,1967) and K% (Brown& Lilleland,1946)also U (ppm) according to [Bouda, (1988)].

Experiment design and statistical design:

The complete randomized design was adopted with each treatment applied on 9 plants each 3 acting as a replicate. The attained data was tabulated and subjected to analysis of variance according to the method described by Snedecor and Cochra (1989. Means were separated by LSD test (0.05)(Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The effect of used uranium concentrations, the used media and their interaction on the assessed parameters will be presented. With respect to the interaction we will try to focus on the concentration of uranium at which insignificant adverse effects appear in relation to control (without uranium or organic matter added).

Vegetative growth

The average shoot length was insignificantly affected up to1&2 ppm uranium usage (65.33 &69.43 cm) for both seasons respectively. Significant decreases in shoot length were detected with increasing the used uranium concentrations to reach significantly the utmost with 16 ppm(52.66&58.23cm) for both season study respectively. Adding organic matter to used media resulted in a significant increase in this parameter with the highest significant effect for the 2 %(67.28&74.22 cm for both seasons, respectively). Interaction data show that increasing organic matter in used media reduced the adverse effect of uranium applications especially at the lowest concentration of uranium .

The average number of leaves per budlings decreased significantly with using any of the adopted uranium concentration. This decrease was in proportional with increasing the concentration. Using organic matter in the media increased this parameter with the highest significant effect due to the 2%. Interaction data clear that using uranium at any concentration significantly reduced this parameter in the case of control media (with no organic matter). This was untrue for the 1 ppm uranium in the first season only. Adding 1% organic matter to the media resulted in neglecting the uranium significant adverse effect up to 2 ppm(46.0) leaves budlings in the first season and had no effect in the second season. While adding 2% organic matter alleviated the tolerable (with insignificant averse effect) uranium concentration to 8ppm in the first season (30.3) leaves budlings)and 4ppm (30.3) in the second one) leaves budlings(table 1).

Table(1) Effect of increasing uranium in the nutrient solution and amendment with organic matter on olive vegeatative growth at two season

Shoot length cm								
Season 1								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	61.00	61.00	61.00	59.00	55.00	52.00	47.00	c٥٦.٥٧
1%	64.00	64.00	64.00	58.00	54.00	54.00	50.00	b٦٥.٨٥
2%	70.00	71.00	71.00	68.00	68.00	62.00	61.00	a٦٧.٢٨
AV	65.00b	65.33a	65.33a	61.66c	59.00d	56.00e	52.66f	
L.S.D A=	0.756							
L.S.D B=	1.1558							
L.S.D AB=	2.002							
Season 2								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	59.7	61.0	61.0	60.3	59.7	57.00	52.00	c٥٨.٦٧
1%	68.7	67.3	67.3	65.7	61.3	60.7	60.7	b٦٤.٥٢
2%	80.0	80.0	80.0	76.0	71.3	70.3	62.0	a٧٤.٢٢
AV	69.46a	69.43a	69.43a	67.33b	64.10c	62.66d	58.23e	
L.S.D A=	1.030							
L.S.D B=	1.573							
L.S.D AB=	2.726							
Leaves number per shoot								
Season 1								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	44.3	43.0	28.3	16.7	17.0	11.3	0.0	22.94c
1%	66.7	46.0	39.3	27.0	38.7	16.0	8.3	b٣٤.٥٧
2%	85.0	81.7	60.3	58.7	53.3	30.3	19.3	55.41a
AV	65.33a	56.66b	42.63c	36.33d	34.10e	19.20f	9.20g	
L.S.D A=	0.818							
L.S.D B=	1.250							
L.S.D AB=	2.165							
Season 2								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	35.7	23.3	21.3	15.0	9.3	8.6	0.0	16.17c
1%	67.7	26.0	25.3	24.3	23.0	21.3	15.3	b٢٨.٩٨
2%	73.0	54.0	49.7	48.3	30.3	27.7	27.3	44.23
AV	58.8a	34.41b	32.10c	29.20d	20.81e	19.08f	14.08g	
L.S.D A=	0.786							
L.S.D B=	1.202							
L.S.D AB=	2.082							

Biomass

On the average control (0 ppm uranium) leaves attained the heaviest dry weight in both seasons of the investigation amounting to (5.33 & 5.78 gm/ pot .) In both seasons, respectively. Alleviating the concentration of applied uranium to 3 ppm in the first season and 4 ppm in the second one (5.31&5.92gm) showed insignificant effects. Furthermore increases in the applied concentrations resulted in significant decreases in this parameter to its' lowest magnitude at16 ppm application (3.57&2.97gm/ pot for both seasons respectively). Effects of 4&8 ppm and 8 &16 ppm in the first season were statistically equal. As for the average effect of organic matter amendment, data show significant increases in leaves dry weight with the increase in percentages applied to reach significantly the highest weight with 2% organic matter. Interaction ;data show that leaf dry weight was not significantly affected up to4 ppm uranium applications for both seasons in the case of no organic matter amendment. Amendment with 1% organic matter did not show a significant effect in this respect. Whereas amendment with 2 % organic matter increased the uranium concentration which had an insignificant adverse effect to 16 &8 ppm (4.03&5.0gm) for both seasons respectively.

As for the stem dry weight, applied uranium to 3 ppm(12.48g/ pot) in the first season and 1 ppm(13.26 g/pot) in the second one had an insignificant effect on this parameter when compared with control. Furthermore increases reduced the dry weight significantly to reach the peak of reduction at 16 ppm(9.44&9.65g/ pot) in both seasons. The effects of both 4 &8 ppm were statistically equal in both seasons. As for the effect of organic matter amendment, the average this parameter was increased significantly with the increase of the organic matter concentration. As for Interaction data, Stem dry weight was statistically equal to control up to using 3 ppm uranium in the first season and 2 ppm in the second. Amendment with 1% organic matter resulted in neglecting the uranium effect up to a concentration of 8 ppm(10.73&11.0g/ pot) in both seasons Whereas, increasing the organic matter to 2% resulted in neglecting the adverse effect of uranium up to a concentration of16 ppm(13.00g/ pot) in the first season and 8ppm(10.5 gm) in the second one.

With respect to the average root dry weight, it was insignificantly affected with increasing the uranium concentration up to 3 ppm(9.00g/pot) in the first season and 1 ppm(9.71g/pot) in the second season . Also using organic matter resulted in a significant increase in this parameter on the average. Results attained by 2% were significantly the highest. Interaction data reveal that in the cases of not using any organic matter a statistically equal dry weight was attained by using to 3&1 ppm uranium in both seasons respectively. The concentration of uranium that does not show any significant adverse effect reached 3& 8 ppm for both season respectively with amendment of 1% organic matter and 16 ppm for both seasons with using 2% organic matter.(table,2)

Total chlorophyll

On the average total chlorophyll significantly decreased as a result of adding uranium to the nutritional solution. In general the significant decrease in the chlorophyll was in parallel with increasing the used uranium concentration. Adding organic matter increased this parameter with the highest significant effect attributed to the2%. Interaction clarify that in the first season application of up to 1 ppm uranium had insignificant effect on the leaf total content of chlorophyll whether the growing media was amended or not with organic matter. In the second season however a similar trend was observed except that all used uranium concentrations showed significant adverse effects on this parameter. Using organic matter at both concentrations showed insignificant adverse effects up till using 1 ppm uranium. (table,3) Data for effect of different treatments on leaves chlorophyll a, b and carotenes content took the same trend as for total chlorophyll content.

Leaf content of macro nutrients:

On the average leaf content nitrogen was insignificantly affected up to 4 ppm (1.49) uranium applications in the first season and 3ppm(1.54) in the second season . Increasing the uranium concentration significantly decreased this content. As for the average effect of the organic matter amendment, it significantly increased this parameter with a more significant effect for the higher concentration. Interaction data illustrate that up to 3 ppm in the first and 1 ppm in the second season insignificant by decreased the leaf N when using a medium free from organic matter. The insignificant adverse effects were detected up to 16 ppm when using media with 1 &2% respectively.

On the average all of the used uranium concentrations significantly reduced the leaf phosphorus content. Amending the growing media with organic matter significantly increased the leaf P content. The highest effect was attributed to 2% organic matter. Interaction data clarify that . Leaf P content was significantly affected by all uranium application in both seasons in the case of control medium. Whereas using media amended with 1 or 2% organic matter increased the tolerable (without significant adverse effects) of used uranium concentrations to 4 and 8 ppm in the first season and 4ppm for both media in the second season.

Increasing the uranium concentration on the average decreased the magnitude of the potassium content in the leaves significantly in parallel to the used concentration. Yet usage 1 ppm in the first season and up to 3 ppm in the second (0.77&0.79) had insignificant effects compared with control. Adding organic matter to the media showed significant effects on increasing this content. The higher concentration had a more significant effect in this respect. Interaction data demonstrate significant effects compared with control with no organic matter or uranium application the usage of 2 ppm in the first season and 4 ppm in the second season did not alter the leaf content of K. Adding organic matter to the growing media at either concentrations and applying any of the used concentrations of uranium did not alter significantly the leaf K content compared with control.(table4)

Table (2) : Effect of increasing uranium in nutrient solution and amendment with organic matter on olive (leaves, stem and roots) biomass g/pot ,in both seasons.

Season 1

LEAVES (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	4.90	4.80	4.63	4.00	3.89	2.80	2.90	4.088c
1%	5.30	5.30	5.55	5.95	4.00	3.53	3.09	b٤.٧٦٩
2%	5.80	5.83	6.02	6.00	5.50	5.00	4.03	a٥.٤٥٢
AV	5.33a	5.53a	5.40a	5.31a	4.46b	3.77bc	3.57c	
L.S.D A=	0.50							
L.S.D B=	0.77							
L.S.D AB=	1.33							

Season 2

LEAVES (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	5.03	4.93	4.58	4.30	3.95	3.03	2.89	4.22c
1%	5.95	5.69	5.63	5.30	5.03	3.58	3.00	4.88b
2%	6.35	6.50	6.40	6.29	5.92	5.00	3.03	5.69a
AV	5.78a	5.65a	5.53a	5.3a	5.29a	3.87b	2.97c	
L.S.D A=	0.98							
L.S.D B=	0.74							
L.S.D AB=	1.28							

Season 1

STEM (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	10.85	10.79	10.20	10.23	9.35	9.30	7.08	9.68c
1%	12.75	12.95	12.33	12.25	10.98	10.73	8.50	11.49b
2%	16.30	15.90	15.75	14.98	13.30	13.00	12.83	14.56a
AV	13.30a	13.21a	12.76a	12.48a	11.21b	11.01b	9.44c	
L.S.D A=	0.55							
L.S.D B=	0.84							
L.S.D AB=	1.45							

Season 2

STEM (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	11.98	10.63	10.69	10.30	9.20	9.30	9.15	10.18c
1%	13.33	13.03	12.09	12.00	11.03	11.00	9.90	11.68b
2%	16.30	16.13	15.90	13.53	12.35	11.28	10.50	13.71a
AV	13.87a	13.26ab	12.89b	11.95c	10.85d	10.52d	9.65e	
L.S.D A=	0.51							
L.S.D B=	0.78							
L.S.D AB=	1.36							

Season 1

ROOT (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	8.39	8.55	7.93	8.33	7.60	5.35	5.00	7.31c
1%	10.23	9.50	9.25	8.39	7.39	6.92	6.60	8.32b
2%	10.50	10.80	10.23	10.28	9.75	9.50	8.90	10.01a
AV	9.71a	9.61a	9.14ab	9.00ab	8.24c	7.29d	6.83e	
L.S.D A=	0.42							
L.S.D B=	0.51							
L.S.D AB=	0.99							

Season 2

ROOT (g/pot)								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	8.50	8.02	6.95	7.00	6.83	6.50	6.40	7.17c
1%	10.09	10.10	10.00	9.55	8.98	7.92	6.00	8.94b
2%	11.59	11.03	10.90	10.53	10.03	9.35	7.93	10.19a
AV	a١٠.٠٦	ab٩.٧١	bc٩.٢٨	cd٩.٠٣	d٨.٦١	e٧.٩٢	f٦.٧٧	
L.S.D A=	0.33							
L.S.D B=	٠.٥٠							
L.S.D AB=	0.86							

Table (3) : Effect of increasing uranium concentration in nutrient solution and amendment with organic matter on total chlorophyll in both season.

Season 1

Total chlorophyll(mg/g)								
0%	2.890	2.570	1.960	1.970	1.910	1.730	1.710	2.157b
1%	3.270	2.710	2.060	2.000	1.900	1.660	1.610	2.211b
2%	3.620	2.960	2.410	2.080	2.080	1.990	1.700	2.414a
AV	3.326a	2.79b	2.25c	2.024cd	1.97d	1.806de	1.653e	
L.S.D A=	0.157							
L.S.D B=	0.241							
L.S.D AB=	0.372							

Season 2

Total chlorophyll(mg/g)								
0.000	2.890	2.660	2.030	1.950	1.900	1.800	1.610	2.105c
0.010	3.320	2.870	2.130	2.040	1.900	1.690	1.580	2.218b
0.020	3.570	3.260	2.640	2.240	2.130	1.990	1.730	2.494a
AV	3.26a	2.93b	2.23c	2.07d	1.97e	1.79f	1.64g	
L.S.D A=	0.039							
L.S.D B=	0.060							
L.S.D AB=	0.104							

Table (4): Effect of increasing uranium in nutrient solution and amendment with organic matter on olive in both seasons.

Season 1				N %				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	0.920	0.920	0.880	0.860	0.830	0.560	0.440	c٠.٧٧٤
1%	1.670	1.720	1.760	1.720	1.690	1.160	0.880	b١.٥١٥
2%	2.000	2.000	1.960	1.920	1.960	1.840	1.660	1.907a
AV	1.53abc	a١.٥٩	ab١.٥٣٦	bc١.٥٠٣	c١.٤٩	d١.١٨٦	e١.٠٠	
L.S.D A=	0.026							
L.S.D B=	٠.٠٤٠							
L.S.D AB=	٠.٠٧٤							
Season 2				N %				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0.000	0.990	0.980	0.890	0.890	0.850	0.590	0.510	c٠.٨١٤
0.010	1.690	1.770	1.790	1.790	1.720	1.220	0.950	b١.٥٥٩
0.020	1.980	1.970	1.950	1.950	1.890	1.660	1..43	a١.٨٣٢
A.V	a١.٥٥٣	a١.٥٧٤	a١.٥٤	a١.٥٤	b١.٤٨	c١.١٥	d٠.٩٦٣	
L.S.D A=	0.029							
L.S.D B=	٠.٠٤٤							
L.S.D AB=	٠.٠٧٤							
Season 1				K %				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	0.460	0.460	0.440	0.400	0.340	0.280	0.220	c٠.٣٧٧
1%	0.880	0.860	0.880	0.760	0.700	0.580	0.440	0.730b
2%	1.000	1.000	0.980	0.960	0.980	0.920	0.880	a٠.٩٦٠
AV	a٠.٧٨	ab٠.٧٧٣	b٠.٧٦٦	b٠.٧٠٦	d٠.٦٨٦	e٠.٥٩٦	f٠.٥١٣	
L.S.D A=	٠.٠٠٨							
L.S.D B=	٠.٠١٢							
L.S.D AB=	٠.٠١٦							
Season 2								
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0.000	0.490	0.500	0.510	0.520	0.520	0.410	0.330	c٠.٤٥٦
0.010	0.900	0.910	0.900	0.890	0.870	0.760	0.550	b٠.٨٢٥
0.020	1.100	1.000	0.990	0.980	0.980	0.900	0.820	a٠.٩٢٤
AV	a٠.٨٣	ab٠.٨٠٣	abc٠.٧٩٣	abc٠.٧٩	bc٠.٦٩	c٠.٦٨	d٠.٥٦٥	
L.S.D A=	٠.٠٧١							
L.S.D B=	١.٠٨٤							
L.S.D AB=	0.188							
Season 1				P %				
O.M(B) U(A)	0	1	2	3	4	8	16	AV
0%	0.190	0.160	0.160	0.150	0.130	0.090	0.050	c٠.١٣١
1%	0.230	0.230	0.210	0.200	0.170	0.140	0.110	0.184b
2%	0.280	0.250	0.250	0.240	0.230	0.180	0.150	0.225a
AV	a٠.٢٣٣	b٠.٢١٣	b٠.٢٠٦	c٠.١٩٦	d٠.١٧٦	e٠.١٣٦	f٠.١٠	
L.S.D A=	0.005							
L.S.D B=	٠.٠٠٧							
L.S.D AB=	٠.٠١٤							
Season 2								
O.M(B) U(A)	0	1	2	3	4	8	16	AV
0.000	0.210	0.180	0.190	0.180	0.170	0.100	0.060	c٠.١٥٥٧
0.010	0.240	0.250	0.230	0.210	0.210	0.180	0.120	b٠.٢٠٥٧
0.020	0.290	0.280	0.250	0.240	0.230	0.190	0.160	a٠.٢٣٤٢
AV	a٠.٢٤٦	b٠.٢٣٦	c٠.٢٢٣	d٠.٢١	d٠.٢٠٣	e٠.١٥٦	f٠.١١٣	
L.S.D A=	0.005							
L.S.D B=	0.007							
L.S.D AB=	٠.٠١٠							

Uranium accumulation

Uranium accumulation in the leaves on the average increased markedly with alleviating the applied uranium concentration. It reached significantly the highest concentration with the usage of 16 ppm). On the average using organic matter in the media decreased the accumulated uranium significantly. Significantly the least accumulation was attributed to the usage of 2% organic matter Interaction data clear that with respect to control medium all used concentration of uranium statistically increased this accumulation except for 1 Ppm (0.04) in the second season only. In the case of adding 1% of organic to the media, it was evident in the first season that this media failed to reduce the accumulation to be insignificant from control Whereas, in the second season, it succeeded in causing a non-significant uranium accumulation up to using 3 ppm uranium. As for the media with 2% organic matter, compared with control, it resulted in insignificant accumulation of uranium up 1 & 4 ppm(0.05&0.09) usage of uranium in both seasons respectively.

On the average uranium accumulation increased significantly in the stem with alleviating the concentration of uranium applied to reach the utmost statistically with the 16 ppm concentration. Adding organic matter to the media decreased this accumulation significantly in parallel to the used concentration. Interaction data show that for control media all used uranium concentrations significantly increased the accumulation. Adding organic matter at either concentration to the growing media led to insignificant uranium accumulation in the stem up to the application of 1 ppm uranium.

With respect to uranium accumulation in the roots on the average accumulation increased statistically with increasing the added concentration. Yet in the first season adding 1 ppm uranium had an insignificant effect compared with the 2ppm. The amendment with organic matter decreased statistically the uranium accumulation in the roots. This effect was more pronounced with the higher concentration used. Interaction data show that with respect to control medium, none of the applied uranium concentrations resulted in an insignificant accumulation of uranium compared with control. Adding organic matter at 1% in the first season led to insignificant accumulation in the roots with 1 ppm uranium (0.51) application in the first season. Whereas, this accumulation was significant in the second season, increasing the added organic matter to 2% in the media led to insignificant uranium accumulation in the roots when using up to 2 ppm uranium in the first season and 1 ppm in the second compared with control (no organic matter or uranium).(table 5)

Table(5) : Accumulation index of uranium (roots, steam and leaves) as affected and amendment with in both season by uranium concentration .

Season 1								
			LEAVES	(ppm)				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0%	0.000	0.320	0.270	0.310	0.220	0.200	0.150	0.210b
1%	0.000	0.150	0.130	0.180	0.150	0.110	0.150	o.124c
2%	0.000	0.050	0.210	0.200	0.600	0.750	1.900	a٠.٥٣
AV	0 g	0.17f	0.20e	0.23d	0.32c	0.35b	0.73a	
L.S.D A=	0.006							
L.S.D B=	0.009							
L.S.D AB=	0.016							
SEASON 2								
				LEAVES	(ppm)			
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0.000	0.000	0.300	0.400	0.320	0.220	0.310	0.240	0.252a
0.010	0.000	0.190	0.150	0.130	0.160	0.240	0.230	0.158b
0.020	0.000	0.040	0.120	0.100	0.090	0.070	0.110	0.771c
A.V	0 f	0.173d	0.226a	0.183cd	0.1533e	0.21b	0.193c	
L.S.D A=	0.007							
L.S.D B=	0.010							
L.S.D AB=	0.017							
Season 1			STEM (ppm)					
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	A.V
0%	0.000	0.620	0.750	0.610	0.620	0.400	0.680	a٠.٥٢٥
1%	0.000	0.350	0.390	0.340	0.300	0.210	0.350	0.277b
2%	0.000	0.200	0.260	0.200	0.260	0.180	0.280	0.197c
AV	0 e	0.39c	0.466a	0.383c	0.393c	0.263d	0.43b	
L.S.D A=	0.007							
L.S.D B=	0.011							
L.S.D AB=	0.017							
Season 2			STEM (ppm)					
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0.000	0.000	0.650	0.600	0.550	0.630	0.430	0.490	0.478a
0.010	0.000	0.300	0.430	0.320	0.550	0.240	0.260	b٠.٣٠
0.020	0.000	0.210	0.230	0.270	0.390	0.230	0.240	c٠.٢٢٣
AV	0 f	0.388c	0.42b	0.38c	0.523a	0.30e	0.33d	
L.S.D A=	0.007							
L.S.D B=	0.012							
L.S.D AB=	0.521							
Season 1			ROOT	(ppm)				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	A.V
0%	0.000	0.950	1.000	0.850	0.830	0.750	0.770	a٠.٧٣٥
1%	0.000	0.510	0.470	0.600	0.610	0.370	2.660	0.745a
2%	0.000	0.250	0.360	0.400	0.430	0.280	0.400	0.377b
AV	0 d	0.57bc	0.61b	0.61b	0.616b	0.524c	1.276a	
L.S.D A=	0.051							
L.S.D B=	0.077							
L.S.D AB=	0.138							
Season 2			ROOT	(ppm)				
O.M(B) U(A)	0	1	2	3	4	8	16 ppm	AV
0.000	0.000	0.950	1.000	0.860	0.840	0.730	0.750	0.725a
0.010	0.000	0.490	0.510	0.450	0.700	0.480	0.490	b٠.٤٤
0.020	0.000	0.250	0.340	0.370	0.480	0.300	0.360	0.301c
AV	0 f	0.563c	0.60b	0.56c	0.676a	0.563e	0.533d	
L.S.D A=	0.012							
L.S.D B=	0.019							
L.S.D AB=	0.285							

Adding uranium to the nutrient solution decreased both the vegetative growth and biomass of the olive budlings in a way parallel to the concentration added.Previous reports revealed similar effects as reported by Abel-Mottalebetal(1998) result showed t the dry matter (root, shoot and whole plant increased with increasing uranium concentration up to 1.0 ppm rate and significantly decreased in maize roots and shoots due to U application in the nutrient solution. and also Arey and Jain (2003): In a study on the toxic effect various doses of U and Th on growth of young wheat *(triticum aestive*) seedling found that root, shoot length, fresh and dry weight, and chlorophyll content decreased even at the lowest studied urany dose studied (1.25mg/ml).soluble proteins and phenols increased with increasing U and Th doses, thought germinations speed was affected ultimate was always 100%.

Also the amendment of growing media with organic matter led to diminishing the adverse effect caused by the added uranium. Similar findings were attained by Horikoshi *et al* (1979)) on suggested similar effects, the soil samples that have highly organic fertilization contained less uranium. Sylivakratz and Ewaldschuny(2006) found that the Organic fertilizers like manures low in uranium concentration.

Both macro nutrients content in the leaves and total chlorophyll showed a marked decline that on the plant spices was in parallel with the added uranium concentrations. Similar results were attained by *Jovanić, et al* (2012) found that the effect of nuclear radiation during eleven years after bombing on six plants species physiological activities was observed. It was shown that significant change in photosynthetic activities, photosynthesis pigments and abilities the plant to converse absorbed solar energy in to photosynthetic product was change. Also it was shown that chlorophyll contents was significant change in to several plants.

The declining in leaf macro nutrients was diminished by amending the used media with organic matter in proportion with the used concentration Uranium accumulation increased with the increase of the added concentration in leaves, stem and roots of the olive budlings . This result increase was diminished with adding organic matter to the media.(Abel-Mottalebetal, 1998) showed the shoots always contained extra P uptake more than roots and the highest P content and uptake were found with the least uranium concentration in the growth media. Potassium content and uptake decreased in both shoot and root due to increase in U concentration. the amount of uranium in maize roots increased with increasing uranium levels in the nutrient solution

In conclusion adverse effects related to uranium application in our opnion is basically due to decreasing the macro nutrients absorption and this is evident by its' decreasing concentration in the leaves. This was reflected on the decrease in the leaves total chlorophyll leading to lowering their photosynthetic activity. This resulted in decreasing the vegetative growth and thereby decreasing the biomass. The effect of adding organic matter might be attributed to their effect on adsorbing uranium which led to a decrease in its' accumulation and thus reducing its' adverse effects. In addition to the nutritive effects of the organic matter which enhance growth parameters and biomass.

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تأثير المادة العضوية على امتصاص و تراكم اليورانيوم فى نبات الزيتون

رمزى جورج استينو[١] ، ابراهيم الشناوى[١] ، محمدعيسى الشوبكى [٢] ، هشام قدرى فؤاد[٢] و نسرين شاكر باخوم[٢]
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أجريت هذه الدراسة خلال موسمين متتاليين ٢٠١٢ و ٢٠١٣. لدراسة تاثير اليورانيوم على نبات الزيتون صنف كالاماتا حيث تم زراعة الشتلات فى اصص و اضافة اليورانيوم الى المحلول المغذي ب ٦ تركيزات. تم تقييم تأثير المادة العضوية للحد من تاثير اليورانيوم . وتم دراسة النمو الخضري ،والوزن الجاف ،الكلوروفيل، والعناصر فى الاوراق NPKوتراكم اليورانيوم. اوضحت البيانات زيادة تاثير اليورانيوم الضار بيتناسب مع زيادة نسبة اليورانيوم المضافة، وتقل مع اضافة المادة العضوية. كما وجد ان امتصاص اليورانيوم يؤدى الى انخفاض امتصاص العناصر الغذائية الكبرى وذلك نتيجة تناقص تركيز هذه العناصر في الأوراق. وقد انعكس ذلك على انخفاض في الكلوروفيل الكلي في الأوراق مما يؤدي إلى انخفاض عملية البناء الضوئى كما أدى ذلك الى قلة النمو الخضري وكذلك الوزن الجاف. و يمكن أن يعزى تأثير ادمصاص اليورانيوم الى إضافة المواد العضوية مما أدى إلى انخفاض في تراكم اليورانيوم وبالتالي تقليل تاثيره على النباتات ، بالإضافة إلى تاثير المواد العضوية على تغذيه النبات.